



This appendix organises validation workshop ‘Opportunities for Improvement’ (OFI) by Business Input and links these to specific Credible Failure Modes. This resource assists Vehicle Interaction Control Improvement planning by grouping Opportunities for Improvement into categories that can be reviewed for relevance, priority, links, and project sequencing. Each suggested OFI for site work processes and practices (Business Inputs) can be considered by senior personnel by asking:

1. Is the Opportunity for Improvement (OFI) relevant and practical?
2. Will it deliver value?
3. Can it be implemented and maintained efficiently?
4. Will it improve the current site Business Inputs that prevent or mitigate the linked Credible Failure Mode from compromising the relevant Required Operating States?

Table C1 – Opportunities for Improvement Mapped to Business Inputs with Credible Failure Mode Links

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>OFI-101: Resolve document reference duplicates for different GHG operations.</b></p>	<p><b>BI-CDA.03 There is an appropriate and up-to-date training management system</b></p>	<p><i>A process should be in place for delivering and maintaining competency-based training to provide skilled personnel for all roles on site.</i></p>	<p>The training management system:</p> <ul style="list-style-type: none"> <li>• Matches skills to roles e.g. through a training needs analysis</li> <li>• Presents information that is appropriate for the audience</li> <li>• Confirms requirements for safe and productive operations</li> <li>• Assesses competency e.g. through written and practical tests</li> <li>• Requires ongoing maintenance of skills for operational, design, planning, and leadership role holders</li> </ul> <p><b>Procedure, Competence, Training and Assessment HSMP 4.2 PR V12 4/6/24 - S6.1 Identify training needs taking a risk-based approach and prepare a TNA for each role in a Department. 6.1.9 Competent people to be engaged to prepare and administer TNAs. S6.2 All people to be Trained and Competent. S6.3 to 6.6 People to be appointed after inducted and if needed have First aid and other non-technical skills. S6.7 and 6.8 Manage training and keep records.</b></p> <p><b>OFI-101 Resolve document reference duplicates for different GHG operations</b></p> <p><b>Consultant Comment:</b> During 'work as documented' mapping for Tarkwa, documents for Damang were also provided. Some of these had duplicate or similar titles.</p> <p>If these duplicate or similar documents are accessible by decision makers at both sites then choosing the incorrect</p>	<ul style="list-style-type: none"> <li>• Appropriately qualified trainers deliver well-structured training.</li> <li>• Regular refresher training and self-learning activities are planned and executed to maintain currency of skills for all personnel on site</li> </ul>	<ul style="list-style-type: none"> <li>• Reports are generated from the training management system to confirm employee competence and skill levels.</li> <li>• Audits and challenge tests are conducted to confirm standards of skill development and maintenance are in place.</li> </ul>	<ul style="list-style-type: none"> <li>△ CFM-CDA.06.02 Operator drives vehicle at the incorrect speed (too fast or too slow).</li> <li>△ CFM-CPA.10.02 Operators unaware of give way requirements for light vehicles</li> <li>△ CFM-CPA.10.04 Operators unaware of right of way requirements or operating constraints</li> <li>△ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</li> <li>△ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance</li> <li>△ CFM-CPA.11.03 Operators and/or passengers do not use fitted seatbelts or restraints</li> <li>△ CFM-CPA.11.05 Operator does not drive on available segregated roads</li> <li>△ CFM-CPA.11.10 Operators or co-workers have required communications equipment but are not contactable</li> <li>△ CFM-CPV.11.20 Operators or passenger has limb outside cabin while travelling</li> <li>△ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> <li>△ CFM-CRA.03.20 Personnel do not manage heavy vehicle blind spots</li> <li>△ CFM-CRA.03.21 Incorrect action on vehicle system alarm - not understood</li> <li>△ CFM-CRA.11.21 No action taken on over speed alarm</li> <li>△ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>document could result in site inappropriate design or planning decisions.</p> <p>Review how the document information protocol applies to documents across all GHG operations. Identify situations where common standards apply and where site specific approaches apply and update document management processes.</p>			<ul style="list-style-type: none"> <li>⚠ CFM-EPA.32.06 Loose objects in cabin or around vehicle remain unsecured</li> <li>⚠ CFM-EPA.33.40 Communication equipment absence, failure or poor reception</li> <li>⚠ CFM-EPV.26.10 Routine or occasional overloading of vehicles</li> <li>⚠ CFM-LPA.44.05 Appropriate distances from fixed and overhead structures are not maintained</li> <li>⚠ CFM-LPV.44.02 Operational personnel do not maintain minimum standards for berms, windrows and other zone protection.</li> <li>⚠ CFM-LPV.54 Excessive water (Dust Control) is applied to road surface</li> <li>⚠ CFM-MPA.63.01 Operator does not meet site requirements when parking</li> <li>⚠ CFM-MPA.63.02 Vehicle operator does not check pathway after being parked</li> <li>⚠ CFM-MPA.66.01 Incorrect communication protocol</li> <li>⚠ CFM-MPA.72.02 Operational access control (pedestrian and vehicle) is inadequate</li> <li>⚠ CFM-MPA.72.03 Mobile equipment operator or pedestrian does not notify when entering a controlled work area</li> <li>⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</li> </ul>
<p><b>OFI-170: Review provision of resting rooms for fatigue management.</b></p>	<p><b>BI-CDA.09.01 Fit for work processes with specific advice on self-management</b></p>	<p><i>Operating sites should develop and maintain processes that support personnel to be both fit for work and to maintain a healthy work-life balance.</i></p>	<p>Personnel are trained in how to manage shift work and other workplace demands. The training covers site requirements for:</p> <ul style="list-style-type: none"> <li>• Managing and reporting impairment e.g. caused by fatigue, medication, illness etc.</li> <li>• Impairment screening e.g. alcohol and other drug screening</li> <li>• Mental health and wellness goals</li> </ul>	<p>Training and assessment carried out to schedule. Health and wellness self-management information is provided. Routine reinforcement of site impairment management expectations and processes.</p> <p><b>Fatigue Management Procedure TGM.1.20.09 WI V9 01/07/2022 - Reinforces requirements for using and reacting to Guardvant fatigue events. Radio call of SAFETY-SAFETY-SAFETY and call truck number for stop until the supervisor can attend.</b></p> <p><b>OFI-170 Review provision of resting rooms for fatigue management.</b></p> <p>Managing fatigue in mining operations is a challenge for all continuous mining</p>	<p>Confirmation that fit for work training and awareness is completed to schedule and that work area references are available. Fatigue monitoring technology, incident reviews.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</li> <li>⚠ CFM-CRA.04.30 Operators change behaviour after fatigue alerting system is fitted</li> <li>⚠ CFM-CTA.11.01 Supervisor does not identify or act when operator is fatigued or intoxicated</li> <li>⚠ CFM-ERA.33.40 In vehicle fatigue monitoring and alerting system fails</li> <li>⚠ CFM-SDA.83 Organisation Work Scheduling and Planning is inadequate</li> <li>⚠ CFM-SDA.86 Work Environment and Work Demands result in Fatigued Mobile Equipment Operators or other Health Affects</li> </ul>

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				<p>operations. Effective management of fatigues requires a whole of system approach that can include providing comfortable locations for taking fatigue breaks.</p> <p>Workshop participants discussed Business Partner processes for taking fatigue breaks noting that there are limited options for short rests.</p> <p>Review the benefits of providing dedicated resting rooms for fatigued mobile equipment operators.</p>		
	<p><b>BI-CPA.01 Recruitment and Selection</b></p>	<p><i>Recruitment and selection processes effectively fill vacant roles with suitable candidates.</i></p>	<p>There are documented recruitment and selection processes that meet site, company, and legislative requirements in place.</p> <p>The recruitment phase includes general processes with details that relevant to the vacant role.</p> <ul style="list-style-type: none"> <li>• A job description that describes duties, conditions, and responsibilities of the vacant position</li> <li>• A step that identifies where potential candidates can be sourced and considers: How and where the vacancy will be advertised to potential candidates; Options for internal recruitment; Options for contacting passive candidates; When the vacancy closes</li> <li>• How applicants are kept informed of progress</li> </ul> <p>The selection phase documents general processes with details that are relevant to the vacant role covering:</p> <ul style="list-style-type: none"> <li>• How candidates are screened (confirming experience, skills and qualifications) and shortlisted</li> <li>• The interview process for shortlisted candidates</li> <li>• Candidate evaluation</li> <li>• Reference and background checking</li> <li>• Tests and assessments e.g. medical screening</li> </ul>	<p>Application of the company recruitment and selection processes based on type of job role.</p>	<p>Job descriptions.</p> <p>Recruitment and selection metrics including time to fill jobs, length of employment, probation etc.</p> <p>Human Resources recruitment and selection records.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance</li> <li>⚠ CFM-CRA.11.22 Operator ignores or bypasses alarm or safety device</li> <li>⚠ CFM-CTA.11.01 Supervisor does not identify or act when operator is fatigued or intoxicated</li> </ul>

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			<ul style="list-style-type: none"> <li>Selecting the successful candidate</li> <li>Contractual agreement between the company and successful candidate</li> <li>Informing supervisors and company support functions such as payroll about the new employee and their start date</li> <li>Informing the unsuccessful candidates</li> </ul> <p><b>Interview discussions</b> The processes described align with the good practice model and this is applied more for trades personnel (where turnover is higher).</p>			
	<b>BI-CPA.02 Onboarding, orientation, and general induction processes</b>	<i>Onboarding, orientation, and general induction processes are in place and applied for new employees.</i>	<p>There is a documented process that details how the site supports new employees when they join the organisation. It includes:</p> <p><b>Onboarding</b></p> <ul style="list-style-type: none"> <li>New employee documentation</li> <li>Information on the site and company mission</li> <li>Confirming user accounts, tools, equipment, clothing, and PPE required by the new employee</li> <li>Any pre site attendance induction requirements</li> </ul> <p><b>Induction to Site</b></p> <ul style="list-style-type: none"> <li>Logistics covering travel to site, site entrance, work location etc.</li> <li>Introductions to supervisors, managers, and fellow employees</li> <li>Position training and competency requirements</li> <li>Progress checks and probation period</li> <li>Policies, procedures, and rules relevant to their role such as: General site access requirements to enter operational areas e.g. area inductions, permission to enter; Incident reporting and emergency response (including requirements for stopping unsafe work), and; Person Protective Clothing and Equipment (PPE) requirements</li> </ul> <p><b>Competence, Training and Awareness HSMP 4.2 PR, Rev 12 4/6/2024</b> - provides guidance on designing training requirements and then providing and assessing skills to fulfill roles on site.</p>	<p>Onboarding, orientation, and general induction processes are adapted based on new employee job role.</p> <p><b>Mining Induction 2024</b> - Provides an exhaustive coverage of hazards present and required controls for workers on site.</p>	<p>Human Resources records.</p> <p>Induction records including test results.</p> <p><b>Operational Control Procedure (Mining Induction) Assessment, V8, 19/03/2024 TGM 13.10.024 REC - Vehicle</b> Operating skills assessed include speed of travel, separation distance, horn signals, towing, and use of spotters.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-MPA.72.02 Operational access control (pedestrian and vehicle) is inadequate</li> <li>⚠ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> <li>⚠ CFM-SPA.90 Emergency response is significantly delayed</li> </ul>
<b>OFI-145: Review Operator</b>	<b>BI-CPA.03.01 Trained,</b>	<i>All workers who operate mobile equipment at the</i>	All workers who operate mobile equipment at the mine (and other workers who routinely interact with vehicles e.g. maintainers) are trained and assessed for	Mobile equipment operator training is delivered to schedule. Where applicable	Training status reports.	⚠ CFM-CDA.06.02 Operator drives vehicle at the incorrect speed (too fast or too slow).

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<p><b>Training for Equipment Features by Vehicle Type.</b></p> <p><b>OFI-146: Review Operator Training for Installed Technology</b></p>	<p><b>Competent and Authorised Mobile Equipment Operators</b></p>	<p><i>mine are trained and assessed for competency for operating defined equipment type, identifying and managing operating environment and vehicle interaction hazards.</i></p>	<p>competency covering site and role relevant aspects including:</p> <ul style="list-style-type: none"> <li>• Understanding requirements for authorisation to operate equipment and to be in a work area (supervisor or mining official clearances)</li> <li>• Completion of pre-start inspections</li> <li>• Correct operating techniques (including communications required for starting and moving, identifying and maintaining no-go zones around mobile equipment etc.); appropriate brake and retarder use during equipment operation</li> <li>• Equipment load limits - weight and dimensions</li> <li>• Site requirements for loading and unloading covering: Load security and stability based on site conditions and requirements; Vehicle stability precautions to be taken when raising trays, tubs, or buckets and tipping loads e.g, identifying loads types that can hang up e.g. when transporting clays; Securing of loads;</li> <li>• Proper movement of people: wearing seatbelts; not transporting passengers in buckets, trays etc.; ensuring that passengers wear seatbelts or other restraints</li> <li>• Preparation before servicing and maintenance, including: Electrical isolation of equipment; cleaning of all mud or loose material; travelling to maintenance location or parking fundamentally stable</li> <li>• Identification and management of infrastructure hazards e.g. HV powerlines</li> <li>• Use of refuelling equipment and refuelling procedures</li> <li>• Park-up procedures to achieve fundamental stability</li> <li>• Identification and reporting of poor road conditions such as substandard delineation, windrows or bund heights, road surface, obstructions etc.</li> <li>• Tyre management including preventing and dealing with tyre heating and managing flat tyres</li> </ul>	<p>training is supported by use of equipment simulators - to safely confirm competency in emergency and unwanted situations such as mechanical or electrical faults, fire, emergency stop, over-speed, sticky loads, etc.)</p> <p><b>OFI-146 Review Operator Training for Installed Technology</b></p> <p>Workshop participants discussed mobile equipment operator training and questioned what is formally documented and how it is communicated.</p> <p>They were unsure of how information about using installed technology for CAS and OAS is being communicated for new operators and during operator refresher training and authorisation.</p> <p>Confirm that operator training in the use of technology includes pre-start checks, defect reporting, expected response to alarms, and are part of simulator refresher training.</p> <p><b>OFI-145 Review Operator Training for Equipment Features by Vehicle Type.</b></p> <p>The workshop participants identified situations where mobile equipment operators do not understand all the features of the equipment that they are using.</p> <p>Lack of knowledge of equipment features and requirements can lead to unwanted operating practices</p>	<p>Skills matrix reviews and updates.</p> <p>Routine audits of the training management system are commissioned and reviewed by senior personnel.</p> <p><b>Off Highway Dump Truck-Operator Practical Assessment - Confirms understanding of key skills and machine requirements by observing pre-use checks and machine operation.</b></p>	<ul style="list-style-type: none"> <li>△ CFM-CPA.10.02 Operators unaware of give way requirements for light vehicles</li> <li>△ CFM-CPA.10.04 Operators unaware of right of way requirements or operating constraints</li> <li>△ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</li> <li>△ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance</li> <li>△ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</li> <li>△ CFM-CPA.11.03 Operators and/or passengers do not use fitted seatbelts or restraints</li> <li>△ CFM-CPA.11.05 Operator does not drive on available segregated roads</li> <li>△ CFM-CPA.11.10 Operators or co-workers have required communications equipment but are not contactable</li> <li>△ CFM-CPV.11.20 Operators or passenger has limb outside cabin while travelling</li> <li>△ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> <li>△ CFM-CRA.03.21 Incorrect action on vehicle system alarm - not understood</li> <li>△ CFM-CRA.11.22 Operator ignores or bypasses alarm or safety device</li> <li>△ CFM-CTA.10.90 Personnel do not alert others to presence of hazards</li> <li>△ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>△ CFM-EPA.32.06 Loose objects in cabin or around vehicle remain unsecured</li> <li>△ CFM-ERA.32.20 Operator fails to conduct effective pre-start that meets requirements</li> <li>△ CFM-ERV.33.23 Seat belt use indicators disabled or compromised</li> <li>△ CFM-MPA.63.01 Operator does not meet site requirements when parking</li> <li>△ CFM-SPA.83.01 Operator fails to comply with site requirements</li> </ul>

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			<ul style="list-style-type: none"> <li>Identifying and responding to mechanical and electrical faults while driving</li> <li>Constraints for operating around pedestrians</li> <li>Precautions for use of remote controlled equipment</li> <li>Responding to unintended equipment operations or movements</li> <li>Site emergency requirements</li> <li>Prevention of and response to tyre fires including activating the fire suppression system</li> <li>Responding to events that impact on tyre and vehicle integrity (e.g. contact with debris, etc.)</li> </ul> <p><b>Competence Training and Awareness Procedure, V12, 4/6/24, HSMP 4.2 PR - S6.1 Determine training needs ...identification of required skills, generation of a training log, minimum skills relate to understanding HSMS work standards</b></p>	<p>and cause damage to equipment.</p> <p>Review training modules to confirm that key operational aspects of equipment are well covered and easily understood by operators in training. Provide visual information about equipment features by type as a reference in work areas.</p>		
<p><b>OFI-145: Review Operator Training for Equipment Features by Vehicle Type.</b></p>	<p><b>BI-CPA.04.01 General features by vehicle type - information prepared for operators</b></p>	<p><i>General features and information organised by vehicle type, are documented and communicated to vehicle operators.</i></p>	<p>Training modules for vehicle operators includes relevant information and key safety features for the vehicles in use on the site. The information is provided in a format that is audience appropriate and available as a reference in the work area.</p>	<p>Training and assessment of vehicle operators about the general features of the vehicle they are operating.</p> <p><b>Dump Truck Inspection Walk Around - Series of slides showing the truck and key locations and components.</b></p> <p><b>OFI-145 Review Operator Training for Equipment Features by Vehicle Type.</b></p> <p>The workshop participants identified situations where mobile equipment operators do not understand all the features of the equipment that they are using.</p> <p>Lack of knowledge of equipment features and requirements can lead to unwanted operating practices and cause damage to equipment.</p> <p>Review training modules to confirm that key operational aspects of equipment are well</p>	<p>Confirmation that work area references are available. Initial and refresher training assessment outcomes. Records of topics covered at inductions, training, pre-shift meetings, etc.</p>	<p>⚠ CFM-LPV.54 Excessive water (Dust Control) is applied to road surface</p>

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				covered and easily understood by operators in training. Provide visual information about equipment features by type as a reference in work areas.		
<p><b>OFI-117: Consider providing visual reference materials for mobile equipment operators.</b></p> <p><b>OFI-122: Update simulator modules to include sight lines.</b></p>	<p><b>BI-CPA.04.02 Sight lines and blind spots by vehicle type - information prepared for vehicle operators</b></p>	<p><i>Mobile equipment sight lines and blind spot information, by vehicle type, is documented and communicated to vehicle operators.</i></p>	<p>Training modules include specific information on operator vision limits and sight lines for the vehicles in use. The information is provided in a format that is audience appropriate and available as a reference in the work area.</p>	<p>Training and assessment for people who operate mobile equipment covers sight lines and blind spots. Mobile equipment operators are aware of vehicle sight lines and blind spots by vehicle type and this information is regularly reinforced.</p> <p><b>OFI-117 Consider providing visual reference materials for mobile equipment operators.</b></p> <p>Mobile equipment operators are provided training by their employers, the Tarkwa Mine Business Partners. Each two years, based on the renewal cycle for their Ghanaian national drivers license, mobile equipment operators are reassessed and reauthorised to work on site by the Tarkwa Gold Fields training team. This reassessment includes use of simulators and is supported by detailed, visual training and support material covering equipment operations, mobile equipment information including expected responses to alerts and alarms.</p> <p>Workshop participants were largely unaware of the training and support material and discussed options for making it available beyond the two year reauthorisation cycle. Their initial focus was on responses to alerts and alarms but they also</p>	<p>Confirmation that work area references are available.</p> <p>Records of topics covered at inductions, training, pre-shift meetings, near miss reviews etc.</p> <p>Interaction monitoring with by-exception reporting from vehicle cameras and collision avoidance technology.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.03.20 Personnel do not manage heavy vehicle blind spots</li> <li>⚠ CFM-MPA.63.01 Operator does not meet site requirements when parking</li> <li>⚠ CFM-MPA.63.04 Parked vehicles block view for pedestrians and other equipment operators</li> <li>⚠ CFM-MPA.65.04 Light vehicle remains in heavy vehicle blind spot due to intersection approach speeds</li> </ul>

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				<p>recognised the usefulness of having information by vehicle type available covering sight lines and blind spots, prestart checks, emergency response e.g. fire suppression and emergency egress, and other general operating details.</p> <p>Consider working with business partners and adapting training materials to develop visual reference material that can be in equipment cabins and workplaces e.g. laminated cards, information cycling on videos etc.</p> <p><b>OFI-122 Update simulator modules to include sight lines</b></p> <p>Vehicle operators get limited exposure to the real experience of restricted sight lines from heavy mobile equipment during their training. It is understood that there are options to update simulator training to highlight sight lines by equipment type supported by a 360 degree camera view.</p> <p>Lack of understanding about sight lines for operators of mobile equipment and people that work around mobile equipment has resulted in significant incidents, including multiple fatalities.</p> <p>Consider updating the simulator training to include the use of 360 degree cameras to increase the level of understanding of sight lines from operator positions in the cabin.</p>		
	<b>BI-CPA.04.03 Vehicle lights and</b>	<i>Site standards for vehicle lights and markings to</i>	Training modules include specific information on site standards for vehicle lights and markings. The	Training and assessment for supervisors, mobile equipment operators, and	Vehicle operator, maintainers and co-workers are assessed on their understanding of	⚠ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance

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	<b>markings requirements - information prepared for operators</b>	<i>improve vision from and visibility of mobile equipment are documented and communicated in a style that is appropriate for the audience.</i>	<p>information is provided in a format that is audience appropriate and available as a reference in the work area.</p> <p>Supervisors, vehicle operators, and maintainers routinely check that lights and markings meet site standards, are operating, and are visible.</p> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI as approved for use 01-03-07 details site requirements for light types and use in section 6.2.1.1. Lights</b></p>	<p>maintainers covers minimum site standards for vehicle lights and markings. Training and assessment includes identifying vehicle types by lighting and markings, prestart check processes, defect reporting, and repair prioritisation.</p>	<p>minimum site standards for vehicle lights and markings. Confirmation that work area references are available.</p> <p>Mobile equipment prestart checks confirm that vehicle lights and markings meet minimum standards before the equipment is operated.</p> <p>Maintenance and service records confirm that:</p> <ul style="list-style-type: none"> <li>• light failures detected during operations are identified and repaired</li> <li>• lights and markings are inspected during planned maintenance.</li> </ul>	<p>⚠ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</p>
<p><b>OFI-117: Consider providing visual reference materials for mobile equipment operators.</b></p> <p><b>OFI-146: Review Operator Training for Installed Technology</b></p>	<b>BI-CPA.04.04 Required emergency checks before operation - information for operator by vehicle type.</b>	<i>Required emergency checks before operation are documented and communicated to vehicle operators.</i>	<p>Vehicle operator emergency check training by vehicle type covers:</p> <ul style="list-style-type: none"> <li>• Cabin integrity</li> <li>• Cabin housekeeping (restraining/removing loose objects)</li> <li>• Use of seatbelts, restraints and interlocks</li> <li>• Rescue and escape devices e.g. installation of oxygen generating self-rescuers in dozers that operate on stockpiles where there is a risk of falling into a void</li> <li>• Emergency escape</li> <li>• Auto shutdown</li> <li>• Reversing alarms</li> <li>• Other relevant information about protective systems</li> </ul> <p>The information is provided in a format that is audience appropriate and available as a reference in the work area.</p>	<p>Training and assessment of vehicle operators confirms that they understand the required emergency related prestart check requirements for the vehicle that they are operating.</p> <p>Prestart inspection forms capture that emergency checks are completed.</p> <p><b>OFI-146 Review Operator Training for Installed Technology</b></p> <p>Workshop participants discussed mobile equipment operator training and questioned what is formally documented and how it is communicated.</p> <p>They were unsure of how information about using installed technology for CAS and OAS is being communicated for new operators and during</p>	<p>Training system records confirm that vehicle operators are trained and competent in carrying out required prestart checks.</p> <p>Supervisors and maintainers review the quality of prestart records.</p> <p>Maintenance reports confirm that faults detected at prestart checks are being corrected.</p>	<p>⚠ CFM-CRA.11.22 Operator ignores or bypasses alarm or safety device</p> <p>⚠ CFM-EPA.32.06 Loose objects in cabin or around vehicle remain unsecured</p> <p>⚠ CFM-ERA.31.09 Installed equipment system status alarms do not operate</p> <p>⚠ CFM-ERA.32.20 Operator fails to conduct effective pre-start that meets requirements</p> <p>⚠ CFM-ERV.33.20 Compromised vehicle cabin no longer meets OEM or site specific specifications</p>

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				<p>operator refresher training and authorisation.</p> <p>Confirm that operator training in the use of technology includes pre-start checks, defect reporting, expected response to alarms, and are part of simulator refresher training.</p> <p><b>OFI-117 Consider providing visual reference materials for mobile equipment operators.</b></p> <p>Mobile equipment operators are provided training by their employers, the Tarkwa Mine Business Partners. Each two years, based on the renewal cycle for their Ghanaian national drivers license, mobile equipment operators are reassessed and reauthorised to work on site by the Tarkwa Gold Fields training team. This reassessment includes use of simulators and is supported by detailed, visual training and support material covering equipment operations, mobile equipment information including expected responses to alerts and alarms.</p> <p>Workshop participants were largely unaware of the training and support material and discussed options for making it available beyond the two year reauthorisation cycle. Their initial focus was on responses to alerts and alarms but they also recognised the usefulness of having information by vehicle type available covering sight lines and blind spots, prestart checks, emergency response e.g. fire suppression and</p>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>emergency egress, and other general operating details.</p> <p>Consider working with business partners and adapting training materials to develop visual reference material that can be in equipment cabins and workplaces e.g. laminated cards, information cycling on videos etc.</p>		
<p><b>OFI-113: Review response processes for equipment alert and alarm notification.</b></p> <p><b>OFI-117: Consider providing visual reference materials for mobile equipment operators.</b></p> <p><b>OFI-132: Review site equipment specifications for key system alarms.</b></p> <p><b>OFI-175: Leverage operator equipment alarm training and awareness resources.</b></p>	<p><b>BI-CPA.04.05 Alarm and vehicle information panel expected response - information prepared for Operators</b></p>	<p><i>Expected responses to vehicle alarms and information displays are documented by vehicle type and communicated to vehicle operators.</i></p>	<p>Vehicle operator training modules include required responses to vehicle alarms and information panel indicators for each vehicle type in use.</p> <p>Training is based on good operating practice and includes real world scenarios covering:</p> <ul style="list-style-type: none"> <li>• Understanding, acknowledging, and responding to OEM alarms and notifications</li> <li>• Understanding, acknowledging, and responding to installed technology alarms and notifications e.g. collision avoidance, fatigue monitoring, autonomous haulage etc.</li> <li>• Managing abnormal tyre situations</li> <li>• Reacting to overload alarms and conditions</li> <li>• Slowing and parking in an appropriate location</li> <li>• Notifying emergency services</li> <li>• Equipment shutdown</li> <li>• Activation of fire suppression system</li> <li>• Use of fire extinguishers, and</li> <li>• Exiting the machine including using an alternate means of egress</li> </ul> <p>The information is provided in a format that is audience appropriate and available as a reference in the vehicle.</p> <p><b>OFI-132 Review site equipment specifications for key system alarms.</b></p> <p>Workshop participants discussed detection and warning systems capability on mobile equipment e.g. alerts and alarms for key systems such as brakes, steering and wheel assemblies e.g. tyre pressure.</p>	<p>Before operating unsupervised, vehicle operators are assessed as being competent in responding to alarms and information panel indicators, for each type of vehicle that they operate. This includes details of the site process for seeking further maintenance advice.</p> <p>Reference information is available and regularly reinforced.</p> <p><b>OFI-175 Leverage operator equipment alarm training and awareness resources.</b></p> <p>Tarkwa mine training has prepared comprehensive materials on expected responses mobile equipment alarms for operators in a highly visual style. This resource is used for operator training and to confirm competency during site authorisation approval.</p> <p>However, some workshop participants were unfamiliar with this alarm training and awareness resource.</p> <p>Review how these operator equipment alarm training and awareness resources can be applied through other</p>	<p>Confirmation that references are available in vehicles.</p> <p>Vehicle operator training and assessment records.</p> <p>Vehicle operation monitoring with by-exception reporting alarm and indicator panel reporting.</p> <p>By exception incident reviews.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.03.21 Incorrect action on vehicle system alarm - not understood</li> <li>⚠ CFM-CRA.04.30 Operators change behaviour after fatigue alerting system is fitted</li> <li>⚠ CFM-CRA.10.30 Proximity alarms do not assist operator</li> <li>⚠ CFM-CRA.11.21 No action taken on over speed alarm</li> <li>⚠ CFM-CTA.11.34 Incorrect action taken on proximity alarm</li> <li>⚠ CFM-ERA.29.01 Multiple vehicles system alarms overwhelm and confuse the operator</li> <li>⚠ CFM-ERA.39.20 Overload warning system fails is incorrect or absent</li> <li>⚠ CFM-ETA.40.01 Routine false positive alarms</li> <li>⚠ CFM-MDV.71.01 Proximity alarms do not perform to specification (false negatives and false positives)</li> <li>⚠ CFM-SRA.92 Unit key system status and alarms are not monitored</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>There have been incidents at Tarkwa where failures in mobile equipment systems have caused vehicle interactions.</p> <p>Consider reviewing site equipment specifications for alerting and alarming capability for key systems e.g. brakes, steering, wheel assembly conditions etc.</p>	<p>communication channels beyond the two year authorisation cycle e.g. using posters, laminated cards in cabs, videos, etc. Consider sharing this benchmark high-quality work across the Gold Fields Group.</p> <p><b>OFI-113 Review response processes for equipment alert and alarm notification.</b></p> <p>Workshop participants confirmed that machine state alerts, alarms, and other information is transmitted back to dispatch. Advice, instructions, and directions are then relayed back via dispatch to vehicle operators.</p> <p>This sequence can result in extensive delays and has resulted in equipment damage and ongoing operations with compromised systems.</p> <p>Review the current process for prompting operators about machine state alarms and consider the cost and benefits of other approaches.</p> <p><b>OFI-117 Consider providing visual reference materials for mobile equipment operators.</b></p> <p>Mobile equipment operators are provided training by their employers, the Tarkwa Mine Business Partners. Each two years, based on the renewal cycle for their Ghanaian national drivers license, mobile equipment operators are reassessed and reauthorised to work on site by the Tarkwa Gold Fields training team. This reassessment includes use of simulators and is supported</p>		

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				<p>by detailed, visual training and support material covering equipment operations, mobile equipment information including expected responses to alerts and alarms.</p> <p>Workshop participants were largely unaware of the training and support material and discussed options for making it available beyond the two year reauthorisation cycle. Their initial focus was on responses to alerts and alarms but they also recognised the usefulness of having information by vehicle type available covering sight lines and blind spots, prestart checks, emergency response e.g. fire suppression and emergency egress, and other general operating details.</p> <p>Consider working with business partners and adapting training materials to develop visual reference material that can be in equipment cabins and workplaces e.g. laminated cards, information cycling on videos etc.</p>		
	<b>BI-CPA.04.06 Tyre hazard awareness for all personnel.</b>	<i>Tyre hazards and their controls are documented and communicated to all personnel, based on their role.</i>	<p>Awareness and training information provides information on tyre hazards and their controls covering:</p> <p>Mobile Equipment Operations</p> <ul style="list-style-type: none"> <li>Reinforcing equipment operations that extend tyre life</li> <li>Tyre maintenance area access</li> <li>Tyre and wheel assembly pre use inspections and defect reporting</li> <li>Emergencies, including: Managing electrical storms; High voltage - emergency response; Equipment fires; Quarantine park up areas; Tyre</li> </ul>	<p>Tyre hazard and control material is prepared for a range of organisational roles.</p> <p>There is training and assessment for mobile equipment operators on tyre management including emergency response.</p> <p>General tyre hazardous awareness information is part of site and operating area inductions.</p> <p>Awareness material on tyre hazards and their controls is</p>	<p>Vehicle operator training and assessment confirms that tyre hazard management and controls are well understood and applied for general operations and in emergencies.</p> <p>Induction and awareness records confirm that all personnel are aware of tyre hazards and their controls appropriate to their role.</p>	<ul style="list-style-type: none"> <li>△ CFM-CTA.10.90 Personnel do not alert others to presence of hazards</li> <li>△ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>△ CFM-EPV.39.42 Vehicles are operated outside specified tyre conditions</li> <li>△ CFM-ERA.32.20 Operator fails to conduct effective pre-start that meets requirements</li> <li>△ CFM-LDA.43.01 Vehicle parking, including emergency parking is inadequately considered in mine design and routine work planning</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>pad access; Tyre pre use inspections and defect reporting</p> <p>Awareness and training material is illustrated with information about actual incidents and is based on organisational role.</p>	<p>documented and used for pre-shift and safety meetings etc.</p>		
<p><b>OFI-135: Review speed limit communication and enforcement.</b></p>	<p><b>BI-CPA.04.10 Site specific travelling speed information prepared for vehicle operators</b></p>	<p><i>Site travelling speeds by vehicle type are documented and communicated in a style that is appropriate for the audience.</i></p>	<p>Training modules for vehicle operators include specific information on travelling speeds by vehicle type for all relevant scenarios.</p> <p>Training should be assessed to ensure that personnel understand vehicle speed expectations:</p> <ul style="list-style-type: none"> <li>• At crests</li> <li>• On curves and at intersections</li> <li>• In restricted or congested areas (where vision aids or spotters should be considered)</li> <li>• When towing</li> <li>• When loaded (and adjusting for different types of load)</li> <li>• When conditions change (slippery, rough, spillage, loss of sight lines, etc.)</li> </ul> <p>The training information is provided in a format that is audience appropriate and available as a reference in the work area</p> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</b> as approved for use 01-03-07</p> <p><b>6.1.5. Speed Limits</b></p> <p>Maximum speed limit signs are located on all roads throughout the mine site. Every driver/ operator is responsible for ensuring that the posted speed limit is complied with. The maximum speed limit on all haulage roads in the mining area is 60km/h unless otherwise sign posted. The maximum speed limit in mine villages is 35km/hr unless sign posted otherwise. Drivers shall drive to condition at all times.</p> <p>Equipment and vehicles shall be operated and driven safely at a speed which is consistent with the prevailing site conditions (road and weather condition). Site conditions can vary considerably over a relatively short period of time, either because of changing weather conditions, reducing visibility or by road conditions deteriorating; reducing traction or becoming more slippery or because of the volume of traffic which</p>	<p>Training and assessment of vehicle operator understanding of safe travel speeds by vehicle type for a range of scenarios and conditions.</p> <p>Mobile equipment operators are aware of travel (and operating) speeds and this information is regularly reinforced.</p>	<p>Vehicle operator training and assessment records.</p> <p>Confirmation that work area references are available.</p> <p>Vehicle operation monitoring with by-exception speed reporting.</p> <p>By exception incident reviews.</p> <p><b>OFI-135 Review speed limit communication and enforcement.</b></p> <p>Workshop participants discussed incidents cause by speeding at Tarkwa including vehicle roll overs and slides. They also consider situations where vehicles travelling too slowly have caused traffic issues on both access and haul roads.</p> <p>Slow moving vehicles generate driver frustration and potential for higher risk driving manoeuvres. Speeding above limits increase the likelihood of vehicles losing control.</p> <p>Review site processes for communicating, monitoring and reinforcing the requirements to travel at zoned speeds and adjust for conditions and circumstances.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CDA.06.02 Operator drives vehicle at the incorrect speed (too fast or too slow).</li> <li>⚠ CFM-LDV.42.02 Speed limits and over-speed management are inadequately considered in mine design and routine work planning</li> <li>⚠ CFM-SRV.96.20 No aggregated monitoring and response to over speed alarms</li> </ul>

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			<p>accelerates wear and tear on bends and other areas where braking takes place. Compliance to speed limits on-site and off-site shall be tracked via GPS units installed in Gold Fields Tarkwa Mine vehicles and on-site for Contractors.</p>			
	<b>BI-CPA.04.11 Site clearance requirements and processes for accurately estimating distances - information prepared for Operators</b>	<i>Site clearance requirements are documented and communicated in a style that is appropriate for the audience.</i>	<p>Training modules for vehicle operators and personnel who routinely work around mobile equipment includes specific information on required separation distances and clearances:</p> <ul style="list-style-type: none"> <li>• For each phase of the operational work cycle</li> <li>• During maintenance and service activities.</li> </ul> <p>Specific information examples usually include using road delineators to calibrate following distances, and site practices for positioning near dig units, dumping, interactions with dozers, dumping into hoppers, road works, parking, when to use spotters (operating in restricted spaces), etc.</p> <p>The information is provided in a format that is audience appropriate and available as a reference in the work area.</p>	<p>Training and assessment confirms that vehicle operators understand site clearance and separation distance requirements for all operational scenarios and conditions.</p> <p>Training and assessment confirms that personnel who work around mobile equipment understand all relevant site clearance and separation distance requirements.</p>	<p>Vehicle operator training and assessment records.</p> <p>Confirmation that work area references are available.</p> <p>Vehicle operation monitoring and reporting using proximity detection technology.</p> <p>By exception incident reviews.</p>	<p>⚠ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance</p>
	<b>BI-CPA.04.12 Give way requirements information prepared for mobile equipment operators and pedestrians</b>	<i>Site give way, and right of way requirements are documented and communicated in a style that is appropriate for the audience.</i>	<p>Training modules include specific information on site give way and right of way requirements.</p> <p>The information is provided in a format that is audience appropriate and available as a reference in the work area.</p>	<p>Training and assessment records confirm that vehicle operators and personnel who work around mobile equipment understand site give way requirements for vehicle interactions relevant to their role.</p> <p>At a minimum this includes understanding site give way requirements for:</p> <ul style="list-style-type: none"> <li>• Right of way</li> <li>• Hierarchy of vehicles</li> <li>• Intersection approach speeds</li> <li>• Intersection spacing requirements</li> </ul>	<p>Vehicle operator training and assessment records.</p> <p>Confirmation that work area references are available.</p> <p>Vehicle operation monitoring and reporting using proximity detection technology and geofencing records.</p> <p>By exception incident reviews.</p>	<p>⚠ CFM-CPA.10.02 Operators unaware of give way requirements for light vehicles</p> <p>⚠ CFM-CPA.10.04 Operators unaware of right of way requirements or operating constraints</p> <p>⚠ CFM-MPA.65.04 Light vehicle remains in heavy vehicle blind spot due to intersection approach speeds</p>
<b>OFI-153: Review in pit parking planning and practices.</b>	<b>BI-CPA.04.13 Minimum requirements for parking in any situation - information</b>	<i>Site requirements for parking in any situation are documented and communicated in a style that is</i>	<p>Training modules for vehicle operators include site specific parking requirements for all scenarios covering:</p> <ul style="list-style-type: none"> <li>• Confirming that a parked vehicle is always fundamentally stable e.g. through the use of wheel chocks, ditches, trenches or wheels turned towards the wall</li> </ul>	<p>Training and assessment confirms that vehicle operators understand:</p> <ul style="list-style-type: none"> <li>• How to park mobile equipment so that it</li> </ul>	<p>Vehicle operator training and assessment records.</p> <p>Confirmation that work area references are available.</p> <p>Workplace inspections of parking practices.</p>	<p>⚠ CFM-MPA.63.01 Operator does not meet site requirements when parking</p> <p>⚠ CFM-MPA.63.04 Parked vehicles block view for pedestrians and other equipment operators</p> <p>⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</p>

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	prepared for operators	<p><i>appropriate for the audience.</i></p> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI as approved for use 01-03-07 provides comprehensive details in site parking requirements in Section 6.3.7. Parking. This covers:</b></p> <ul style="list-style-type: none"> <li><i>Parking in an inherently stable manner</i></li> <li><i>Locations where parking is permitted</i></li> <li><i>Locations where parking is not permitted</i></li> <li><i>Leaving a vehicle</i></li> <li><i>Use of chocks</i></li> <li><i>15m distance from edge or toe of a high wall</i></li> </ul>	<ul style="list-style-type: none"> <li>Entering and leaving defined parking locations</li> <li>Parking to minimise interactions with other vehicles</li> <li>Servicing, maintenance, and breakdown situations in operating areas</li> <li>Parking in mobile equipment emergencies e.g. fires or potential fire situations</li> </ul> <p>The information is provided in a format that is audience appropriate and available as a reference in the work area.</p>	<p>is fundamentally stable</p> <ul style="list-style-type: none"> <li>Minimum site requirements for parking for in all scenarios and conditions.</li> </ul> <p><b>OFI-153 Review in pit parking planning and practices.</b></p> <p>Workshop participants advised that restrictions in mine working areas leads to narrow access roads, confined work areas, frequent interactions between workgroups, poor siting of light vehicle parking areas, and sometimes an absence of parking.</p> <p>Poorly parked mobile equipment creates vehicle interaction hazards e.g. when heavy mobile equipment departs from a parked position.</p> <p>Confirm that parking area planning and design processes are adequate and monitor in pit parking practices.</p>	<p>Vehicle operation monitoring and reporting using proximity detection technology.</p> <p>By exception incident reviews.</p>	

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		<ul style="list-style-type: none"> <li>Moving off after parking</li> </ul>				
<p><b>OFI-129: CAS Project to include providing CAS data to augment current inspection processes.</b></p>	<p><b>BI-CPA.04.14 Managing road works, including grader operations - information prepared for operators</b></p>	<p>Information on managing road works is documented and communicated in a style that is appropriate for the audience.</p>	<p>Training modules for vehicle operators include specific information on road maintenance hazards and controls covering:</p> <ul style="list-style-type: none"> <li>Roles and responsibilities for briefing, communications, and instructions</li> <li>Non-standard road conditions e.g. temporary narrowing</li> <li>How to pass or overtake an operating grader</li> <li>Communication requirements between road works crews and vehicle operators</li> <li>Hazard notification, awareness, and management e.g. the use of signs</li> <li>Scenarios based on incidents that illustrate what can go wrong</li> </ul> <p>The information is provided in a format that is audience appropriate and available as a reference in the work area.</p>	<p>Vehicle operator training and assessment confirms managing road works across the full range of scenarios and conditions, including grader operations, is well understood and applied.</p> <p>Road work briefings and with update communications take place before and across shifts.</p>	<p>Vehicle operator training and assessment records.</p> <p>Confirmation that work area references are available.</p> <p>Workplace observations during road maintenance.</p> <p>Vehicle operation monitoring and reporting using proximity detection technology.</p> <p>By exception incident reviews.</p> <p><b>OFI-129 CAS Project to include providing CAS data to augment current inspection processes.</b></p> <p>Workshop participants report that there are adequate Tarkwa mine procedures, processes, and operator training for managing interactions between road maintenance crews and operations.</p> <p>While the application of processes to manage interactions can be observed and assessed, this observation performance measure is at best periodic.</p> <p>Explore if CAS technology can be used to identify the subset of vehicle interactions between road maintenance vehicles and operations mobile equipment (and light vehicles). If it can, consider the value of developing performance measures for interactions with road maintenance equipment.</p>	<ul style="list-style-type: none"> <li>CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> <li>CFM-LPV.54 Excessive water (Dust Control) is applied to road surface</li> </ul>

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	<b>BI-CPA.04.15</b> <b>Minimum requirements for hazard notification and demarcation - information prepared for operators</b>	<i>Information about site standards for hazard notification and demarcation, are documented and communicated in a style that is appropriate for the audience.</i>	<p>Information about the full range of hazard notification and demarcation approaches used at site is documented and provided to operators in training modules, awareness updates, and in reference resources. The information provided uses real scenarios and details expected responses. Examples of hazard notification and demarcation can include:</p> <ul style="list-style-type: none"> <li>Alerts, such as: Information Signs; Flashing lights; Block lights; Intersection signage; Use of high visibility markers and cones (surface)</li> <li>Physical warnings, such as: Chains; Guard rails; Delineation on roadway edges e.g. reflector posts; Draw point delineation</li> <li>Constructed devices, such as: Edge protection; Toe of slope delineation; Tip and dump edge windrows; stop blocks at tip points or stope edges</li> </ul> <p>Scenarios may include:</p> <ul style="list-style-type: none"> <li>Road hazards e.g. broken down equipment</li> <li>Changes in operating conditions</li> <li>Emergencies</li> </ul> <p>The information is provided in a format that is audience appropriate and available as a reference in the work area.</p>	<p>Training and assessment for vehicle operators confirms that they understand general road network safety features, including:</p> <ul style="list-style-type: none"> <li>Site standards for different types of hazard notification and demarcation</li> <li>Where they are used, and</li> <li>How to report issues and defects</li> </ul>	<ul style="list-style-type: none"> <li>Vehicle operator training and assessment records.</li> <li>Confirmation that work area references are available.</li> <li>Workplace hazard reporting by vehicle operators.</li> <li>By exception incident reviews.</li> </ul>	<p>△ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</p>
	<b>BI-CPA.04.16</b> <b>Minimum requirements for windrows (bunds) - information prepared for operators</b>	<i>Information about site standards for segregation windrows (bunds) is documented and communicated in a style that is appropriate for the audience.</i>	<p>Training modules and awareness updates for vehicle operators covers road network safety features including the different size and types of windrows (bunds) in use for:</p> <ul style="list-style-type: none"> <li>Edge protection minimum height and width based on equipment in use at site</li> <li>Road way segregation on corners</li> <li>Road way segregation at intersections including approach heights for light vehicle visibility</li> <li>Temporary bunding e.g. for in field maintenance</li> </ul>	<p>Training and assessment for vehicle operators confirms that they understand general road network safety features, including</p> <ul style="list-style-type: none"> <li>Site standards for different types of windrows (bunds)</li> <li>Where they are used, and</li> <li>How to report bund issues and defects</li> </ul>	<p>Vehicle operator training and assessment records.</p> <p>Confirmation that work area references are available.</p> <p>Workplace hazard reporting by vehicle operators.</p> <p>By exception incident reviews.</p>	<p>△ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</p>

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			The information is provided in a format that is audience appropriate and available as a reference in the work area.			
	<b>BI-CPA.04.20 Sight lines and blind spots - information prepared for people who work around vehicles.</b>	<i>Sight line and blind spot information, by vehicle type, is documented and communicated to personnel who work around mobile equipment.</i>	Training modules include specific information on operator vision limits and sight lines for the vehicles in use. The information is provided in a format that is audience appropriate and available as a reference in the work area.	<p>Training and assessment for people who work around mobile equipment covers limits on vision, from the equipment operator position.</p> <p>Personnel who interact with mobile equipment are aware of vehicle sight lines and blind spots by type and this information is regularly reinforced.</p>	<p>Confirmation that work area references are available.</p> <p>Records of topics covered at inductions, training, pre-shift meetings, near miss reviews etc.</p> <p>Interaction monitoring with by-exception reporting from vehicle cameras and collision avoidance technology.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.03.20 Personnel do not manage heavy vehicle blind spots</li> <li>⚠ CFM-LDV.44.08 Blind spots on heavy vehicles are not considered in workplace layout</li> <li>⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</li> </ul>
<p><b>OFI-143: Review technician numbers on shift</b></p> <p><b>OFI-155: Review processes for managing equipment breakdowns and field repairs.</b></p> <p><b>OFI-167: Review process that confirm mobile equipment is ready for use after maintenance.</b></p>	<b>BI-CPA.05.01 Skilled and experienced personnel are accountable for maintaining mobile equipment</b>	<i>All workers who maintain mobile equipment are trained, competent and authorised for the tasks that they carry out.</i>	<p>Mobile equipment maintainers are trained and competent for the tasks that they undertake, including:</p> <ul style="list-style-type: none"> <li>• Preparation for works: Understanding and accessing work orders and checklists; preparing and receiving permits for activities such as hot work live work, or confined space entry; Isolation of energies</li> <li>• Monitoring, inspecting, checking and measuring for: Temperature of components; V-belts; pre- and post-maintenance; testing (normally) pressurised components; safety related devices (isolation points, brakes, steering, load carrying members, etc.)</li> <li>• Replacing, repairing, or adjusting: Hoses; restraints and brackets; specific equipment in safety or operational systems; fire suppression systems; fuel systems; brake and steering components; fitting of energy restraint components such as lagging, heat shields, sound insulation, guards, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Mobile equipment maintainer competency training is delivered to schedule.</li> <li>• Maintainers complete work orders based on their skills and training and site supervision requirements.</li> </ul> <p><b>OFI-167 Review process that confirm mobile equipment is ready for use after maintenance.</b></p> <p>Workshop participants discussed challenges for recruiting and retaining experienced maintainers. Examples include experienced site drill fitters being offered international roles.</p> <p>A lack of skilled and experienced maintenance</p>	<ul style="list-style-type: none"> <li>• Training, competency, and skills status reports.</li> <li>• Equipment reliability metrics, defect analysis and by exception incident reports.</li> </ul> <p><b>OFI-143 Review technician numbers on shift</b></p> <p>Workshop participants discussed frequent occasions when there are not enough technicians available on shift to perform repairs.</p> <p>Delayed repairs can lead to compromised equipment being put back into service.</p> <p>Review the manning levels for technicians on shift to confirm sufficient numbers are available.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>⚠ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</li> <li>⚠ CFM-ERA.40.22 Over speed warning alarm fails to operate</li> <li>⚠ CFM-ERV.33.20 Compromised vehicle cabin no longer meets OEM or site specific specifications</li> <li>⚠ CFM-SRA.87.10 Equipment faults arising from poor standard of maintenance</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>staff has consequences including increases in equipment down time and the likelihood of defective equipment being returned to operations. Performance measures include equipment availability, early breakdowns, fires, and equipment failures that can cause vehicle interaction incidents.</p> <p>Review and confirm that business partner processes to confirm that mobile equipment is ready for use after maintenance are adequate. Consider a review of recruitment and retention processes for equipment maintainers.</p> <p><b>OFI-155 Review processes for managing equipment breakdowns and field repairs.</b></p> <p>Workshop participants advise that broken down equipment in the operating environment is often not secured and protected. Also significant in-pit repairs are carried out at Tarkwa by the Business Partners.</p> <p>Broken down equipment parked on, or being repair beside, hauls roads creates vehicle interaction hazards. There are a range of well established controls that include communication, demarcation, and longer term protection using earth bunds etc.</p> <p>Review, update and train personnel in understanding how to apply site standards to manage broken down equipment. Confirm that</p>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				supervisors monitor that controls are in place and make corrections when required.		
	<b>BI-CPA.08.02 Equipment and PPE standards for entering operational areas - information prepared for all personnel</b>	<i>Site standards for PPE, high visibility clothing, lights, communication equipment, alerting devices, and other items required in operational areas are documented and communicated in a style that is appropriate for the audience.</i>	Requirements for personnel visiting or working in operating areas are documented in a style that is appropriate for the audience. They provide details and illustrations covering minimum standards for PPE, high visibility clothing, lights, communication equipment, alerting devices, and other items required in operational areas.  <b>Personal Protective Equipment Guidelines No Ref V-00 19/01/2022 Pg 5 High Visibility Clothing required in operating areas</b>	Information on the minimum PPE and equipment standards before entering operational areas is provided at inductions and during training. Information detailing standards is communicated to all employees, contractors, and visitors.  <b>Mining Induction Review and Refresher Revised 16/05/2024</b> Slide 3 provides an overview of required PPE  <b>Consultant Comment - There is a difference in requirements between the Guidelines and the Induction Training (no high-viz stripe on trousers).</b>	By exception reporting, and investigation of circumstances where minimum PPE and equipment standards are breached.	<ul style="list-style-type: none"> <li>⚠ CFM-MPA.72.02 Operational access control (pedestrian and vehicle) is inadequate</li> <li>⚠ CFM-SPA.83.02 Inconsistent application of performance management processes</li> </ul>
<p><b>OFI-102: Review and formalise escalating responses for operator alertness detected by OAS.</b></p> <p><b>OFI-169: Review site processes for tracking and monitoring hours worked.</b></p> <p><b>OFI-170: Review provision of resting rooms for fatigue management.</b></p> <p><b>OFI-171: Consider benchmarking Tarkwa shift rosters against other operations.</b></p>	<b>BI-CPA.09.01 Site fatigue management processes are comprehensive and optimise work rosters</b>	<i>Site fatigue management processes are comprehensive and designed to support employees.</i>	<p>Site fatigue management processes include:</p> <ul style="list-style-type: none"> <li>• Education and awareness packages for shift workers</li> <li>• Optimum shift roster design</li> <li>• Hours of work and rest requirements including travel time</li> <li>• Additional work hours management</li> <li>• Advice and support for supervisors to remove fatigued persons from the workplace e.g. prestart fitness for work judgments,</li> <li>• Fatigue call ups during shift</li> </ul> <p><b>OFI-171 Consider benchmarking Tarkwa shift rosters against other operations.</b></p> <p>Managing fatigue in mining operations is a challenge for all continuous mining operations. Effective management of fatigues requires a whole of system approach that includes the design of shift rosters.</p> <p>Workshop participants discussed the shift rosters deployed by Tarkwa Mine Business Partners and</p>	<p>Compare industry good practice to current site approaches covering:</p> <p><b>Work Hours Policy</b></p> <p>Develop working-hours policy for daily work hours, maximum average weekly hours, total hours over a three-month period, and managing commutes and work-related travel.</p> <p><b>Managing Work Rosters</b></p> <ul style="list-style-type: none"> <li>• Design working hours and rosters to provide for adequate sleep opportunity (considering time for eating, washing, personal commitments etc.).</li> <li>• Make sure that there is enough time in a</li> </ul>	<p>Site fatigue management awareness and training is being completed to schedule.</p> <p>Site hours worked tracking systems send reports and identify exceedances.</p> <p><b>OFI-169: Review site processes for tracking and monitoring hours worked.</b></p> <p>Workshop participants discussed site processes for fatigue management including how cumulative hours worked, including travel time, are monitored at Tarkwa Mine.</p> <p>They noted that excessive hours at work without adequate breaks results in fatigued mobile equipment operators.</p> <p>Consider a review of the effectiveness of the current</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</li> <li>⚠ CFM-CRA.04.30 Operators change behaviour after fatigue alerting system is fitted</li> <li>⚠ CFM-CTA.11.01 Supervisor does not identify or act when operator is fatigued or intoxicated</li> <li>⚠ CFM-SDA.83 Organisation Work Scheduling and Planning is inadequate</li> <li>⚠ CFM-SDA.86 Work Environment and Work Demands result in Fatigued Mobile Equipment Operators or other Health Affects</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>identified an opportunity benchmark against how other operations manage shift rosters to manage fatigue.</p> <p>Benchmark Tarkwa shift rosters against other Gold Fields operations, consider duration, cycle sequence, time off, number of panels etc.</p> <p><b>OFI-102 Review and formalise escalating responses for operator alertness detected by OAS.</b></p> <p>Tarkwa Mine has installed Operator Alert System (OAS) technology and has an onsite monitoring control room. The technology and supporting processes are mature and fully operationally integrated at site.</p> <p>Workshop participants confirmed that OAS technology is a significant vehicle interaction control in continuous mining operation. However, their discussion and review of procedures that escalating responses based on lapses in operator alertness are not in the procedure and are not included in OAS operator training materials. There is a response protocol is detailed in poster format for OAS monitoring staff and is applied routinely.</p> <p>The Tarkwa OAS and supporting practices set a Gold Fields benchmark. Consider reviewing and updating all supporting procedures and training modules so that they capture site practice for responding to differing levels of alertness detected in-field personnel.</p>	<p>break for a minimum of six hours sleep</p> <ul style="list-style-type: none"> <li>Set the number of consecutive days that can be worked.</li> <li>Adopt a forward rotation roster systems for shift work (day-evening-night).</li> <li>Avoid quick shift changeovers such as finishing at 11 am and starting again at 7 am.</li> <li>Avoid starting or finishing shifts between 10 pm and 6 am.</li> <li>As far as possible maintain predictable shift rosters and provide adequate notice of changes.</li> <li>Allocate shift and night workers consecutive days off to allow for at least two full nights rest including some weekends.</li> </ul> <p><b>Hours of Work</b></p> <ul style="list-style-type: none"> <li>Ensure that workers have and take adequate and regular breaks so that they can rest, eat, and rehydrate.</li> <li>Ensure adequate lunchroom and ablution facilities.</li> <li>Control the length of shifts - increase resourcing, control overtime especially</li> </ul>	<p>hours of work tracking system. Confirm that it considers commutes and captures information on hours worked including:</p> <ul style="list-style-type: none"> <li>Maximum shift length</li> <li>Maximum average weekly hours</li> <li>Total hours over a three-month period</li> </ul>	

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>unscheduled overtime.</p> <ul style="list-style-type: none"> <li>• Put in place overtime restrictions when people already work 12 hour shifts.</li> <li>• Control the length of shifts to 14 hours, except for exceptional circumstances.</li> <li>• Control emergency call outs, shift swapping and overtime to ensure at least two consecutive nights sleep before and after commencing roster to allow for recovery.</li> <li>• Limit use of standby and on-call duties.</li> <li>• Ensure that responding to emergencies does not result in excessive hours.</li> <li>• Except for emergencies, give at least 24 hrs notice before changing someone from day shift.</li> <li>• Consider alternatives for personnel who have difficulties adjusting to working hours and shift patterns.</li> </ul> <p><b>Commuting and Travel</b></p> <ul style="list-style-type: none"> <li>• Use journey planning to manage long commutes and travel requirements.</li> </ul>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<ul style="list-style-type: none"> <li>• Provide alternative transport options at end of overtime and shift work to relieve commuting burden.</li> </ul> <p><b>Work Demands</b></p> <ul style="list-style-type: none"> <li>• Schedule safety critical work outside low body clock periods (i.e. between 2 am and 6 am).</li> <li>• Structure shifts and work plans so that demands are highest towards the middle of the shift and decrease towards the end.</li> <li>• Adequate multiskilling across crews to allow for fatigue relief.</li> <li>• Provide adequate resources to cover breaks for operators of equipment that is in service continually.</li> </ul> <p><b>Shift and Night Work;</b></p> <ol style="list-style-type: none"> <li>1. Keep sequential night shifts to a minimum.</li> <li>2. Avoid overtime allocations after afternoon or night shifts.</li> <li>3. Include rest periods in the work schedule and allow time for controlled sleeping and napping if necessary.</li> </ol> <p><b>Monitor Performance</b></p> <ul style="list-style-type: none"> <li>• Monitor actual time worked against the allocated roster to identify if excessive</li> </ul>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>hours are being worked.</p> <p><b>OFI-170 Review provision of resting rooms for fatigue management.</b></p> <p>Managing fatigue in mining operations is a challenge for all continuous mining operations. Effective management of fatigues requires a whole of system approach that can include providing comfortable locations for taking fatigue breaks.</p> <p>Workshop participants discussed Business Partner processes for taking fatigue breaks noting that there are limited options for short rests.</p> <p>Review the benefits of providing dedicated resting rooms for fatigued mobile equipment operators.</p>		
	<b>BI-CPA.10 Task expectations are well communicated and reinforced over the work shift.</b>	<i>Task performance expectations are clearly communicated at task allocation and then reinforced over the shift.</i>	<p>Each shift there is a process to allocate tasks and reinforce task relevant mobile equipment interaction controls.</p> <p>There is further communication during the shift as tasks or conditions change. Where appropriate, visual information (photographs, maps of roadways, etc.) are used.</p>	Pre-shift meetings, and as required, communications are logged and monitored for quality and effectiveness.	<p>Records from pre-shift meetings and other relevant communications.</p> <p>Communication logs with individuals.</p>	<p>△ CFM-CPA.11.05 Operator does not drive on available segregated roads</p> <p>△ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</p> <p>△ CFM-SPA.83.01 Operator fails to comply with site requirements</p> <p>△ CFM-SRA.87 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained</p>
<b>OFI-159: Review site communication processes including work area induction</b>	<b>BI-CPV.08 Protocols for site induction and operating areas access</b>	<i>Induction processes for people using the road network are in place and</i>	<p>Induction training and underlying procedures and rules cover:</p> <ul style="list-style-type: none"> <li>Site access including access to nominated areas, such as working face areas, stockpiles, reclaim areas, workshops and other high traffic locations</li> </ul>	All personnel at and visitors to operating sites undertake inductions and these are recorded. Inductions clearly communicate minimum site standards.	Regular inspections and personal hazard awareness records are made - with non-conformance corrected or escalated as appropriate. Periodic reviews	<p>△ CFM-MPA.72.01 Access control infrastructure is inadequate</p> <p>△ CFM-MPA.72.02 Operational access control (pedestrian and vehicle) is inadequate</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
refresher frequency.		applied at operating sites.	<ul style="list-style-type: none"> <li>Escorting requirements including vehicle communication protocols, permission to travel and general warning requirements</li> <li>Incident reporting and emergency response</li> <li>Person Protective Clothing and Equipment (PPE) requirements</li> <li>Strict requirements to never modify safety equipment</li> <li>Handheld mobile phones and other personal electronic devices (PEDs) are never used when operating mobile equipment (and guidance on the presence of detection devices on these items)</li> <li>Handheld mobile phones are never used when working around mobile equipment</li> </ul>	<p><b>OFI-159 Review site communication processes including work area induction refresher frequency.</b></p> <p>Workshop participants discussed and confirmed that work area inductions and refreshers are carried out as needed i.e. not to a regular schedule.</p> <p>This has led to situations where personnel who work in the mine are not fully informed about hazards present, required controls and key contacts. Examples include road network changes and personnel changes.</p> <p>Review site communication processes, including refresher inductions, to confirm that information about hazards present and their controls is getting to personnel.</p>	of site access logs confirm all personnel have required inductions	
<b>OFI-102: Review and formalise escalating responses for operator alertness detected by OAS.</b>	<b>BI-CRA.09.20 Introduce technology that supports existing fatigue management approaches</b>	<i>If new technology is introduced, it improves fatigue management by operationally integrating and enhancing existing processes.</i>	<p>Apply relevant site and company relevant for complex socio-technology projects.</p> <p><b>OFI-102 Review and formalise escalating responses for operator alertness detected by OAS.</b></p> <p>Tarkwa Mine has installed Operator Alert System (OAS) technology and has an onsite monitoring control room. The technology and supporting processes are mature and fully operationally integrated at site.</p> <p>Workshop participants confirmed that OAS technology is a significant vehicle interaction control in continuous mining operation. However, their discussion and review of procedures that escalating responses based on lapses in operator alertness are not in the procedure and are not included in OAS operator training materials. There is a response protocol is detailed in poster format for OAS monitoring staff and is applied routinely.</p> <p>The Tarkwa OAS and supporting practices set a Gold Fields benchmark. Consider reviewing and updating all supporting procedures and training modules so that they</p>	<p>Site and company reviews for technology that can support and enhance existing fatigue management approaches follows this sequence:</p> <ul style="list-style-type: none"> <li>Carry out a baseline assessment of existing fatigue control effectiveness</li> <li>Consider the benefits of technology to enhance or replace existing fatigue management controls</li> <li>Establish functional and performance requirements and request that vendors confirm:</li> </ul>	<p>Project management reviews.</p> <p>Performance monitoring after technology implementation.</p>	<ul style="list-style-type: none"> <li>△ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</li> <li>△ CFM-ERA.33.40 In vehicle fatigue monitoring and alerting system fails</li> <li>△ CFM-SDA.83 Organisation Work Scheduling and Planning is inadequate</li> <li>△ CFM-SDA.86 Work Environment and Work Demands result in Fatigued Mobile Equipment Operators or other Health Affects</li> </ul>

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			capture site practice for responding to differing levels of alertness detected in-field personnel.	<ul style="list-style-type: none"> <li>• What the technology does</li> <li>• What the technology does not do</li> <li>• Work with knowledgeable and experienced personnel to anticipate potential changes in operator behaviour after technology is introduced</li> <li>• Confirm the processes that will prevent or mitigate these changes</li> <li>• Include these processes in the technology implementation plan</li> <li>• Prepare the business case for the technology investment;</li> <li>• Prepare an operational implementation plan that engages the workforce</li> <li>• Consider how the new technology can provide data and information that can be applied to improve site operations</li> </ul>		
<p><b>OFI-102: Review and formalise escalating responses for operator alertness detected by OAS.</b></p>	<p><b>BI-CRA.09.21 Fatigue alert alarms</b></p>	<p><i>When fatigue monitoring systems are fitted, they have an operator alert function</i></p>	<p>Fatigue monitoring systems include a local alert function.</p> <p><b>OFI-102 Review and formalise escalating responses for operator alertness detected by OAS.</b></p> <p>Tarkwa Mine has installed Operator Alert System (OAS) technology and has an onsite monitoring control room. The technology and supporting processes are mature and fully operationally integrated at site.</p>	<p>The alert function is confirmed as working by equipment operators as part of prestart checks, and there is a defined defect management process.</p> <p>The site equipment maintenance strategy directs the servicing and</p>	<p>Prestart equipment check records.</p> <p>Site equipment maintenance records.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</li> <li>⚠ CFM-ERA.33.40 In vehicle fatigue monitoring and alerting system fails</li> <li>⚠ CFM-SDA.83 Organisation Work Scheduling and Planning is inadequate</li> <li>⚠ CFM-SDA.86 Work Environment and Work Demands result in Fatigued Mobile Equipment Operators or other Health Affects</li> </ul>

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			<p>Workshop participants confirmed that OAS technology is a significant vehicle interaction control in continuous mining operation. However, their discussion and review of procedures that escalating responses based on lapses in operator alertness are not in the procedure and are not included in OAS operator training materials. There is a response protocol is detailed in poster format for OAS monitoring staff and is applied routinely.</p> <p>The Tarkwa OAS and supporting practices set a Gold Fields benchmark. Consider reviewing and updating all supporting procedures and training modules so that they capture site practice for responding to differing levels of alertness detected in-field personnel.</p>	<p>maintenance of the installed technology.</p>		<p>⚠</p>
<p><b>OFI-114: Improve implementation of consistent fleet ID across site systems.</b></p> <p><b>OFI-115: Improve quality of data networks on site.</b></p>	<p><b>BI-CRA.09.22 Fatigue status data send</b></p>	<p><i>Installed fatigue monitoring technology is fully leveraged to assist equipment operators, supervisors, and site management improve operational performance.</i></p>	<p>When fatigue monitoring systems are fitted, they capture and send data for monitoring and analysis.</p>	<p>When fatigue monitoring systems are fitted, data is sent to:</p> <ul style="list-style-type: none"> <li>• Support and monitor operator performance, including making interventions;</li> <li>• Alert and update supervisors on operator performance</li> <li>• Analyse and improve operational processes</li> </ul> <p>Data and associated information are managed following site privacy and record keeping standards.</p> <p><b>OFI-114 Improve implementation of consistent fleet ID across site systems.</b></p> <p>The Tarkwa VICE review confirmed that fleet identification for vehicle types is not always available and may be inconsistent.</p> <p>Without adequate knowledge of vehicle types then unwanted proximity alarms may be generated.</p>	<p>Records that confirm fatigue status data is used to improve fatigue management performance for:</p> <ul style="list-style-type: none"> <li>• Individuals</li> <li>• Supervisors</li> <li>• Operating sites</li> </ul> <p>Confirmation that site records and privacy management standards are being maintained e.g. through audits or reviews.</p>	<p>⚠ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</p> <p>⚠ CFM-ERA.33.40 In vehicle fatigue monitoring and alerting system fails</p> <p>⚠ CFM-SDA.83 Organisation Work Scheduling and Planning is inadequate</p> <p>⚠ CFM-SDA.86 Work Environment and Work Demands result in Fatigued Mobile Equipment Operators or other Health Affects</p>

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				<p>Further define the issues and work with the technology provider to resolve how fleet IDs are loaded and tracked inside and across multiple systems. Establish agreed points of truth and checks.</p> <p><b>OFI-115 Improve quality of data networks on site.</b></p> <p>Workshop participants noted that there are frequent disconnects due to poor signal and network challenges around the Tarkwa operations.</p> <p>With loss of signal the ability for dispatch to contact and advise operators of responses to alarm states is impaired.</p> <p>Improve quality and reliability of site data networks to support timely and reliable alarm responses.</p>		
	<p><b>BI-CRA.11.01 Supervisors and trainers provide clear performance management expectations by role</b></p>	<p><i>Performance expectations for safe and productive outcomes are documented and communicated to all personnel.</i></p>	<p>Performance requirements are detailed by role and are used for training and competency assessments.</p> <p>Supervisors continually review, reinforce performance expectations.</p> <p>Performance management processes provide feedback that supports safe and productive behaviours and corrects unsafe and non-productive behaviours.</p>	<p>Employee training and assessment confirms understanding of site performance expectations for:</p> <ul style="list-style-type: none"> <li>• Obeying site rules</li> <li>• Following site procedures</li> <li>• Responding to instructions</li> <li>• Meeting site standards</li> <li>• Reporting and responding to safety issues</li> </ul>	<p>Training system and employee records confirm that all personnel understand the site performance expectations that are relevant to their role.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CDA.06.02 Operator drives vehicle at the incorrect speed (too fast or too slow).</li> <li>⚠ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</li> <li>⚠ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</li> <li>⚠ CFM-CPA.11.03 Operators and/or passengers do not use fitted seatbelts or restraints</li> <li>⚠ CFM-CPA.11.05 Operator does not drive on available segregated roads</li> <li>⚠ CFM-CPA.11.10 Operators or co-workers have required communications equipment but are not contactable</li> <li>⚠ CFM-CPA.11.21 Operator fails to see signage installed to standard</li> <li>⚠ CFM-CPV.11.20 Operators or passenger has limb outside cabin while travelling</li> <li>⚠ CFM-EPA.32.06 Loose objects in cabin or around vehicle remain unsecured</li> <li>⚠ CFM-EPV.26.10 Routine or occasional overloading of vehicles</li> <li>⚠ CFM-EPV.39.42 Vehicles are operated outside specified tyre conditions</li> </ul>

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						<ul style="list-style-type: none"> <li>⚠ CFM-ERA.32.20 Operator fails to conduct effective pre-start that meets requirements</li> <li>⚠ CFM-LPA.44.05 Appropriate distances from fixed and overhead structures are not maintained</li> <li>⚠ CFM-LPV.54 Excessive water (Dust Control) is applied to road surface</li> <li>⚠ CFM-MPA.66.01 Incorrect communication protocol</li> <li>⚠ CFM-MPA.72.02 Operational access control (pedestrian and vehicle) is inadequate</li> <li>⚠ CFM-MPA.72.03 Mobile equipment operator or pedestrian does not notify when entering a controlled work area</li> <li>⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</li> <li>⚠ CFM-SPA.83.01 Operator fails to comply with site requirements</li> <li>⚠ CFM-SPA.83.02 Inconsistent application of performance management processes</li> </ul>
	<b>BI-CTA.12.01 Pre-commencement and periodic medicals for mobile equipment operators</b>	<i>Pre-employment and periodic medicals confirm that personnel meet position requirements.</i>	<p>Personnel who operate mobile equipment have pre-commencement and periodic medicals to confirm that they can safely and productively carry their assigned tasks.</p> <p>Medicals are carried out by appropriately trained personnel with oversight from a physician.</p> <p>Medical assessments include all regulatory requirements.</p>	<p>For relevant positions, the site hiring and selection process includes a requirement for a medical assessment.</p> <p>Medicals are completed before position offers are made.</p> <p>A senior site manager has the accountability for the site process for organising and managing the results of employee periodic medicals.</p> <p>Medical assessments meet all regulatory requirements.</p>	<p>Reviews confirm the site process is being applied</p> <p>Reviews confirm that the site process meets records management and privacy standards.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</li> <li>⚠ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance</li> <li>⚠ CFM-CPA.11.10 Operators or co-workers have required communications equipment but are not contactable</li> <li>⚠ CFM-CPA.11.21 Operator fails to see signage installed to standard</li> <li>⚠ CFM-CRA.04.30 Operators change behaviour after fatigue alerting system is fitted</li> <li>⚠ CFM-ERA.33.40 In vehicle fatigue monitoring and alerting system fails</li> <li>⚠ CFM-STA-91 Regulator prosecution</li> </ul>
<b>OFI-166: Review RTW and rehabilitation processes</b>	<b>BI-CTA.12.02 Medical support and rehabilitation of injured personnel</b>	<i>Workers whose health has been degraded are supported to return to full (or alternate) duties.</i>	<ul style="list-style-type: none"> <li>• Medical providers and site based rehabilitation officers support the recovery of injured workers</li> <li>• Alternate duties are identified as required to support an injured worker transition back into their original role</li> <li>• Permanently impaired workers transition to alternate site based roles or leave the site to obtain off-site employment and care</li> </ul>	<ul style="list-style-type: none"> <li>• When an incident occurs where a worker is injured the site rehabilitation officer engages with medical services to support a return-to-work process and document the requirements as a return-to-work plan</li> <li>• Injured workers follow their return-to-</li> </ul>	<ul style="list-style-type: none"> <li>• Medical and rehabilitation reports are prepared by the return-to-work coordinator for review by senior leaders</li> <li>• As required the Human Resources Manager or other leaders intervene to support a worker transitioning to</li> </ul>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</li> <li>⚠ CFM-CTA.11.01 Supervisor does not identify or act when operator is fatigued or intoxicated</li> </ul>

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				<p>work plan whilst they are continuing to recover</p> <ul style="list-style-type: none"> <li>Fully healed workers return to full time duties</li> <li>Workers who can not return to their original roles are guided to alternate site, or off site, roles and treatment programs</li> </ul>	<p>alternate roles, employment, or care</p> <ul style="list-style-type: none"> <li>Records of injury outcomes are provided to relevant stakeholders for tracking and reporting</li> </ul>	
<p><b>OFI-116: Review mobile equipment cabin ergonomic standards.</b></p>	<p><b>BI-EDA.22.01 Specifications for operator displays</b></p>	<p><i>Appropriately consistent operator displays provide the information necessary for safe and productive outcomes.</i></p>	<ul style="list-style-type: none"> <li>Site specifications for mobile equipment operator displays are confirmed with OEMs, and third-party suppliers and consider: Operator size range (anthropometrics); Operating conditions e.g. lighting levels, background noise; Communicating routine machine status information (gauges, warning lights, etc.); Key controls including those related to abnormal and emergency situations</li> <li>Display specifications required information about critical safety related systems, including: Speed; Pressure of pneumatic or hydraulic brake systems health; Brake circuit charging pressure; Parking brake applied; Steering Function health (hydraulic); Temperature of key components, and; Vision aids (cameras, proximity, etc.); Pressure in hydrostatic drives if service braking is hydrostatic; Temperature of oil-immersed brakes; Fire suppression system operating pressures;</li> <li>Other display specifications for additional information, such as: <ul style="list-style-type: none"> <li>Electrical system health: battery charge; on-machine sensor status; warning lights (illuminating during start-up); System voltage</li> <li>Consumable status: Fuel level; Hydraulic reservoir level; Engine oil pressure; Hydraulic oil temperature; Cooling water temperature; Hydraulic transmission temperature; Transmission oil pressure;</li> </ul> </li> </ul>	<p>Mobile equipment is assessed and approved for use by a competent person following the Introduction to Site processes.</p> <p>All vehicles in operating areas meet site requirements for consistent operator displays.</p> <p>The details of equipment being used are listed in asset registers.</p> <p>OEM provided asset documentation is added to Plant Safety File.</p> <p>Maintenance planners review introduction to site records and add work orders for the maintenance of key systems.</p> <p><b>OFI-116 Review mobile equipment cabin ergonomic standards.</b></p> <p>Workshop participants noted that the installation of aftermarket equipment screens in vehicle cabins is creating ergonomic problems and in some cases restricted emergency egress.</p> <p>Confusing displays and alarms lead to an increased cognitive</p>	<p>Operator training and feedback on displays by equipment model and type.</p> <p>Introduction to Site documentation and records.</p> <p>OEM provided documentation covering display details are part of the Asset Plant Safety File and inform operator training.</p> <p>Maintenance reviews and investigations e.g. failure to act on vehicle alarm.</p> <p><b>HSMP 6.1 PR Performance Measurement and Monitoring Procedure - S6.13.5 Ergonomics - requirements for an Occupational Hygienist survey to be conducted.</b></p>	<ul style="list-style-type: none"> <li>CFM-CRA.03.21 Incorrect action on vehicle system alarm - not understood</li> <li>CFM-CRA.10.30 Proximity alarms do not assist operator</li> <li>CFM-CTA.11.34 Incorrect action taken on proximity alarm</li> <li>CFM-ERA.29.01 Multiple vehicles system alarms overwhelm and confuse the operator</li> <li>CFM-ERA.40.22 Over speed warning alarm fails to operate</li> <li>CFM-MDV.71.01 Proximity alarms do not perform to specification (false negatives and false positives)</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>Engine oil temperature; Hydraulic oil pressure</p> <ul style="list-style-type: none"> <li>○ General operating information: Running time or distance travelled meter; Service hour meter; Slope indicator</li> </ul> <p><i>Note: where there is more than one driving position, the display should be similar at each.</i></p> <p><b>Key Source References:</b></p> <ol style="list-style-type: none"> <li>1. Section 4.7 of ISO 19296 Mining - Mobile machines working underground - Machine Safety First edition 2018-11</li> <li>2. Each display shall be marked by clear symbols in accordance with ISO 6405-1 and ISO 6405-2.</li> </ol>	<p>load and increase potential for operator mistakes.</p> <p>Review and update cabin ergonomic and installation standards for each type of equipment in use at Tarkwa.</p>		
	<p><b>BI-EDA.26.05 Standards that set minimum requirements for cabin integrity, restraints, access and escape, auto shutdowns and other relevant protective systems</b></p>	<p><i>Equipment selected for site use is fit for purpose and delivers safe and productive outcomes.</i></p>	<p>Mobile equipment specifications are in place that include requirements for:</p> <ol style="list-style-type: none"> <li>1. Cabin integrity and operator restraint (seat belts, noise reduction)</li> <li>2. Auto shutdowns</li> <li>3. Ergonomics of seats, control panels/devices (allowing for different size/weight workers and in place to reduce any whole body vibration effects)</li> <li>4. Communications and information devices are sourced and fitted to minimise distraction</li> <li>5. Warning devices e.g. status of safety systems (including seat belt fitment), tilt switches on remote controllers, proximity alarms, movement alarms, state displays (gear selected etc.)</li> <li>6. Protective devices for emergencies (fire, collision, etc.)</li> <li>7. Egress / escape by alternate exit in the event of an emergency e.g. through non-laminated glass windows</li> <li>8. Required ratings for Light Vehicles</li> <li>9. Confirming that statutory conformance requirements are met for Heavy Vehicles e.g. ROPS / FOPS and head/whiplash protection</li> <li>10. As required the installation of self-rescuers for vehicles that may be engulfed e.g. dozers that operate on stockpiles.</li> <li>11. Monitoring and alarm devices for safety systems (thermal, in-vehicle-monitoring-systems</li> </ol>	<p>Senior managers including representative of operations and maintenance approve equipment selection recommendations.</p> <p>A rigorous introduction to site process checks that received mobile equipment meets site requirements before it is permitted to operate.</p>	<p>All equipment in use is approved and documented. The details of equipment being used are listed in asset registers.</p> <p>OEM provided asset documentation is added to Plant Safety File.</p> <p>Maintenance planners review: introduction to site records and add work orders to maintain site standards.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-EDA.21.10 Equipment or Component Design is not error tolerant</li> <li>⚠ CFM-ERV.33.20 Compromised vehicle cabin no longer meets OEM or site specific specifications</li> <li>⚠ CFM-SPA.83.01 Operator fails to comply with site requirements</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			(IVMS) for conformance with site rules meeting prevailing conditions, speed alarms, and alerts on pressure of brakes, steering, tyres, etc.)			
<b>OFI-116: Review mobile equipment cabin ergonomic standards.</b>	<b>BI-EDA.29.01 Mobile equipment operator interfaces consider ergonomics and cognitive loading</b>	<i>Information provided by screens, control panels, alerts, alarms, and other installed devices assists mobile equipment operators to deliver safe and productive outcomes.</i>	<p>There is a site process that considers cab ergonomics when installing screens, control panels, alerts, alarms, and other devices that:</p> <ul style="list-style-type: none"> <li>References site and company standards</li> <li>References industry standards e.g. AS 2359.5 - Symbols for operator controls and other displays</li> <li>Considers good practice industry research</li> <li>Consults with experienced operators, maintainers, and technicians</li> <li>Reviews and adjusts, as required, based on outcomes from installation pilots</li> </ul> <p>The site process also reviews changes in cognitive load for mobile equipment operators covering:</p> <ul style="list-style-type: none"> <li>The additional cognitive load of newly installed or activated interfaces</li> <li>The cumulative load when combined with other screens, control panels, alerts, alarms, and devices</li> <li>The range of operating environments and circumstances that are relevant for the device or interface</li> <li>How the expected outcomes will be delivered e.g. improvements in situational awareness, operator decision making, and performance</li> <li>Related potential failure modes and their controls</li> </ul>	<p>The site process is applied when selecting, trialling, and installing screens, control panels, alerts, alarms, and other devices.</p> <p><b>OFI-116 Review mobile equipment cabin ergonomic standards.</b></p> <p>Workshop participants noted that the installation of aftermarket equipment screens in vehicle cabins is creating ergonomic problems and in some cases restricted emergency egress.</p> <p>Confusing displays and alarms lead to an increased cognitive load and increase potential for operator mistakes.</p> <p>Review and update cabin ergonomic and installation standards for each type of equipment in use at Tarkwa.</p>	<p>Records of the site process being applied.</p> <p>Logs and records that demonstrate the installed device and interface is being used as designed.</p> <p>Operator feedback.</p>	<ul style="list-style-type: none"> <li>△ CFM-CRA.04.30 Operators change behaviour after fatigue alerting system is fitted</li> <li>△ CFM-CRA.10.30 Proximity alarms do not assist operator</li> <li>△ CFM-CTA.11.34 Incorrect action taken on proximity alarm</li> <li>△ CFM-ERA.29.01 Multiple vehicles system alarms overwhelm and confuse the operator</li> <li>△ CFM-ETA.40.01 Routine false positive alarms</li> <li>△ CFM-SRA.92 Unit key system status and alarms are not monitored</li> </ul>
<b>OFI-132: Review site equipment specifications for key system alarms.</b>	<b>BI-EPA.26 Fit-for-purpose equipment selection and</b>	<i>Equipment selected for site use is fit-for-purpose and delivers safe and productive</i>	<p>Sites have an equipment selection process that involves maintainers and operational personnel in a team review (Risk Assessment format) and uses asset specifications when:</p> <ul style="list-style-type: none"> <li>Purchasing new or used equipment</li> </ul>	Senior managers including representatives of operations and maintenance approve equipment selection recommendations.	Maintenance strategies confirm the status of all mobile equipment and associated infrastructure systems.	<ul style="list-style-type: none"> <li>△ CFM-EDA.21.10 Equipment or Component Design is not error tolerant</li> <li>△ CFM-EDV.21.22 Steering and brake alarms not fitted</li> <li>△ CFM-EPA.25.20 Load shape, or restraints or load securing devices fail causing an incident</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>OFI-138: Investigate automated shutdown during extended equipment idle periods.</b></p> <p><b>OFI-140: Confirm that site vehicle identification standards are understood and applied.</b></p> <p><b>OFI-148: Review Technology Specifications for Equipment Introduction to Site</b></p>	<p><b>Introduction to Site processes</b></p>	<p><i>outcomes - meeting all site requirements for worker ergonomics, control integrity, matched technology (to site), equipment performance and operating environment constraints.</i></p>	<ul style="list-style-type: none"> <li>Transferring equipment to site</li> <li>Hiring equipment</li> <li>Assessing contractor equipment</li> </ul> <p>Equipment specifications ensure that mobile equipment assets meet site production and operating environment demands (including provision of systems for monitoring location (including geofencing), communicating and visibility/sight lines). The specifications also cover the use of ancillary equipment such as forklifts, scissor lifts, elevating work platforms etc. and considers suitability for the operating environment (stability, use of quick detach systems, character of the material being transported, temperature ranges, etc.)</p> <p>Equipment specifications include allowance for all safety related functions such as energy constraint (guarding), removal of energy (isolation), and protection against unwanted operation.</p> <p>Information on equipment use limitations from the OEM should be provided to the operators/maintainers with training modules that also check for understanding.</p> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI as approved for use 01-03-07</b></p> <p><b>6.2.1. Vehicle Selection</b></p> <p>All mobile equipment used on site shall be safe and suitable for use under the working conditions in which they were engaged. Prior to operating any mobile equipment on site, a competent person shall assess the equipment/ vehicle to ensure it meets the vehicle's and driving standards. Specialists shall be employed to certify specialized equipment before use. Selection of vehicles shall take account of the activities they are intended to perform and the risks to operators and maintainers. All newly acquired equipment and vehicles shall be risk assessed for adequacy before being certified for use on site at Mine Maintenance. All mobile equipment shall comply with any relevant statutory requirements and shall be properly operated and maintained in accordance with the manufacturer's operating recommendations. Designated mining equipment shall be equipped with fatigue detection equipment (Guardvant) and Collision Avoidance System must be functional during use. A vehicle shall not be operated on site unless it complies with the following minimum vehicle standards (refer to Vehicle Roadworthiness Guideline for more information):</p>	<p>A rigorous introduction to site process checks that received mobile equipment meets site requirements before it is permitted to operate. This includes ensuring that site requirements are met for:</p> <ul style="list-style-type: none"> <li>Safety related systems including: Brakes; Steering; Control and warning and alarm systems that meet requirements (including technology solutions); Warning devices are in place to detect fatigue, use of mobile phones or personal electronic devices, and other site required systems; Radios or communication systems matching site requirements; Integrity of lifting and load moving components</li> <li>Visibility and demarcation: Head lights; Running lights; Indicators; Vehicle identification numbers that are clear and visible</li> <li>General operability: Running gear e.g. tyres; Remote control technologies with associated fail safes to prevent unintended operation; Noise and fume generation matched to site requirements; Other components meeting</li> </ul>	<p>Safety related components/checks are addressed with additional rigour (e.g. proof test requirements) with status reports available to senior personnel.</p> <p>Equipment specifications are regularly reviewed, and if required after significant incidents.</p>	<ul style="list-style-type: none"> <li>△ CFM-ERA.31.09 Installed equipment system status alarms do not operate</li> <li>△ CFM-ERV.33.20 Compromised vehicle cabin no longer meets OEM or site specific specifications</li> <li>△ CFM-ETV.25.05 Fitted airbags fail to deploy</li> <li>△ CFM-ETV.33.01 OEM supplied seat belts are disabled or removed</li> <li>△ CFM-LPV.41.20 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning</li> <li>△ CFM-SDA.86 Work Environment and Work Demands result in Fatigued Mobile Equipment Operators or other Health Affects</li> <li>△ CFM-SPA.88 Inadequate management of change</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p><b>OFI-148 Review Technology Specifications for Equipment Introduction to Site</b></p> <p>Mobile equipment selected and introduced to site is an accountability of Tarkwa Business Partners with Gold Fields oversight. There is also a requirement to notify the regulator.</p> <p>Gold Fields are supplying their Business Partners with additional technology that will be deployed in their vehicles. The technology includes Hexagon Mining Collision Avoidance Systems (CAS), operator alertness systems (OAS), and fleet management.</p> <p>Confirm technology post installation specifications relevant to these systems and include installation standards.</p> <p><b>OFI-138 Investigate automated shutdown options for extended equipment idle periods.</b></p> <p>Tarkwa mine has an energy saving approach that includes limiting mobile equipment idle time.</p> <p>Review feasibility of automated equipment shutdown during long idle periods. Discuss with contractors and include in equipment specifications.</p> <p><b>OFI-132 Review site equipment specifications for key system alarms.</b></p> <p>Workshop participants discussed detection and warning systems capability on mobile equipment e.g. alerts and alarms for key systems such as brakes, steering and wheel assemblies e.g. tyre pressure.</p> <p>There have been incidents at Tarkwa where failures in mobile equipment systems have caused vehicle interactions.</p> <p>Consider reviewing site equipment specifications for alerting and alarming capability for key systems e.g. brakes, steering, wheel assembly conditions etc.</p>	<p>site requirements for surfaces (cleanliness, coatings, external FRAS), strength, and confirming it is matched to site engineering and maintenance capabilities</p> <ul style="list-style-type: none"> <li>Maintenance information and work orders are confirmed to be in place for the incoming items of equipment as required with information included in site information management systems (plant safety files).</li> </ul> <p><b>OFI-140 Confirm that site vehicle identification standards are understood and applied.</b></p> <p>Workshop participants confirmed that some vehicles in use do not have identification numbers in place. They also noted that this is a legal requirement in Ghana.</p> <p>Vehicle identification is essential for communication.</p> <p>Confirm site standards, review vehicle numbering and lights for conformance and correct as required.</p>		
	<p><b>BI-EPA.27.50 New or upgraded technology specification, test, and commissioning process.</b></p>	<p><i>The operational deployment of new or upgraded communications equipment and technology is well managed.</i></p>	<p>There is a site standard for selection, testing, and operational deployment of new or upgraded communications equipment and technology.</p> <p>It is supported by site processes and protocols for technology selection that require:</p> <ul style="list-style-type: none"> <li>A use case that summarises the costs and benefits</li> </ul>	<p>New or upgraded communications and technology is tested and commissioned before being operationally deployed.</p> <p>Selected technology testing, pilots, reviews, and operational deployment approaches include:</p>	<p>An approved project management plan for the operational deployment of new or upgraded communications equipment and technology.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-EPA.33.40 Communication equipment absence, failure or poor reception</li> <li>⚠ CFM-MPA.66.01 Incorrect communication protocol</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<ul style="list-style-type: none"> <li>• Site duty requirements for the technology</li> <li>• Functional requirement details</li> <li>• Technical requirements e.g. communications infrastructure WIFI networks, dedicated telecommunication networks, cabling, on and off site computing capacity, etc.</li> <li>• Performance requirement details</li> <li>• Selection, pilot, and operational deployment</li> </ul>	<ul style="list-style-type: none"> <li>• Pilot assessment of technology against site duty requirements</li> <li>• Cold commissioning e.g. collision detection initially done in silent mode to minimise operational disruptions and integrate other business systems</li> <li>• Confirming ongoing logistics, and maintenance support requirements.</li> </ul>		
	<b>BI-EPA.30.01</b> <b>Mobile equipment is speed limited</b>	<i>If required, mobile equipment is reliably speed limited.</i>	<p>Where site speed limit governing of mobile equipment is required, specifications are set considering:</p> <ul style="list-style-type: none"> <li>• Equipment type</li> <li>• Equipment application e.g. a tractor unit used in an underground man hauler may have a higher speed than a tractor unit configured as a forklift</li> <li>• Location (operating environment)</li> </ul> <p>Tamper proof and tamper evident requirements</p>	<p>Speed limiting of mobile equipment that meets site requirements is confirmed at each step of the:</p> <ul style="list-style-type: none"> <li>• Site specify, purchase, delivery, acceptance, commissioning, and the introduction to site checks</li> <li>• In mobile equipment safety files</li> <li>• During maintenance and servicing</li> </ul>	<p>Site speed limiting specifications are in place and applied and captured in mobile equipment safety files.</p> <p>Equipment prestart checks and defect reports</p> <p>By exception - speed limiter compromises detected during periodic maintenance are reported and investigated</p>	<p>⚠ CFM-EPV.31.33 Speed limiting device compromised</p>
	<b>BI-EPA.30.05</b> <b>New to site mobile equipment meets specifications for vehicle lights, signage, and markings.</b>	<i>All vehicles in operating areas meet site specifications for lights, signage, and markings.</i>	<p>The Introduction to Site process confirms that mobile equipment specifications for:</p> <ul style="list-style-type: none"> <li>• Reversing and head lights</li> <li>• Running lights</li> <li>• Indicators</li> <li>• Identification numbers</li> <li>• Supporting documentation</li> <li>• Maintenance and servicing requirements details</li> </ul>	<p>Mobile equipment is assessed and approved for use following the Introduction to Site processes.</p> <p>All vehicles in operating areas meet site requirements for:</p> <ul style="list-style-type: none"> <li>• Reversing and head lights</li> <li>• Running lights</li> <li>• Indicators</li> </ul>	<p>Mobile equipment approval for site use records for mobile equipment.</p> <p>Maintenance records e.g. replacement of non-standard components post mobile equipment deployment.</p> <p>By exception reporting of non-conformance of operating mobile equipment.</p>	<p>⚠ CFM-EDV.21.22 Steering and brake alarms not fitted</p> <p>⚠ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>Apply when:</p> <ul style="list-style-type: none"> <li>• Purchasing new or used equipment</li> <li>• Transferring equipment to site</li> <li>• Hiring equipment</li> <li>• Assessing contractor equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Identification numbers</li> <li>• Supporting documentation of conformance for plant safety dossiers</li> <li>• Maintenance and servicing requirements</li> </ul>	Regular mobile equipment operational and maintenance audit findings.	
<p><b>OFI-121: Review site standards for headlights</b></p> <p><b>OFI-142: Review priorities set and planning for maintenance tasks.</b></p> <p><b>OFI-143: Review technician numbers on shift</b></p> <p><b>OFI-144: Review effectiveness of maintenance backlog management processes.</b></p>	<b>BI-EPA.31.01 Maintenance of safety and operational systems on mobile equipment</b>	<p><i>Safety and operational systems on mobile equipment are maintained to a schedule and repaired when they breakdown.</i></p> <p><i>Mobile equipment with compromised safety and operational systems does not operate.</i></p>	<p>Maintenance strategies in place for all mobile and related plant based on OEM requirements for inspections, replacement and lubrication of components. Work on safety systems includes proof testing where appropriate e.g. after maintenance on brakes and steering systems, for exhaust gas levels, emergency stop functions, etc.</p> <p>Faults detected at prestart checks and during operations are classified and prioritised for maintenance as a defect management process. Fault types where equipment should not be used and the process to follow in this situation are well defined.</p>	<p>Maintenance planners issue work orders for mobile plant in line with confirmed strategies, containing checklists, instruction, procedures, and guidance for records to be prepared and submitted on completion of the work order.</p> <p>Maintenance workers conduct work order tasks in line with site requirements (which may extend beyond OEM procedures).</p> <p>Completed work order records are returned to the maintenance planners for permanent storage.</p> <p>Senior engineering and operational personnel review records to confirm maintenance strategy meets site requirements.</p> <p><b>OFI-144 Review effectiveness of maintenance backlog management processes.</b></p> <p>Workshop participants indicated that there are problems with the maintenance backlog system and incomplete mobile equipment tasks are not</p>	<p>Equipment availability metrics.</p> <p>Reports on maintenance work order close out are prepared by maintenance planners for review by senior personnel</p> <p>Metrics on the status of safety related work orders.</p> <p>Reviews and investigations after significant maintenance failures.</p> <p><b>OFI-143 Review technician numbers on shift</b></p> <p>Workshop participants discussed frequent occasions when there are not enough technicians available on shift to perform repairs.</p> <p>Delayed repairs can lead to compromised equipment being put back into service.</p> <p>Review the manning levels for technicians on shift to confirm sufficient numbers are available.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-EDA.21.10 Equipment or Component Design is not error tolerant</li> <li>⚠ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>⚠ CFM-EPA.33.40 Communication equipment absence, failure or poor reception</li> <li>⚠ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</li> <li>⚠ CFM-ERA.31.09 Installed equipment system status alarms do not operate</li> <li>⚠ CFM-ERA.33.40 In vehicle fatigue monitoring and alerting system fails</li> <li>⚠ CFM-ERA.39.20 Overload warning system fails is incorrect or absent</li> <li>⚠ CFM-ETV.33.01 OEM supplied seat belts are disabled or removed</li> <li>⚠ CFM-SRA.87.10 Equipment faults arising from poor standard of maintenance</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>being rescheduled as required.</p> <p>The backlog system used by maintenance planners is currently not working effectively.</p> <p>Confirm if the issue is relevant for both Business partners and the review maintenance systems to confirm backlog issues are being managed and tracked through to resolution.</p> <p><b>OFI-142 Review priorities set and planning for maintenance tasks.</b></p> <p>Workshop participants reported that maintenance windows for equipment are frequently shortened due to production demands or lack of required components.</p> <p>Incomplete maintenance works can lead to failures of key systems and unplanned breakdowns.</p> <p>Review the use of component kits which confirm all required components and consumables are held before commencing a service. Also, review the priorities for maintenance tasks and consider how to effectively quarantine the maintenance windows from short term production requirement pressures.</p> <p><b>OFI-121 Review and update site standards for headlights.</b></p> <p>Workshop participants advise that the new replacement LED bulbs create more shadows than the traditional bulbs</p>		

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				<p>Roads obscured by shadows can lead to an inability to detect rough road conditions.</p> <p>Conduct a lighting survey for the different available headlight bulb types and adopt the best as a site standard. This should confirm that all new-to-site and refurbished equipment meets the requirement to provide sufficient light intensity and contrast.</p>		
	<p><b>BI-EPV.26.01 Skilled and experienced personnel specify and select mobile equipment and mobile equipment components.</b></p>	<p><i>Suitably qualified and experienced personnel, with operating site knowledge, specify and select fit for purpose mobile equipment and related components (e.g. tyres, trailers, and attachments).</i></p>	<p>The process for preparing equipment and component specifications considers relevant company and site standards for:</p> <ul style="list-style-type: none"> <li>• Operator and passenger protection e.g. seating, restraints, protection from cargo etc.</li> <li>• Lights and markings</li> <li>• Speed settings for different vehicle configurations e.g. low speed with tray or tub up)</li> </ul> <p>The process for selecting equipment and component considers <b>where</b> the vehicle will be operated:</p> <ul style="list-style-type: none"> <li>• Location e.g. surface or underground</li> <li>• Road network layout</li> <li>• Sight line requirements</li> <li>• Type and condition of surface</li> <li>• Road gradient</li> <li>• Road camber or profile</li> <li>• Turn radii</li> <li>• Type and condition of dumping and loading areas</li> <li>• Climate range</li> </ul> <p>The process for selecting equipment and component considers <b>how</b> the vehicle will be operated:</p> <ol style="list-style-type: none"> <li>1. Average and maximum speeds</li> <li>2. Maximum wheel load, average load, TKPH, and weight distribution</li> <li>3. Cycle length empty and laden</li> </ol>	<p>Suitably qualified and experienced personnel, with operating site knowledge:</p> <ol style="list-style-type: none"> <li>1. Confirm site current and future operating conditions</li> <li>2. Apply relevant company and site standards</li> <li>3. Prepare equipment and component specifications</li> <li>4. Select equipment and components that meet site requirements</li> </ol>	<p>Deployed mobile equipment and associated components deliver required production outcomes at the expected cost e.g. equipment maintenance and service schedules meet plan.</p> <p>Consider equipment performance measures e.g. availability, planned versus breakdown maintenance, mean time to failure etc.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-EDA.21.10 Equipment or Component Design is not error tolerant</li> <li>⚠ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>⚠ CFM-EPA.32.06 Loose objects in cabin or around vehicle remain unsecured</li> <li>⚠ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</li> <li>⚠ CFM-ERA.31.09 Installed equipment system status alarms do not operate</li> <li>⚠ CFM-LPV.41.20 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning</li> <li>⚠ CFM-SRA.87.10 Equipment faults arising from poor standard of maintenance</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>4. Shift duration and number of cycles per shift)</p> <p>5. Special components such as water tanks and sprays, suitability for road works, explosives or hazardous goods transport, etc.</p> <p>The selection process also considers supplier relationships and ongoing site support.</p>			
	<b>BI-EPV.30.01 Skilled and experienced personnel are accountable for setting mobile equipment operating parameters.</b>	<i>Skilled and experienced personnel consider equipment design and site requirements when setting operating parameters for mobile equipment in use.</i>	<p>Accountable personnel setting mobile equipment operating parameters consider:</p> <p><b>Operating conditions:</b> Type of surface; Condition of surface; Road gradient; Road camber or profile; Turn radii; Quarry or underground; Type and condition of dumping and loading areas; Climate and season (and associated road watering and maintenance requirements); Operator constraints and requirements</p> <p><b>Routine operations:</b> Average and maximum speeds; Maximum wheel load; Average load; TKPH; Weight distribution - load stability and security; Cycle length - empty and laden; Shift duration; Number of cycles per shift; Mix and numbers of vehicles to deploy (as for short-term planning)</p> <p><b>Periodic duty:</b> Towing capacity; Loading and tipping non routine loads - clay, water-logging, reactive etc.</p>	The accountability for setting and reviewing site mobile equipment operating parameters is assigned to organisational roles with the appropriate knowledge, capability, and experience of site operational requirements.	<p>Confirm that the accountability for setting operating parameters for mobile equipment in use has been assigned.</p> <p>Review mobile equipment reliability and production outcomes.</p> <p>Confirm that equipment is operating withing site operating parameters e.g. haul distances, speed etc.</p>	<p>⚠ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</p> <p>⚠ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</p> <p>⚠ CFM-LPV.41.20 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning</p>
<b>OFI-114: Improve implementation of consistent fleet ID across site systems.</b>	<b>BI-EPV.40 Mobile Equipment data send</b>	<i>When sensors that monitor equipment components and systems have been fitted, the data is utilised to improve</i>	<p>When sensors and monitoring systems for equipment components and systems have been fitted, the data is utilised to improve and sustain performance.</p> <p>Site infrastructure requirements for data transfer are specified.</p> <p>Onboard and off-board data capture, transfer, and storage are specified e.g. tyre pressure and temperature,</p>	<p>On-board systems monitor equipment usage, data is transferred via site infrastructure.</p> <p>The data is aggregated and sorted so that it can be used for performance monitoring, reporting, and analysis.</p>	<p>Accurate, timely, and tailored reports on equipment usage and performance are provided to operators, supervisors, mine planners, maintenance personnel, training, and management.</p>	<p>⚠ CFM-EDV.21.22 Steering and brake alarms not fitted</p> <p>⚠ CFM-ERA.31.09 Installed equipment system status alarms do not operate</p> <p>⚠ CFM-SRA.92 Unit key system status and alarms are not monitored</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>OFI-115: Improve quality of data networks on site.</b></p>		<p><i>and sustain performance.</i></p>	<p>acceleration, braking, engine revs, speed, strut pressure, alarm status etc.</p> <p>Specifications for how equipment data is aggregated, sorted, monitored for drift, reported, and analysed are in place.</p>	<p><b>OFI-114 Improve implementation of consistent fleet ID across site systems.</b></p> <p>The Tarkwa VICE review confirmed that fleet identification for vehicle types is not always available and may be inconsistent.</p> <p>Without adequate knowledge of vehicle types then unwanted proximity alarms may be generated.</p> <p>Further define the issues and work with the technology provider to resolve how fleet IDs are loaded and tracked inside and across multiple systems. Establish agreed points of truth and checks.</p> <p><b>OFI-115 Improve quality of data networks on site.</b></p> <p>Workshop participants noted that there are frequent disconnects due to poor signal and network challenges around the Tarkwa operations.</p> <p>With loss of signal the ability for dispatch to contact and advise operators of responses to alarm states is impaired.</p> <p>Improve quality and reliability of site data networks to support timely and reliable alarm responses.</p>	<p>Reports are reviewed and performance drifts are identified and corrected.</p>	
<p><b>OFI-113: Review response processes for equipment alert and alarm notification.</b></p> <p><b>OFI-118: Review frequency of mobile</b></p>	<p><b>BI-EPV.40.01 Local and remote failsafe for sensors, alarms, and installed safety devices.</b></p>	<p><i>Sensor and alarm faults for equipment components, systems, and installed safety devices are detected with local notification, data</i></p>	<p>There are specifications for fault reporting from sensors, alarms, and safety devices installed on mobile equipment.</p> <p>The specifications include requirements for local notification, data capture and fault information send.</p> <p>The specifications confirm fault priority and category and required action.</p>	<p>When monitoring systems for equipment components alarm or safety devices are compromised there is local notification and relevant fault data is captured, transmitted off vehicle.</p> <p>The data is transmitted, aggregated and sorted so that it is available to:</p>	<p>Accurate, timely, and tailored reports on fault reporting from sensors, alarms, and safety devices installed on mobile equipment are provided to supervisors, maintenance personnel, training, management, suppliers, contract service</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.03.21 Incorrect action on vehicle system alarm - not understood</li> <li>⚠ CFM-CRA.11.22 Operator ignores or bypasses alarm or safety device</li> <li>⚠ CFM-EDV.21.22 Steering and brake alarms not fitted</li> <li>⚠ CFM-ERA.31.09 Installed equipment system status alarms do not operate</li> <li>⚠ CFM-SRA.92 Unit key system status and alarms are not monitored</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>equipment alarm system checks.</b></p> <p><b>OFI-131: Update equipment defect management processes to include alarms.</b></p>		<p><i>capture and fault information send.</i></p>	<p>When monitoring systems for equipment components alarm or safety devices are compromised, this data is captured and is sent for analysis and review.</p> <p><b>OFI-131 Update equipment defect management processes to include alarms.</b></p> <p>Workshop participants discussed the benefits of extending defect reporting and Business Partner maintenance management systems to include installed technology alerts and alarms. This includes developing protocols to operate when alarms and alerts are defective.</p> <p>Undetected non-functional alarms on operating mobile equipment present significant hazards for operators who assume the alert and alarm are operating.</p> <p>Review the defect management system and associated training to address how to react to defective monitoring and alarm systems. Review failsafe and detection notification with technology providers and confirm that it meets site requirements.</p>	<ol style="list-style-type: none"> <li>1. Provide instructions back to the operator</li> <li>2. Monitor performance</li> <li>3. Prepare reports</li> <li>4. Undertake diagnostics and analysis</li> </ol> <p><b>OFI-113 Review response processes for equipment alert and alarm notification.</b></p> <p>Workshop participants confirmed that machine state alerts, alarms, and other information is transmitted back to dispatch. Advice, instructions, and directions are then relayed back via dispatch to vehicle operators.</p> <p>This sequence can result in extensive delays and has resulted in equipment damage and ongoing operations with compromised systems.</p> <p>Review the current process for prompting operators about machine state alarms and consider the cost and benefits of other approaches.</p>	<p>providers and others as required.</p> <p><b>OFI-118 Review frequency of mobile equipment alarm system checks</b></p> <p>Workshop participants discussed the frequency and adequacy of maintenance checks and testing of vehicle alarm and alert systems. They raised questions about consistency, quality, and scheduling of checks.</p> <p>Concerns were raised on alarm systems that do not fail-to-safe. They also recognised that defective or non-functioning alert and alarm systems during vehicle operations can result in significant incidents and equipment damage.</p> <p>Review site processes for checking and tests of mobile equipment alarms. Consider both OEM installed third-party technology alarms.</p>	
<p><b>OFI-123: Consider in-field maintenance checks prior to planned services</b></p> <p><b>OFI-144: Review effectiveness of maintenance backlog management processes.</b></p>	<p><b>BI-ERA.31.02 Inspection and maintenance of mobile equipment cabin integrity, restraints, access and escape, auto shutdowns and other relevant protective systems.</b></p>	<p><i>The protective systems and safety related components of on-site approved mobile equipment remain functional.</i></p>	<p>Maintenance strategies related to cabins, passenger restraints, access and egress, auto shutdown and other relevant protective systems are in place for all vehicles on site and include:</p> <ul style="list-style-type: none"> <li>• Regular visual checks and inspections</li> <li>• Measurements (with tolerances)</li> <li>• Proof testing</li> </ul> <p>Replacement of components based on OEM schedule, recommendations, and site duty requirements.</p>	<p>Work orders for equipment on site are completed in a timely manner covering:</p> <ul style="list-style-type: none"> <li>• Cabin integrity,</li> <li>• Restraints (including load carrying restraints),</li> <li>• Access and emergency egress</li> <li>• Auto shutdown and other relevant protective systems</li> </ul> <p>Maintenance planners close out work orders when</p>	<p>Equipment availability metrics.</p> <p>Reports on maintenance work order close out are prepared by maintenance planners for review by senior personnel</p> <p>Metrics on the status of safety related work orders.</p> <p>Reviews and investigations after significant maintenance failures.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-ERV.33.20 Compromised vehicle cabin no longer meets OEM or site specific specifications</li> <li>⚠ CFM-ETV.25.05 Fitted airbags fail to deploy</li> <li>⚠ CFM-SRA.87.10 Equipment faults arising from poor standard of maintenance</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>confirmed as completed and prepare regular status reports on work order status for equipment on site.</p> <p><b>OFI-144 Review effectiveness of maintenance backlog management processes.</b></p> <p>Workshop participants indicated that there are problems with the maintenance backlog system and incomplete mobile equipment tasks are not being rescheduled as required.</p> <p>The backlog system used by maintenance planners is currently not working effectively.</p> <p>Confirm if the issue is relevant for both Business partners and the review maintenance systems to confirm backlog issues are being managed and tracked through to resolution.</p> <p><b>OFI-123 Consider in-field maintenance inspections prior to planned services.</b></p> <p>The workshop participants discussed how mobile equipment maintenance inspections are carried in the pit before scheduled maintenance by Tarkwa Mine Business Partners. They confirmed that the practice is not routine.</p> <p>This sometimes results in defects not being repaired because all the maintenance requirements for a vehicle arriving for a service have not been identified.</p> <p>Consider the cost benefits of implementing a process for in-field maintenance</p>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>OFI-121: Review site standards for headlights</b></p> <p><b>OFI-123: Consider in-field maintenance checks prior to planned services</b></p> <p><b>OFI-140: Confirm that site vehicle identification standards are understood and applied.</b></p> <p><b>OFI-144: Review effectiveness of maintenance backlog management processes.</b></p>	<p><b>BI-ERA.31.03 Inspection and maintenance of mobile equipment lights and markings</b></p>	<p><i>Mobile equipment in use always meets category standards for lights and markings.</i></p>	<p>Each category of mobile equipment has an approved standard for lights and markings.</p> <p>There are comprehensive site processes in place to apply and maintain this mobile equipment standard including:</p> <ol style="list-style-type: none"> <li>1. Selection</li> <li>2. Site use approval</li> <li>3. Inspection</li> <li>4. Cleaning and washing</li> <li>5. Defect reporting</li> <li>6. Equipment stand down</li> <li>7. Repairs</li> <li>8. Planned maintenance including the replacement of components based on OEM schedule, recommendations, and site duty requirements.</li> </ol> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</b> as approved for use 01-03-07 provides details of site requirements for light types and use in section <b>6.2.1.1. Lights</b></p>	<p>inspections to assist with maintenance planning.</p> <p>Inspection, defect reporting, repair and maintenance processes that consider lights and marking for mobile equipment are consistently applied.</p> <p>Prestart checks include:</p> <ol style="list-style-type: none"> <li>1. Confirming functioning lights and indicators</li> <li>2. Visible decals</li> <li>3. Whip flags (e.g. for surface mining light vehicles)</li> <li>4. Flashing lights (colour as specified)</li> </ol> <p><b>OFI-144 Review effectiveness of maintenance backlog management processes.</b></p> <p>Workshop participants indicated that there are problems with the maintenance backlog system and incomplete mobile equipment tasks are not being rescheduled as required.</p> <p>The backlog system used by maintenance planners is currently not working effectively.</p> <p>Confirm if the issue is relevant for both Business partners and the review maintenance systems to confirm backlog issues are being managed and tracked through to resolution.</p> <p><b>OFI-140 Confirm that site vehicle identification standards are understood and applied.</b></p>	<ol style="list-style-type: none"> <li>1. The current and approved standard for each category of mobile equipment details requirements for lights and markings.</li> <li>2. Monitoring that prestart checks are being undertaken to required standard.</li> <li>3. Equipment availability metrics include defect stand down information.</li> <li>4. Reports on maintenance work order close out are prepared by maintenance planners for review by senior personnel.</li> </ol>	<p>△ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</p>

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				<p>Workshop participants confirmed that some vehicles in use do not have identification numbers in place. They also noted that this is a legal requirement in Ghana.</p> <p>Vehicle identification is essential for communication.</p> <p>Confirm site standards, review vehicle numbering and lights for conformance and correct as required.</p> <p><b>OFI-121 Review and update site standards for headlights.</b></p> <p>Workshop participants advise that the new replacement LED bulbs create more shadows than the traditional bulbs</p> <p>Roads obscured by shadows can lead to an inability to detect rough road conditions.</p> <p>Conduct a lighting survey for the different available headlight bulb types and adopt the best as a site standard. This should confirm that all new-to-site and refurbished equipment meets the requirement to provide sufficient light intensity and contrast.</p> <p><b>OFI-123 Consider in-field maintenance inspections prior to planned services.</b></p> <p>The workshop participants discussed how mobile equipment maintenance inspections are carried in the pit before scheduled maintenance by Tarkwa Mine Business Partners. They confirmed that the practice is not routine.</p>		

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				<p>This sometimes results in defects not being repaired because all the maintenance requirements for a vehicle arriving for a service have not been identified.</p> <p>Consider the cost benefits of implementing a process for in-field maintenance inspections to assist with maintenance planning.</p>		
<p><b>OFI-118: Review frequency of mobile equipment alarm system checks.</b></p> <p><b>OFI-123: Consider in-field maintenance checks prior to planned services</b></p> <p><b>OFI-144: Review effectiveness of maintenance backlog management processes.</b></p>	<p><b>BI-ERA.31.04 Inspection and Maintenance of Mobile Equipment alarms, monitors, cameras, and other warning devices.</b></p>	<p><i>Mobile equipment alarms, cameras and advice screens are functional during operations.</i></p>	<p>Each category of mobile equipment has an approved standard for alarms, cameras, advice screens, and other warning devices.</p> <p>There are comprehensive site processes in place to apply and maintain this mobile equipment standard including:</p> <ul style="list-style-type: none"> <li>• Selection</li> <li>• Site use approval</li> <li>• Inspection and calibration</li> <li>• Proof testing</li> <li>• Cleaning and washing</li> <li>• Defect reporting</li> <li>• Equipment stand down requirements</li> <li>• Repairs and replacement</li> <li>• Planned maintenance including proof testing, component replacement based on OEM schedule, recommendations, and site duty requirements.</li> </ul>	<p>Inspection, calibration, proof testing, defect reporting, repair, maintenance and other processes relevant to mobile equipment alarms, cameras, and in cabin monitors, and other warning devices are consistently applied.</p> <p>Prestart checks and infield calibration includes checking and reporting on the status of operator relevant alarms, cameras, advice screens, and other warning devices.</p> <p><b>OFI-144 Review effectiveness of maintenance backlog management processes.</b></p> <p>Workshop participants indicated that there are problems with the maintenance backlog system and incomplete mobile equipment tasks are not being rescheduled as required.</p> <p>The backlog system used by maintenance planners is currently not working effectively.</p> <p>Confirm if the issue is relevant for both Business partners and the review maintenance systems to confirm backlog</p>	<ul style="list-style-type: none"> <li>• The current and approved standard for each category of mobile equipment details requirements for alarms, cameras, advice screens, and other warning devices.</li> <li>• Monitoring that prestart checks are being undertaken to required standard.</li> <li>• Equipment availability metrics include defect stand down information.</li> <li>• Reports on maintenance work order close out are prepared by maintenance planner</li> </ul> <p><b>OFI-118 Review frequency of mobile equipment alarm system checks</b></p> <p>Workshop participants discussed the frequency and adequacy of maintenance checks and testing of vehicle alarm and alert systems. They raised questions about consistency, quality, and scheduling of checks.</p>	<ul style="list-style-type: none"> <li>△ CFM-CRA.10.30 Proximity alarms do not assist operator</li> <li>△ CFM-ERV.33.23 Seat belt use indicators disabled or compromised</li> <li>△ CFM-ETA.40.01 Routine false positive alarms</li> <li>△ CFM-SRA.92 Unit key system status and alarms are not monitored</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>issues are being managed and tracked through to resolution.</p> <p><b>OFI-123 Consider in-field maintenance inspections prior to planned services.</b></p> <p>The workshop participants discussed how mobile equipment maintenance inspections are carried in the pit before scheduled maintenance by Tarkwa Mine Business Partners. They confirmed that the practice is not routine.</p> <p>This sometimes results in defects not being repaired because all the maintenance requirements for a vehicle arriving for a service have not been identified.</p> <p>Consider the cost benefits of implementing a process for in-field maintenance inspections to assist with maintenance planning.</p>	<p>Concerns were raised on alarm systems that do not fail-to-safe. They also recognised that defective or non-functioning alert and alarm systems during vehicle operations can result in significant incidents and equipment damage.</p> <p>Review site processes for checking and tests of mobile equipment alarms. Consider both OEM installed third-party technology alarms.</p>	
<p><b>OFI-144: Review effectiveness of maintenance backlog management processes.</b></p>	<p><b>BI-ERA.31.05 Inspection, calibration, maintenance, and updating of mobile equipment tools and speed measuring systems</b></p>	<p><i>Mobile equipment maintenance tools, speedometers and other indicators are accurate.</i></p>	<p>Key maintenance tools and measuring components on equipment are regularly calibrated, including:</p> <ul style="list-style-type: none"> <li>• Speed measurement devices include speedometers</li> <li>• Operator information panels</li> <li>• OEM and third-party monitoring technology</li> <li>• Torsion wrenches and pressure monitoring devices</li> </ul> <p>Inspection, calibration and maintenance is scheduled in line with OEM or third-party provided nominated maintenance strategies.</p>	<p>Work orders are raised and issued to achieve inspection and calibration of maintenance tools and speed measurement devices follows OEM or third-party provider schedule, recommendations.</p> <p><b>OFI-144 Review effectiveness of maintenance backlog management processes.</b></p> <p>Workshop participants indicated that there are problems with the maintenance backlog system and incomplete mobile equipment tasks are not being rescheduled as required.</p> <p>The backlog system used by maintenance planners is</p>	<ul style="list-style-type: none"> <li>• Current inspection, calibration, maintenance, and software version records for each mobile equipment unit.</li> <li>• Maintenance status reports.</li> </ul>	<ul style="list-style-type: none"> <li>⚠ CFM-ERA.39.21 Speedometer does not indicate actual speed</li> <li>⚠ CFM-ERA.40.22 Over speed warning alarm fails to operate</li> <li>⚠ CFM-SRV.96.20 No aggregated monitoring and response to over speed alarms</li> </ul>

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				<p>currently not working effectively.</p> <p>Confirm if the issue is relevant for both Business partners and the review maintenance systems to confirm backlog issues are being managed and tracked through to resolution.</p>		
<p><b>OFI-123: Consider in-field maintenance checks prior to planned services</b></p> <p><b>OFI-144: Review effectiveness of maintenance backlog management processes.</b></p>	<p><b>BI-ERA.31.08 Inspection and maintenance of mobile equipment key systems, brakes, steering, and wheel assemblies</b></p>	<p><i>Key mobile equipment systems and components such as brakes, electric drive propulsion elements, steering, and wheel assemblies do not fail without detection or warning.</i></p>	<p>Each category of mobile equipment has an approved standard for key systems and components.</p> <p>There are comprehensive site processes in place to apply and maintain this mobile equipment standard including:</p> <ul style="list-style-type: none"> <li>• Selection</li> <li>• Site use approval</li> <li>• Inspection and calibration</li> <li>• Prestart checks</li> <li>• Reporting operator performance</li> <li>• Defect reporting</li> <li>• Equipment stand down requirements</li> <li>• Repairs and replacement</li> <li>• Planned maintenance and component replacement based on OEM schedule, recommendations, and site duty requirements.</li> </ul> <p>Defect reports, alarms, and non-conforming actions of operators and maintainers are analysed to consider additional inspections and maintenance, further operator training, and performance monitoring.</p> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</b> as approved for use 01-03-07 provides details of site requirements for brakes in <b>Section 6.2.1.2. Brakes</b>. This includes a requirement for light vehicles accessing the mining operational area to undergo mandatory brake testing.</p>	<p>Inspection, calibration, defect reporting, repair, maintenance, and other processes relevant to mobile equipment key systems are consistently applied.</p> <p>Mobile equipment prestart checks and in field testing check and report on the status of key systems.</p> <p>A defect reporting system is in place with clear guidance on the actions to be taken if mobile equipment key systems are compromised.</p> <p><b>OFI-144 Review effectiveness of maintenance backlog management processes.</b></p> <p>Workshop participants indicated that there are problems with the maintenance backlog system and incomplete mobile equipment tasks are not being rescheduled as required.</p> <p>The backlog system used by maintenance planners is currently not working effectively.</p> <p>Confirm if the issue is relevant for both Business partners and the review maintenance systems to confirm backlog issues are being managed and tracked through to resolution.</p>	<ul style="list-style-type: none"> <li>• The current and approved standard for each category of mobile equipment details key system and component operational requirements.</li> <li>• Monitoring that prestart checks are being undertaken to the required standard and frequency.</li> <li>• Equipment availability metrics include defect stand down information.</li> <li>• Reports on maintenance work orders close out for key systems.</li> <li>• Incident analysis of component or key system failures that occurred without warning or detection.</li> </ul>	<ul style="list-style-type: none"> <li>⚠ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>⚠ CFM-EPV.39.42 Vehicles are operated outside specified tyre conditions</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p><b>OFI-123 Consider in-field maintenance inspections prior to planned services.</b></p> <p>The workshop participants discussed how mobile equipment maintenance inspections are carried in the pit before scheduled maintenance by Tarkwa Mine Business Partners. They confirmed that the practice is not routine.</p> <p>This sometimes results in defects not being repaired because all the maintenance requirements for a vehicle arriving for a service have not been identified.</p> <p>Consider the cost benefits of implementing a process for in-field maintenance inspections to assist with maintenance planning.</p>		
<p><b>OFI-110: Review Tarkwa Communications Infrastructure and Radio Use.</b></p> <p><b>OFI-115: Improve quality of data networks on site.</b></p> <p><b>OFI-151: Review site processes and confirm that they are adequate to support required radio communications.</b></p>	<p><b>BI-ERA.31.30 Selection, inspection, and maintenance of radios and other communication equipment</b></p>	<p><i>Operating sites deploy fit for purpose, effective, and reliable radios and other communication equipment.</i></p>	<p>There is a site performance standard for site radios and other communication equipment</p> <p>There are comprehensive site processes that define:</p> <ul style="list-style-type: none"> <li>• Required communication equipment by equipment category</li> <li>• Required communication equipment for personnel who work around mobile equipment e.g. handheld devices</li> <li>• Assigned radio channels</li> <li>• Acceptable practices when communication equipment is faulty, out of range, or unavailable</li> <li>• Expected maintenance performance metrics</li> </ul>	<p>Prestart checks, defect reporting, radio channel allocation, signal coverage, repair, maintenance, and other processes relevant to communications equipment are consistently applied.</p> <p><b>OFI-151 Review site processes and confirm that they are adequate to support required radio communications.</b></p> <p>Workshop participants discussed site processes and schedules for the routine checking of radios in mobile equipment. This includes prestart checks, defect reporting, and scheduled maintenance of radios and site infrastructure. It also includes confirming minimum requirements for radios in heavy mobile equipment,</p>	<p>Maintenance planners close out work orders when completed and prepare regular status and performance reports for communications equipment.</p> <p>Work orders for equipment repair are completed in a timely manner.</p>	<p>⚠ CFM-EPA.33.40 Communication equipment absence, failure or poor reception</p> <p>⚠ CFM-MPA.66.01 Incorrect communication protocol</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>service vehicles, light vehicles and for pedestrians.</p> <p>Surface mining operations typically deliver safe and productive outcomes using radios to support disciplined positive communications to manage interactions in working areas. Workshop participants report that radio faults do occur and that pre start and routine schedules for checking radios and communication infrastructure are inconsistent.</p> <p>Review site processes and confirm that they are adequate to support required radio communications. Involve Business Partners in the review.</p> <p><b>OFI-110 Review Tarkwa Communications Infrastructure and Radio Use.</b></p> <p>Workshop participants report that there are ongoing site issues with communication equipment, including competition for radio use, incorrect use of radios, and network blind spots in the mine.</p> <p>Effective radio and data communications are essential for safe and productive mine operations and cover positive communications and dispatch.</p> <p>Review radio use discipline, radio availability e.g. radios in light vehicles accessing the pit, network coverage etc. Establish site minimum standards.</p> <p><b>OFI-115 Improve quality of data networks on site.</b></p>		

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				<p>Workshop participants noted that there are frequent disconnects due to poor signal and network challenges around the Tarkwa operations.</p> <p>With loss of signal the ability for dispatch to contact and advise operators of responses to alarm states is impaired.</p> <p>Improve quality and reliability of site data networks to support timely and reliable alarm responses.</p>		
<p><b>OFI-119: Confirm and apply calibration requirements for VIMS speed monitoring.</b></p>	<p><b>BI-ERA.31.50 Protocols for the calibration of measuring equipment</b></p>	<p><i>Measuring and position monitoring equipment is inspected and calibrated.</i></p>	<p>There is a site standard for the regular inspection, calibration, and upgrade management of measuring equipment.</p> <p>It is supported by site processes that detail:</p> <ul style="list-style-type: none"> <li>• Skills, qualifications, and experience required by personnel undertaking at site inspections and equipment calibration</li> <li>• Offsite provider support</li> <li>• Inspection, calibration, and software upgrade management for deployed technologies e.g. position systems</li> </ul>	<p>Site personnel are trained, competent, and authorised to use measuring equipment for:</p> <ol style="list-style-type: none"> <li>1. Equipment maintenance e.g. pressure, braking, and other measures</li> <li>2. Measurement of as built conditions in the operating environment</li> </ol> <p>The training includes inspecting, testing, and confirming that measuring and position equipment is calibrated before use.</p> <p><b>OFI-119 Confirm and apply calibration requirements for VIMS speed monitoring</b></p> <p>Workshop participants discussed how vehicle speed at Tarkwa Mine is measured using VIMS.</p> <p>They noted recent concerns about the system calibration and accuracy so that there is confidence that reliable information is being captured and reported.</p> <p>Confirm and apply the minimum requirements for</p>	<p>Reports on the calibration status of measuring equipment.</p> <p>Records confirm the competence of personnel undertaking measuring or surveying tasks.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CDA.06.02 Operator drives vehicle at the incorrect speed (too fast or too slow).</li> <li>⚠ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>⚠ CFM-EPV.39.42 Vehicles are operated outside specified tyre conditions</li> <li>⚠ CFM-ERA.39.20 Overload warning system fails is incorrect or absent</li> <li>⚠ CFM-ERV.33.20 Compromised vehicle cabin no longer meets OEM or site specific specifications</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>OFI-133: Review site pre-start processes</b></p> <p><b>OFI-134: Consider mandating fitted radios for all mine vehicles.</b></p>	<p><b>BI-ERA.32.01 Operator pre-start checks include safety and operational components</b></p>	<p><i>Equipment operators carry our prestart checks to confirm equipment can be operated and work area hazards are identified and managed. Equipment that is compromised does not operate.</i></p>	<p>Equipment operators are competent and supported to carry equipment and work area prestart checks.</p> <p>Mobile equipment prestart checks include:</p> <ol style="list-style-type: none"> <li>1. Brakes including warning systems</li> <li>2. Steering including warning systems</li> <li>3. Tyres and other running gear</li> <li>4. Conditions of vehicle - load carrying elements, guards and covers, lights and signage, hydraulic lines, and ground engaging tools</li> <li>5. Access and egress (normal and emergency) in good condition and accessible</li> <li>6. Communications (radios etc.)</li> <li>7. Fire extinguishers and fire suppression system status,</li> <li>8. Any attachments, e.g. buckets, jacks, lifting equipment, spare wheels etc.</li> </ol> <p>Faults detected at prestart checks and during operations are classified:</p> <ol style="list-style-type: none"> <li>1. When equipment cannot continue to operate and how to manage repair or removal from work area</li> <li>2. When equipment can continue to be operated (and communication of tolerable faults)</li> </ol> <p>Work area checks include identifying and managing hazards from: Vehicle moving off; Obstacles; Road conditions; Weather (rain, wind (dust), other threats), and; Vision and sight line restrictions</p> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI as approved for use 01-03-07</b></p> <p><b>6.2. Mobile Equipment</b></p> <p>If any part of an item of mobile equipment or light vehicle is not fully operational, the machinery or vehicle is to be tagged out of service and the maintenance department informed. The equipment is not to be used until repairs are completed.</p> <p><b>6.2.1.8. Radio Use</b></p>	<p>calibration of vehicle measuring systems.</p> <p>Equipment operators are trained, competent and authorised to carry equipment and work area prestart checks before operating equipment.</p> <p>Prestart checklists are prepared for each type of equipment.</p> <p>Prestart equipment and work area checks are logged.</p> <p>There is a site defect reporting and management system.</p> <p><b>Consultant Comment - Multiple incidents in the provided data set relate to wheels falling off during operations. the use of wheel nut indicators can reduce the potential for pre-use inspections to fail to detect loose or failing studs.</b></p> <p><b>OFI-133 Review site pre-start processes.</b></p> <p>Workshop participants advised that pre-start books are not always available. When they are not available they are not used and vehicles go into operation without a proper check.</p> <p>Failure to conduct appropriate pre-starts can lead to vehicle or key component failures during operations.</p> <p>Review site pre-start systems considering a potential to use a digital option with maintenance system connects rather than relying on printed paper books.</p>	<p>Supervisors monitor the quality of operator prestart checks.</p> <p>Maintenance planners review prestart forms and raise work orders as required.</p> <p>Prestart records confirm that checks of work areas and key systems, including - communications, brakes, steering, tyres and running gear are completed.</p>	<p>△ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</p> <p>△ CFM-EPV.39.42 Vehicles are operated outside specified tyre conditions</p> <p>△ CFM-ETV.33.01 OEM supplied seat belts are disabled or removed</p>

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			<p>All mine vehicles shall be fitted with radio and shall change to the Mining Operations channel when travelling in and around mining area. Any vehicle that does not have access to a radio capable of receiving channels must be escorted whilst on the haul roads and the Pit areas. Areas such as the Process Plant and construction sites where communication is required must be done through the 2-way radio system.</p> <p><b>OFI-134 Consider mandating fitted radios for all mine vehicles.</b></p> <p>Workshop participants discussed situations where vehicles are routinely entering the mine without functioning radios. Many personnel operating light vehicles in the pit use hand held radios.</p> <p>Inability to contact other vehicles, or be contacted, can lead to misunderstandings and cause vehicle collisions.</p> <p>Confirm the site equipment specifications requirements for fitted and functioning radios. Communicate site requirements and consider having radio checks when buggy whips are fitted to light vehicles. Reduce the reliance on portable radios e.g. to pedestrians and escorts. Consider mandating fitted radios on all mine vehicles.</p>			
<p><b>OFI-110: Review Tarkwa Communications Infrastructure and Radio Use.</b></p> <p><b>OFI-147: Review Light Vehicle Prestart Process</b></p> <p><b>OFI-151: Review site processes and confirm that they are adequate to support required radio communications.</b></p>	<p><b>BI-ERA.32.07 Prestart checks of radio and other communication devices</b></p>	<p><i>Prestart checks confirm that mobile equipment operators and people who work around mobile equipment can communicate.</i></p>	<p>Mobile equipment operators and personnel who work around mobile conduct prestart checks that confirm:</p> <ol style="list-style-type: none"> <li>1. Radios are working</li> <li>2. Radios are set on the correct channel</li> <li>3. Other communication devices are working and set up correctly (where relevant)</li> </ol> <p>There is a well-defined site defect management process to manage faults in communications equipment before and during operations. It includes what to do when there is a fault.</p>	<p>Radio and other communication device users are trained in:</p> <ol style="list-style-type: none"> <li>1. Site call up and response standards</li> <li>2. Managing faults and defects</li> <li>3. Emergency calls</li> <li>4. Equipment prestart checks</li> </ol> <p><b>OFI-151 Review site processes and confirm that they are adequate to support required radio communications.</b></p> <p>Workshop participants discussed site processes and schedules for the routine checking of radios in mobile equipment. This includes prestart checks, defect</p>	<p>Training record reviews.</p> <p>Prestart records confirm that checks are completed.</p> <p>Supervisors monitor and coach on the quality of operator prestart checks.</p> <p>Maintenance planners review prestart forms and raise work orders as required.</p> <p>As required investigations of communication faults.</p> <p><b>OFI-147 Review Review Light Vehicle Prestart Process</b></p> <p>Light vehicle prestart checks are required and carried out at Tarkwa mine.</p> <p>Workshop participants report that LV prestart checks are generic and do not include installed technology and</p>	<p>△ CFM-CPA.11.10 Operators or co-workers have required communications equipment but are not contactable</p> <p>△ CFM-EPA.33.40 Communication equipment absence, failure or poor reception</p> <p>△ CFM-MPA.66.01 Incorrect communication protocol</p> <p>△</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>reporting, and scheduled maintenance of radios and site infrastructure. It also includes confirming minimum requirements for radios in heavy mobile equipment, service vehicles, light vehicles and for pedestrians.</p> <p>Surface mining operations typically deliver safe and productive outcomes using radios to support disciplined positive communications to manage interactions in working areas. Workshop participants report that radio faults do occur and that pre start and routine schedules for checking radios and communication infrastructure are inconsistent.</p> <p>Review site processes and confirm that they are adequate to support required radio communications. Involve Business Partners in the review.</p> <p><b>OFI-110 Review Tarkwa Communications Infrastructure and Radio Use.</b></p> <p>Workshop participants report that there are ongoing site issues with communication equipment, including competition for radio use, incorrect use of radios, and network blind spots in the mine.</p> <p>Effective radio and data communications are essential for safe and productive mine operations and cover positive communications and dispatch.</p> <p>Review radio use discipline, radio availability e.g. radios in light vehicles accessing the</p>	<p>communications equipment. Also some forms are not submitted on time.</p> <p>Review Light Vehicle prestart check process, confirm that reporting and defect management processes are satisfactory. Confirm requirements for prestart checks for CAS and OAS technology and communications equipment.</p>	

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				pit, network coverage etc. Establish site minimum standards.		
<p><b>OFI-118: Review frequency of mobile equipment alarm system checks.</b></p> <p><b>OFI-147: Review Light Vehicle Prestart Process</b></p>	<p><b>BI-ERA.32.11 Prestart checks of mobile equipment alarms and monitors</b></p>	<p><i>Prestart checks confirm that mobile equipment alarms, monitors and information panels are working.</i></p>	<p>Mobile equipment operators conduct prestart checks, or monitor equipment self-checks, to confirm alarms, monitors, and information panels are working.</p> <p>There is a well-defined site defect management process to manage faults before and during operations. It includes what actions to take based on fault type.</p> <p><b>OFI-111 Include CAS and OAS Checks in Pre-Starts.</b></p> <p>Workshop participants discussed how Collision Avoidance Systems (CAS) and Fatigue Management (OAS) devices are checked before use.</p> <p>It is reported that CAS and OAS checks are not part of operator pre-start equipment checks.</p> <p>Review mobile equipment pre-start check process, consider opportunities to include OAS and CAS technology checks. Confirm fault categories and expected actions if faults or defects are reported.</p>	<p>Mobile equipment operators are trained and competent in conducting and monitoring equipment prestart checks. This training includes:</p> <ol style="list-style-type: none"> <li>1. Alarm checks</li> <li>2. Alarm response</li> <li>3. Monitor and information panel check</li> <li>4. Monitoring status and responding to monitor and information panel checks</li> <li>5. Managing faults and defects during operations</li> </ol>	<ol style="list-style-type: none"> <li>1. Training record review confirm the currency of vehicle operator skills including alarm and other indicator prestart checks and meanings and expected response.</li> <li>2. Prestart records confirm that checks are completed.</li> <li>3. Supervisors monitor and coach on the quality of operator prestart checks.</li> <li>4. Maintenance planners review prestart forms and raise work orders as required.</li> <li>5. As required investigations of alarm, monitor, and information panel faults.</li> </ol> <p><b>OFI-147 Review Review Light Vehicle Prestart Process</b></p> <p>Light vehicle prestart checks are required and carried out at Tarkwa mine.</p> <p>Workshop participants report that LV prestart checks are generic and do not include installed technology and communications equipment. Also some forms are not submitted on time.</p> <p>Review Light Vehicle prestart check process, confirm that reporting and defect management processes are</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.10.30 Proximity alarms do not assist operator</li> <li>⚠ CFM-CRA.11.22 Operator ignores or bypasses alarm or safety device</li> <li>⚠ CFM-ERA.32.20 Operator fails to conduct effective pre-start that meets requirements</li> <li>⚠ CFM-ERV.33.23 Seat belt use indicators disabled or compromised</li> <li>⚠ CFM-SRA.92 Unit key system status and alarms are not monitored</li> <li>⚠ OFI-111: Include CAS and OAS Checks in Pre-Starts</li> </ul>

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					<p>satisfactory. Confirm requirements for prestart checks for CAS and OAS technology and communications equipment.</p> <p><b>OFI-118 Review frequency of mobile equipment alarm system checks</b></p> <p>Workshop participants discussed the frequency and adequacy of maintenance checks and testing of vehicle alarm and alert systems. They raised questions about consistency, quality, and scheduling of checks.</p> <p>Concerns were raised on alarm systems that do not fail-to-safe. They also recognised that defective or non-functioning alert and alarm systems during vehicle operations can result in significant incidents and equipment damage.</p> <p>Review site processes for checking and tests of mobile equipment alarms. Consider both OEM installed third-part technology alarms.</p>	
<p><b>OFI-141: Review, update, and apply the Tarkwa Traffic Management Plan.</b></p> <p><b>OFI-157: Review road maintenance practices for vegetation control.</b></p> <p><b>OFI-162: Review mine planning</b></p>	<p><b>BI-LDA.41.01 Road design guidelines set minimum standards for the construction and maintenance of the road network</b></p>	<p><i>Site tailored road design standards support the delivery of safe and productive outcomes and are applied to construct and maintain haul roads, ramps, benches, loading areas, parking areas, access to service areas and other relevant infrastructure.</i></p>	<p>The site road design specifications consider prevailing weather conditions, equipment in use, operator experience, available construction materials, tyre and equipment life, equipment maintenance, fuel usage, and productivity.</p> <p>Site road design guidelines provide tailored specifications for:</p> <ul style="list-style-type: none"> <li>Physical constraints: Width of pavements, sizes of roadways, linear and cross grades, and ramp size (guidance based on type of equipment in use and tasks undertaken); Curvature (both horizontal and vertical); pavement shape</li> <li>Site specific requirements: Emergency stopping and run-off areas if required for long downhill sections of roadway; Surface / pavement material; Construction or mining of segregated</li> </ul>	<p>Road networks (and excavations) are constructed following design guidelines and ‘as built’ is checked off against design before handover.</p> <p>Maintenance crews reference design guidelines during routine maintenance, repair e.g. after flooding and upgrades, to confirm that minimum standards are in place.</p> <p>Routine mine road housekeeping rapidly removes spillage, maintains</p>	<p>In date and approved site road design guidelines and supporting resources.</p> <p>Sign-off records of as built and as maintained against design standards.</p> <p>Work area inspections non-conformance reports and analysis.</p> <p>CAS technology heatmaps and reports.</p> <p>Monitoring of equipment operators reporting and resolution of debris and deterioration.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CDA.06.02 Operator drives vehicle at the incorrect speed (too fast or too slow).</li> <li>⚠ CFM-CPA.10.02 Operators unaware of give way requirements for light vehicles</li> <li>⚠ CFM-CPA.11.05 Operator does not drive on available segregated roads</li> <li>⚠ CFM-MDA.61.06 Inadequate work planning means that heavy vehicle operators approach fixed structures that are incidental to achieving operational outcomes</li> <li>⚠ CFM-MPA.65.04 Light vehicle remains in heavy vehicle blind spot due to intersection approach speeds</li> <li>⚠ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> </ul>

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<p><b>input to speed limits.</b></p> <p><b>OFI-163: Review Road Construction and Maintenance Standards.</b></p>			<p>roadways that separate heavy mobile equipment and light vehicles; Parking areas covering location, size, and delineation; Storage areas covering separation, segregation and access requirements; Workshops, fuel bays and battery charging locations (considering any introduced flammable liquids or gases, distances, and traffic flow requirements); Stockpiles; Access to bins or tip points (crushers, passes, etc.); Safety berms or windrows; Dump geometry (including tip heads); Roadways around infrastructure e.g. overhead HV lines; Line of sight for equipment operators (including orientation of UG portals, break-aways and intersections, workshops, management of doors and ventilation screens, and longer haul roads)</p> <ul style="list-style-type: none"> <li>General road network features: Guideposts, delineators, roadway signage (beside or above roadway); Signs and barriers; Lighting (area and traffic control); The installation of one way block lights for intersections, long driveages and drifts; Location and requirements for installation of required infrastructure (pipes, cables, lighting, etc.)</li> </ul> <p>Accountabilities are assigned for the complete road network life-cycle: Preparing designs; Processes to achieve as-built sign-off; Roadway inspections; Scheduled roadway maintenance; Interim repair works; Decommissioning or moving to alternate uses.</p> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI as approved for use 01-03-07</b></p> <p>Section 6 Traffic Standard gives guidance on design, construction, layout, and key parameters such as pavement width, gradient and cross slope, edge protection, intersections (including roundabouts (circles)), and maintenance requirements.</p> <p>6.1.2.7. Road Intersection Intersections shall be at 90 degrees and crossroad intersections shall be avoided, wherever possible.</p> <p>6.1.2.8. Acceptable (preferred) intersection since the side road is at 90 degrees to the main road Round About This type of intersection shall be avoided wherever possible Roundabouts should regulate the intersection of no more than two roads wherever possible. All roads are given the same level of priority and traffic is to give way to</p>	<p>good water drainage, repairs potholes, rutting and depressions.</p> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI as approved for use 01-03-07</b></p> <p><b>6.1.3. Road Maintenance and Repair</b></p> <p>Roads must be regularly maintained so that they do not develop bumps, ruts or potholes, which may make control of vehicles difficult or cause health problems due to whole-body vibration.</p> <p><b>OFI-163 Review Road Construction and Maintenance Standards</b></p> <p>Workshop participants report that haul road construction and maintenance is sometimes inadequate.</p> <p>Issues include steep ramps sometimes greater than 10%, rough ramps, substandard maintenance on haul roads. This situation increases equipment and tyre damage, slows production, and physically stresses operators.</p> <p>Confirm Tarkwa Mine road design standards and update processes to construct and maintain infrastructure to site standards.</p> <p><b>OFI-162 Review mine planning input to speed limits.</b></p> <p>Workshop participants discussed how and when mobile equipment speed limits are set during the mine</p>		

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			<p>the LEFT. This will be shown with roundabout YEILD signs placed on all approaches to the intersection. Roads should intersect at 90°. Major roads joining a roundabout will be divided down their centre line by a traffic island at least 5m long.</p> <p><b>OFI-141 Review, update, and apply the Tarkwa Traffic Management Plan</b></p> <p><i>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</i> was first approved for use on the 01-03-07. It is still current but has not been reviewed and updated since initial publication. It is a comprehensive document that confirms a range of site design and operating requirements that reflect good mine design and operating practice at Tarkwa.</p> <p>However, during the Tarkwa 2024 Vehicle Interaction Control Effectiveness (VICE) review, workshop participants identified misalignments between this key reference document and operational practice and conditions. These include:</p> <ul style="list-style-type: none"> <li>• Road and ramp conditions - construction and maintenance</li> <li>• Non-conforming intersections and circles (roundabout) design and construction</li> <li>• Limited availability and use of radios for general pit communications</li> <li>• Unclear Positive communications e.g. passing, and approaching mobile equipment</li> <li>• Obscured or missing Traffic Signage</li> <li>• Lack of infrastructure and signage to support management of pedestrians</li> <li>• Parking practices not aligned with documented requirements for physical segregation from heavy vehicles</li> </ul> <p>These issues were confirmed by supporting consultants during mine tours and interviews.</p> <p>Consider a review of the Tarkwa Traffic Management plan in conjunction with the development of Gold Fields Minimum Standards for Vehicle interaction controls. At a minimum the review should revisit and update minimum requirements for:</p>	<p>planning and design processes.</p> <p>Incorrect speed limits can lead to vehicle over speed events e.g. when cresting and tyre overheating.</p> <p>Review and confirm the processes for setting site speed limits is considered during mine design and planning.</p> <p><b>OFI-157 Review road maintenance practices for vegetation control.</b></p> <p>Workshop participants confirmed that there are frequently tree branches close to roads or extending onto pavements.</p> <p>Branches and then other obstructions on roadways can lead to incidents occurring.</p> <p>Review and update road maintenance practices to include addressing encroaching vegetation and dead fall.</p>		

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			<ul style="list-style-type: none"> <li>Intersection design - bench mark against industry developments since 2007 including defaults to T intersections where possible</li> <li>Simplifying intersection design and construction to fully leverage upgrades and to support successful further deployment of CAS technology</li> <li>Road and ramp maintenance</li> <li>Positive communications protocols and practices</li> </ul>			
<p><b>OFI-141: Review, update, and apply the Tarkwa Traffic Management Plan.</b></p> <p><b>OFI-153: Review in pit parking planning and practices.</b></p>	<p><b>BI-LDV.43 Road design guidelines specify minimum parking area requirements</b></p>	<p><i>Parking area designs are fit for purpose. Parking areas are constructed and maintained to meet site requirements.</i></p>	<p>Parking area designs and construction include layouts for crib areas that segregate vehicle types and provide walkways at safe locations.</p> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</b> as approved for use 01-03-07 provides comprehensive details in site parking requirements in <b>Section 6.3.7. Parking</b>. This covers:</p> <ul style="list-style-type: none"> <li>Parking in an inherently stable manner</li> <li>Locations where parking is permitted</li> <li>Locations where parking is not permitted</li> <li>Leaving a vehicle</li> <li>Use of chocks</li> <li>15m distance from edge or toe of a high wall</li> <li>Moving off after parking</li> </ul> <p><b>OFI-141 Review, update, and apply the Tarkwa Traffic Management Plan</b></p> <p><i>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</i> was first approved for use on the 01-03-07. It is still current but has not been reviewed and updated since initial publication. It is a comprehensive document that confirms a range of site design and operating requirements that reflect good mine design and operating practice at Tarkwa.</p> <p>However, during the Tarkwa 2024 Vehicle Interaction Control Effectiveness (VICE) review, workshop participants identified misalignments between this key reference document and operational practice and conditions. These include:</p> <ul style="list-style-type: none"> <li>Road and ramp conditions - construction and maintenance</li> </ul>	<p>Designs are executed by road construction crews - placing windrows and berms as required to segregate vehicle types and walkways.</p> <p>Supervisors direct and monitor the activities of road maintenance and construction crews.</p> <p><b>OFI-153 Review in pit parking planning and practices.</b></p> <p>Workshop participants advised that restrictions in mine working areas leads to narrow access roads, confined work areas, frequent interactions between workgroups, poor siting of light vehicle parking areas, and sometimes an absence of parking.</p> <p>Poorly parked mobile equipment creates vehicle interaction hazards e.g. when heavy mobile equipment departs from a parked position.</p> <p>Confirm that parking area planning and design processes are adequate and monitor in pit parking practices.</p>	<p>Commissioning and handover records confirming that 'as built' meets design requirements</p> <p>Supervisor inspection records.</p>	<ul style="list-style-type: none"> <li>CFM-LDA.43.01 Vehicle parking, including emergency parking is inadequately considered in mine design and routine work planning</li> <li>CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</li> <li>CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> </ul>

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			<ul style="list-style-type: none"> <li>• Non-conforming intersections and circles (roundabout) design and construction</li> <li>• Limited availability and use of radios for general pit communications</li> <li>• Unclear Positive communications e.g. passing, and approaching mobile equipment</li> <li>• Obscured or missing Traffic Signage</li> <li>• Lack of infrastructure and signage to support management of pedestrians</li> <li>• Parking practices not aligned with documented requirements for physical segregation from heavy vehicles</li> </ul> <p>These issues were confirmed by supporting consultants during mine tours and interviews.</p> <p>Consider a review of the Tarkwa Traffic Management plan in conjunction with the development of Gold Fields Minimum Standards for Vehicle interaction controls. At a minimum the review should revisit and update minimum requirements for:</p> <ul style="list-style-type: none"> <li>• Intersection design - bench mark against industry developments since 2007 including defaults to T intersections where possible</li> <li>• Simplifying intersection design and construction to fully leverage upgrades and to support successful further deployment of CAS technology</li> <li>• Road and ramp maintenance</li> <li>• Positive communications protocols and practices</li> </ul>			
<p><b>OFI-107: Improve site delineation processes and practices.</b></p> <p><b>OFI-141: Review, update, and apply the Tarkwa Traffic Management Plan.</b></p> <p><b>OFI-173: Improve in pit lighting and monitor status.</b></p>	<p><b>BI-LPA.42.04 Lighting, delineation and signs are installed and maintained to standards that meet minimum site road design requirements.</b></p>	<p><i>There are minimum standards for the installation, inspection and maintenance of lighting, delineation, and signs that assist vehicle operators maintain situational awareness.</i></p>	<p>Designs and construction requirements include standards for lighting of high traffic areas (e.g. around the mine infrastructure areas, vehicle (including remotely controlled) operating areas, dump edges, intersections, etc.) and signs to alert vehicle operators of road network requirements. Permanent signs are erected to provide warnings around fixed infrastructure and temporary signs or warning devices (traffic cones, barrier tape, etc.) are used around temporary work areas or road network hazards not yet repaired.</p>	<p>Survey marks out the requirements for road network infrastructure to meet site requirements.</p> <p>Road construction crews place and maintain permanent and temporary lighting, communication and information signage around the road network.</p> <p>Work crews place demarcation and warning signage around their work</p>	<p>Survey records.</p> <p>As built plans with sign-off.</p> <p>Workplace inspections.</p> <p>By exception incident investigations.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.10.02 Operators unaware of give way requirements for light vehicles</li> <li>⚠ CFM-CPA.11.05 Operator does not drive on available segregated roads</li> <li>⚠ CFM-LPA.42.03 Obscured or missing signage</li> <li>⚠ CFM-MPA.63.04 Parked vehicles block view for pedestrians and other equipment operators</li> </ul>

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				<p>areas and nominated access routes.</p> <p>'As built' is checked off against design by operations.</p> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</b> as approved for use 01-03-07</p> <p><b>6.1.6. Traffic Signage Road signs</b> are located on all roads throughout the site. They shall be obeyed at all times and apply to light and heavy vehicle drivers. Sufficient warning signs need to indicate potential dangers. Signs shall be kept clean and well-maintained so that they are always visible. No vehicle is to proceed beyond a no-entry sign or barricade unless the specific authorization of a supervisor has been obtained.</p> <p><b>OFI-141 Review, update, and apply the Tarkwa Traffic Management Plan</b></p> <p><i>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</i> was first approved for use on the 01-03-07. It is still current but has not been reviewed and updated since initial publication. It is a comprehensive document that confirms a range of site design and operating requirements that reflect good mine design and operating practice at Tarkwa.</p> <p>However, during the Tarkwa 2024 Vehicle Interaction Control Effectiveness (VICE) review, workshop participants identified misalignments between this key reference</p>		

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				<p>document and operational practice and conditions. These include:</p> <ul style="list-style-type: none"> <li>• Road and ramp conditions - construction and maintenance</li> <li>• Non-conforming intersections and circles (roundabout) design and construction</li> <li>• Limited availability and use of radios for general pit communications</li> <li>• Unclear Positive communications e.g. passing, and approaching mobile equipment</li> <li>• Obscured or missing Traffic Signage</li> <li>• Lack of infrastructure and signage to support management of pedestrians</li> <li>• Parking practices not aligned with documented requirements for physical segregation from heavy vehicles</li> </ul> <p>These issues were confirmed by supporting consultants during mine tours and interviews.</p> <p>Consider a review of the Tarkwa Traffic Management plan in conjunction with the development of Gold Fields Minimum Standards for Vehicle interaction controls. At a minimum the review</p>		

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				<p>should revisit and update minimum requirements for:</p> <ul style="list-style-type: none"> <li>• Intersection design - bench mark against industry developments since 2007 including defaults to T intersections where possible</li> <li>• Simplifying intersection design and construction to fully leverage upgrades and to support successful further deployment of CAS technology</li> <li>• Road and ramp maintenance</li> <li>• Positive communications protocols and practices</li> </ul> <p><b>OFI-173 Improve in pit lighting and monitor status.</b></p> <p>Poor levels of lighting and area lighting in the Pit on nightshift can lead to operator errors.</p> <p>Workshop participants discussed and confirmed regular situations where lighting in the pit areas is below standard.</p> <p>Review the standards for and practices around installing lighting towers and other area lighting in and around the pit. Consider developing across shift reports confirming lighting measurement status meets site standards.</p>		

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				<p><b>OFI-107 Improve site delineation processes and practices.</b></p> <p>Workshop participants discussed and confirmed that delineators are not always visible around road network.</p> <p>Operators rely on the spacing of delineator to assist with maintaining clearance when following other vehicles.</p> <p>Review current standard for installing delineators, compare with site practices for road construction, inspection, and maintenance. Consider developing a site program to improve and maintain delineation standards and other road network standards e.g. signage and lighting.</p>		
	<b>BI-LPA.42.11 Competent and site experienced water cart operators</b>	<i>Dust is well controlled without overwatering the road surface.</i>	<p>Site performance requirements are in place for water cart operators so that dust is controlled without creating a slippery road.</p> <p>Performance requirements may include:</p> <ul style="list-style-type: none"> <li>• Spray application e.g. strip spraying</li> <li>• Spray bar patterns and timing</li> <li>• Water application based on speed</li> <li>• Using an automated spray system</li> </ul>	<p>Mobile equipment operators provide feedback on dust control and overwatering.</p> <p>Supervisors monitor dust control watering operations.</p> <p>Trainers reinforce importance of watering and communication for water cart operators.</p>	<p>Water cart operator performance assessment against site requirements for dust management without overwatering.</p> <p>By exception incident reporting.</p> <p>Digital reports from automated water carts.</p>	<p>⚠ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</p> <p>⚠ CFM-LPV.54 Excessive water (Dust Control) is applied to road surface</p>
	<b>BI-LPA.42.20 Infrastructure protection using barriers or warning devices.</b>	<i>Site infrastructure is protected from unplanned contact with mobile equipment.</i>	<p>When constructing roads near infrastructure, hazardous locations or work areas the documented requirements include placing windrows, bunds or physical barriers (designed to reduce injury threats if struck (i.e. rounded and/or frangible)) - and where these cannot be placed (e.g. for overhead lines) then warning devices (over height alarms, cable balls, geo fencing etc.), or vision enhancing components (mirrors, translucent ventilation curtains etc.) are installed.</p> <p>Information is prepared on requirements and workers are trained in how to implement and adjust protection barriers and warning devices.</p>	<p>Barriers and warning devices that protect site infrastructure from contact with mobile equipment are installed as designed.</p> <p>Protection types include physical barriers that prevent contact through to warning/vision enhancing devices to enhance vehicle operator's situational awareness.</p>	<p>Records of as designed, installation of barriers and warning devices.</p> <p>Regular inspection and test records confirm performance requirements are being maintained.</p>	<p>⚠ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</p> <p>⚠ CFM-LPA.44.05 Appropriate distances from fixed and overhead structures are not maintained</p> <p>⚠ CFM-LPV.44.02 Operational personnel do not maintain minimum standards for berms, windrows and other zone protection.</p> <p>⚠ CFM-MPA.72.02 Operational access control (pedestrian and vehicle) is inadequate</p> <p>⚠ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</p>

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				Workers only remove or modify barriers in line with site requirements.		
	<b>BI-LPA.48.01 Power line working distance management process</b>	<i>Safe working distances are always maintained between power lines and mobile equipment e.g. cranes, trucks, forklifts, etc.</i>	Procedures in place specifying minimum approach distances and required controls when working near and travelling under powerlines.  Warning devices required on power lines - Tiger Tails, Signage and Power Line Corridor entry permits.	Supervisors and mine planners are aware of minimum approach distances to power lines from mobile plant implement expected controls e.g. use of permits in some circumstances.  Supervisor, superintendents, and managers monitor the activities of vehicle operators working around powerlines and confirm meet site performance requirements.	Task level workflow logs Permits Supervisor inspections Lift plan records	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance</li> <li>⚠ CFM-LPA.44.05 Appropriate distances from fixed and overhead structures are not maintained</li> </ul>
	<b>BI-LPA.57.01 Mobile equipment operators follow road rules and adjust based on conditions and circumstances.</b>	<i>Mobile equipment operators follow road rules drive to conditions and circumstances.</i>	Mobile equipment operators follow road rules and adjust based on conditions and circumstances by: <ul style="list-style-type: none"> <li>• Decreasing speed</li> <li>• Increasing clearance distances</li> <li>• Stopping if required</li> <li>• Notifying or removing hazards (road conditions, spillage, etc.)</li> </ul>	Ongoing briefings and checks that confirm that mobile equipment operators understand road rules and are aware of necessary operating adjustments based on conditions and circumstances.	Supervisor and despatch oversight.  Supervisors and peers monitor vehicle operator performance.  By exception hazard reporting and incident investigation.	<ul style="list-style-type: none"> <li>⚠ CFM-LPA.42.03 Obscured or missing signage</li> <li>⚠ CFM-LPV.44.02 Operational personnel do not maintain minimum standards for berms, windrows and other zone protection.</li> <li>⚠ CFM-LPV.54 Excessive water (Dust Control) is applied to road surface</li> <li>⚠ CFM-MDA.61.06 Inadequate work planning means that heavy vehicle operators approach fixed structures that are incidental to achieving operational outcomes</li> <li>⚠ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> </ul>
	<b>BI-LPV.56.01 Road surface changes are identified and managed by vehicle operators</b>	<i>There is a site process that details expected responses from operators when there are changes in road surfaces.</i>	Site specific information is available for vehicle operators to assist with identifying and managing changes in road surfaces based on vehicle type covering: <ul style="list-style-type: none"> <li>• Weather variables such as rain, snow, ice etc.</li> <li>• Changes in road sheeting</li> <li>• Over watering for dust control</li> <li>• During road maintenance or construction</li> <li>• Slips and debris (including responding to strata failure monitoring systems and observed conditions (surface and underground))</li> </ul>	Training, assessment, and sign-off that vehicle operators can identify and notify changing road conditions including in excavations and dump areas.  Vehicle operators notify supervisors about changes to, and hazards, present within the road network.  Supervisors or Superintendents respond to the identified hazard or change.	Hazard reports.  Road maintenance records.  Supervisor inspections and logs.	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> </ul>

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			<ul style="list-style-type: none"> <li>• Movement of work areas such as tip heads (movement of edge) and stockpiles (slip/slump of material being dug)</li> <li>• Loading and unloading areas</li> </ul> <p>Initiating road maintenance activities (pavement and signage).</p>			
	<b>BI-LRA.41.10 Construction, inspection, and maintenance of site infrastructure and fixed plant</b>	<i>Site infrastructure and fixed plant remains structurally sound.</i>	<p>There is a site standard for the construction, inspection, and maintenance of infrastructure and fixed plant. It is supported by comprehensive site processes for:</p> <ul style="list-style-type: none"> <li>• Construction approval</li> <li>• Construction and commissioning</li> <li>• Inspections of infrastructure and fixed plant</li> <li>• Repairs and maintenance</li> <li>• Isolation from mobile equipment</li> <li>• Weather damage failures</li> <li>• Demolition</li> </ul> <p>Site infrastructure and fixed plant remains structurally sound during normal operations and failures are managed if they occur.</p>	<p>Construction, inspection, and maintenance and other processes relevant to site infrastructure and fixed plant are consistently applied.</p> <p>A defect reporting system is in place with clear guidance on the actions to be taken if site infrastructure or fixed plant are compromised.</p>	<p>Infrastructure and fixed plant inspection, maintenance, and repair reports.</p> <p>As required, investigations of infrastructure and fixed plant failures.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>⚠ CFM-LPA.44.05 Appropriate distances from fixed and overhead structures are not maintained</li> <li>⚠ CFM-LPV.44.02 Operational personnel do not maintain minimum standards for berms, windrows and other zone protection.</li> </ul>
<p><b>OFI-119: Confirm and apply calibration requirements for VIMS speed monitoring.</b></p> <p><b>OFI-135: Review speed limit communication and enforcement.</b></p>	<b>BI-LRA.42.02 Speed and operating environment parameter data send</b>	<i>Relevant equipment operating data is used to improve the design, construction, and maintenance of the operating environment.</i>	<p>Equipment operating data relevant to the design, construction, and maintenance of the operating environment is captured and transferred and may include:</p> <ul style="list-style-type: none"> <li>• Speed</li> <li>• Travel paths</li> <li>• Engine performance</li> <li>• Loading</li> <li>• Others</li> </ul> <p>Specifications for how equipment data related to the operating environment is aggregated, sorted, monitored, reported, and analysed are in place.</p>	<p>On-board systems monitor equipment usage, data is transferred via site infrastructure.</p> <p>The data is aggregated and sorted so that it can be used for performance monitoring, reporting, and analysis.</p> <p><b>OFI-119 Confirm and apply calibration requirements for VIMS speed monitoring</b></p> <p><b>Workshop participants discussed how vehicle speed</b></p>	<p>Accurate, timely, and tailored reports on operating environment impacts on equipment are provided to operators, supervisors, mine planners, maintenance personnel, training, and management.</p> <p>Reports are reviewed and performance drifts are identified and corrected.</p> <p><b>OFI-135 Review speed limit communication and enforcement.</b></p>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.11.21 No action taken on over speed alarm</li> <li>⚠ CFM-CRA.11.22 Operator ignores or bypasses alarm or safety device</li> <li>⚠ CFM-ERA.31.09 Installed equipment system status alarms do not operate</li> <li>⚠ CFM-ERA.40.22 Over speed warning alarm fails to operate</li> <li>⚠ CFM-SRV.96.20 No aggregated monitoring and response to over speed alarms</li> </ul>

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				<p>at Tarkwa Mine is measured using VIMS.</p> <p>They noted recent concerns about the system calibration and accuracy so that there is confidence that reliable information is being captured and reported.</p> <p>Confirm and apply the minimum requirements for calibration of vehicle measuring systems.</p>	<p>Workshop participants discussed incidents cause by speeding at Tarkwa including vehicle roll overs and slides. They also consider situations where vehicles travelling too slowly have caused traffic issues on both access and haul roads.</p> <p>Slow moving vehicles generate driver frustration and potential for higher risk driving manoeuvres. Speeding above limits increase the likelihood of vehicles losing control.</p> <p>Review site processes for communicating, monitoring and reinforcing the requirements to travel at zoned speeds and adjust for conditions and circumstances.</p>	
<p><b>OFI-137: Review understanding for applying processes when there are significant changes in operating conditions or circumstances.</b></p>	<p><b>BI-LTA.56 Formal processes for managing changes in conditions</b></p>	<p><i>There are formal processes in place for managing changes in conditions that can compromise safe production.</i></p>	<p>Procedures in place for managing changes to normal mobile equipment operations covering:</p> <ul style="list-style-type: none"> <li>• Electrical storms</li> <li>• High winds and raised dust</li> <li>• Reduced visibility (e.g. fog, mist, loss of area lighting)</li> <li>• Road pavement conditions (wet, damaged, etc.)</li> <li>• Compromised access controls, etc.</li> </ul> <p>Also conditions which compromise normal road traffic operations such as:</p> <ul style="list-style-type: none"> <li>• Limited access to working areas</li> <li>• Short term work plans increase vehicle movements and interaction intensity</li> <li>• External traffic movements e.g. escorting loads</li> </ul> <p>Consider developing Trigger Action Response Plans for site relevant changes in conditions. Use gradated levels with required responses such as:</p> <ol style="list-style-type: none"> <li>1. Green Level. Threat is not present or can be well managed using routine processes and equipment.</li> </ol>	<p>Supervisors and workers are trained in developed TARPs and their competence is confirmed.</p> <p>Conditions beyond those expected trigger an appropriate response from sites escalating awareness and ceasing operations as appropriate.</p> <p>Significant (Amber and above) triggers are communicated to more senior personnel on site.</p>	<p>Training and awareness records.</p> <p>TARP levels and site responses are approved and in-date.</p> <p>Records of communications and notifications of Amber and Red levels, including with external parties as required.</p> <p><b>OFI-137 Review understanding for applying processes when there are significant changes in operating conditions or circumstances.</b></p> <p>Workshop participants confirmed that there are site processes in place for dealing with changes in operating conditions and circumstances e.g. third parties on mine site.</p> <p>However, they questioned knowledge and awareness levels on the application of</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CDA.06.02 Operator drives vehicle at the incorrect speed (too fast or too slow).</li> <li>⚠ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> </ul>

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			<p>2. Yellow Level (optional). Threat is present but not yet hazardous. This level is communicating situation detail, increasing awareness, and monitoring and communication changes.</p> <p>3. Amber Level. Threat level has increased and can be managed through changes to processes and heightened vigilance of workers and supervisors.</p> <p>4. Red Level. Threat is continuing to increase and workers (apart from any deployed to reduce the threat) are withdrawn to safe locations.</p>		<p>these processes, including triggers for their implementation and key actions that follow.</p> <p>Review understanding and capability of operators and other in-field personnel e.g. drillers and field maintenance to notify and act on changes in operating conditions and circumstances.</p>	
	<b>BI-LTA.57 Ceasing Operations Procedure - compromised operating environment</b>	<i>Significant compromises to the operating environment will initiate the site cease operations process and plans.</i>	<p>There is a process and threshold for ceasing operations at site because of compromised operating conditions that considers:</p> <ul style="list-style-type: none"> <li>Physical conditions, including: Failure of roadways e.g. slumps, washouts, sink holes; Actual or potential geotechnical failures; Infrastructure potential or actual failure e.g. fall of HV lines; Falls of ground; Seismic events; Fallen trees</li> <li>Sight lines and visibility, including: Fires and smoke near site; Precipitation: snow, sleet, rain, hail etc.; Dust; Loss of ventilation (Underground)</li> <li>Pavement changes, such as: Flooding; Temperature extremes; Major Damage; Traction loss due to water or presence of oils</li> <li>Other factors, including: Trespassers; Animals</li> </ul>	<p>Training and assessment in the process and threshold for initiating the ceasing operations process for mobile equipment operators, supervisors and managers.</p> <p>Summary information on the process steps and thresholds is available on Trigger Action Response Plans (TARP) or equivalent.</p> <p>The summary information includes site relevant operating environment thresholds and expected actions when it is no longer safe to continue normal operations using mobile equipment.</p>	<p>Training records.</p> <p>Approved and in-date Trigger Action response Plans (TARPS) with site relevant operating environment thresholds and expected actions.</p> <p>Risk and control management records.</p>	<ul style="list-style-type: none"> <li>△ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> <li>△ CFM-LPA.56.01 Operations continue when operating environment is significantly compromised</li> <li>△ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> <li>△ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> </ul>
<b>OFI-106: Consider Developing a site TARP to consistently manage Electrical Storms.</b>	<b>BI-LTA.58.01 Lightning and Extreme Weather Management</b>	<i>There are formal processes in place for managing heavy rain, electrical storms, and other extreme weather events.</i>	<p>Procedures in place for storm situations and other weather impacts on roads and mobile equipment operations.</p> <p>Develop and implement a process to minimise potential for fire from lightning strikes and other weather impacts</p> <ul style="list-style-type: none"> <li>Monitor lightning activity using meteorological forecasts and other early warning detection systems</li> <li>Lightning protection or diversion systems should be installed in accordance with appropriate</li> </ul>	<p>Training and assessment in the process and threshold for initiating the ceasing operations process for mobile equipment operators, supervisors, and managers during storms and other weather conditions impacting road network safety</p>	<p>Supervisors monitor activities of Vehicle Operators during storms - confirming their activities meet site requirements.</p> <p>Training records are regularly checked to confirm currency of workers understanding around storm and lightning response requirements.</p>	<ul style="list-style-type: none"> <li>△ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> <li>△ CFM-LPA.56.01 Operations continue when operating environment is significantly compromised</li> </ul>

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			<p>standards (e.g. National Fire Protection Agency 780 2011 Standard for Installation of Lightning Protection Systems; AS/NZS 1768 2007 Lightning Protection)</p> <ul style="list-style-type: none"> <li>• Provide timely communications to allow sufficient time for all exposed site personnel to seek appropriate safe shelter</li> <li>• Place equipment in protected area away from fuel sources (i. stop damage; ii. Stop spread to fleet)</li> <li>• Instigate awareness training for workers that highlights the risks of lightning strikes and other exposure to weather related impacts (slippery roads, etc.)</li> <li>• Develop a trigger action response plan (TARP) for lightning and electrical storms that outlines responses to a storm at certain distances away from the mine (e.g. a staged response depending on distance)</li> <li>• Procedure for the use and protection of explosives in known lightning conditions</li> </ul> <p><b>OFI-106 Consider Developing a site TARP to consistently manage Electrical Storms.</b></p> <p>Workshop participants confirmed managing Electrical Storms (lightning) at Tarkwa Mine is decided on a case by case basis. They also discussed how weather tracking radar might be used to monitor the distance to storm fronts.</p> <p>This approach does not deliver a consistent response to managing the hazards from electrical storms such as lightning strikes on heavy mobile equipment causing tyre bursts, premature detonation of explosives, or strikes to pedestrians in the open.</p> <p>Confirm the ability to track the distance of electrical storms from Tarkwa. Benchmark and adapt approaches that have been developed and deployed at other Gold Fields surface operations e.g. Trigger Action Response Plans (TARPs) that detail actions to be taken when there is an electrical storm based on distance from site.</p>	<p>Summary information on the process steps and thresholds is available on Trigger Action Response Plans (TARP) or equivalent.</p> <p>The summary information includes site relevant weather condition thresholds and expected actions when it is no longer safe to continue normal operations using mobile equipment.</p>		
	<p><b>BI-MDA.65.02</b> <b>Clear requirements for loading from</b></p>	<p><i>Loading mobile equipment from fixed infrastructure is safe and productive.</i></p>	<p>The loading system must prevent the cabin of the vehicle from entering the area under the bin, unless a Falling Object Protection System (FOPS) that exceeds the maximum weight impact, is installed over the vehicle cabin to protect the operator.</p>	<p>Engineering sign-off that the loading system and the vehicle in use meet are fit for use.</p>	<p>Equipment selection records. Training records. Supervisor inspection records of loading operations.</p>	<p>⚠️ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</p>

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	structures e.g. reject bins		<p>Operational and safety requirements are specified in procedures and other documents and media e.g. instructional videos. They provide information to the operator about:</p> <ul style="list-style-type: none"> <li>• Vehicle access</li> <li>• Vehicle loading</li> <li>• Vehicle exit</li> <li>• Leaving the vehicle during loading</li> <li>• Emergency response</li> </ul> <p>They include relevant change management thresholds such as:</p> <ul style="list-style-type: none"> <li>• Changes in vehicle type</li> <li>• New operators</li> </ul>	<p>Vehicle operators are trained and assessed in loading requirements, including emergency response.</p> <p>Supervisor oversight.</p>		
<p><b>OFI-155: Review processes for managing equipment breakdowns and field repairs.</b></p>	<p><b>BI-MDA.67.01 Protocols for working on equipment in production areas</b></p>	<p><i>Personnel undertaking inspection, servicing, maintenance or recovery work on equipment in operational areas are protected from mobile equipment and other workplace hazards.</i></p>	<p>Sites have a consistent, defined, and measurable process for managing mobile equipment and other hazards in production areas during:</p> <ul style="list-style-type: none"> <li>• Inspection</li> <li>• Equipment servicing</li> <li>• Equipment maintenance work</li> <li>• Equipment recovery</li> </ul> <p>The process defines:</p> <ol style="list-style-type: none"> <li>1. Where, and in what circumstances it applies</li> <li>2. Hazard identification and control assignment</li> <li>3. How decisions on delineation are made and deployed</li> <li>4. The experience and competency required before authorisation to work in a production area</li> <li>5. Communication requirements</li> <li>6. Responsibilities of trades and service personnel</li> <li>7. Mobile equipment responsibilities</li> </ol>	<p>Trades, service and other personnel meet site requirements for working on equipment in production areas - with placement of windrows, barriers, cones, warning signage, geo fences and other measures implemented.</p> <p>Designated and segregated in-pit work areas.</p> <p>Communication protocols with mine controller and supervisor.</p> <p><b>OFI-155 Review processes for managing equipment breakdowns and field repairs.</b></p> <p>Workshop participants advise that broken down equipment in the operating environment is often not secured and</p>	<p>Planning documentation.</p> <p>Operational logs for service and maintenance personnel.</p> <p>Authorisation records for personnel who carry out servicing and maintenance tasks in operational areas.</p> <p>Notification records.</p> <p>Maintenance, production supervisors, and mobile equipment operators monitor performance.</p> <p>Maintenance and production supervisors monitor trades and service personnel to confirm performance.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.03.20 Personnel do not manage heavy vehicle blind spots</li> <li>⚠ CFM-MPA.63.01 Operator does not meet site requirements when parking</li> <li>⚠ CFM-MPA.72.03 Mobile equipment operator or pedestrian does not notify when entering a controlled work area</li> <li>⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</li> <li>⚠ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> </ul>

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			8. Production area owner responsibilities	<p>protected. Also significant in-pit repairs are carried out at Tarkwa by the Business Partners.</p> <p>Broken down equipment parked on, or being repair beside, hauls roads creates vehicle interaction hazards. There are a range of well established controls that include communication, demarcation, and longer term protection using earth bunds etc.</p> <p>Review, update and train personnel in understanding how to apply site standards to manage broken down equipment. Confirm that supervisors monitor that controls are in place and make corrections when required.</p>		
<p><b>OFI-105: Review site escort training and approval processes.</b></p> <p><b>OFI-160: Review escort process consider qualifications and authorisation.</b></p> <p><b>OFI-164: Review site planning for escorts</b></p>	<b>BI-MDA.72.11 Escort Requirements</b>	<i>Vehicles and operators that are not approved for unrestricted site access, are escorted. Site escort requirements are clear and deliver safe and productive outcomes.</i>	<p>Sites have a consistent, defined, and measurable escort process for managing access when:</p> <ol style="list-style-type: none"> <li>When vehicles are not approved for general site access</li> <li>Vehicle operators who do not have required site permits or licences</li> </ol> <p>The escort process defines:</p> <ol style="list-style-type: none"> <li>Where, and in what circumstances it applies</li> <li>The experience and competency required before an escort is authorised</li> <li>Who must be notified, how they are notified, and when they are notified</li> <li>Communication requirements between the vehicles under escort and the escort</li> <li>Equipment required e.g. radios, lights, Collision Avoidance Systems, flags, etc.</li> <li>Approval steps and documentation requirements e.g. permits, gatehouse logs etc.</li> </ol>	<p>The site escort process is applied, and vehicle operators being escorted are briefed on:</p> <ul style="list-style-type: none"> <li>Communication protocols</li> <li>Travel separation distances</li> <li>Restricted locations</li> <li>Road conditions</li> <li>Emergency protocols</li> <li>Other site requirements</li> <li>Parking and first movement requirements</li> </ul> <p>Personnel who provide the escort are authorised and competent, and confirm that escorted vehicles are operated and parked in</p>	<p>Escort documentation.</p> <p>Authorisation records for personnel approved to act as escorts.</p> <p>Escort notification records.</p> <p>Supervisors and mobile equipment operators monitor performance of escorts and escorted vehicles.</p>	<p>⚠️ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</p> <p>⚠️ CFM-MPA.72.02 Operational access control (pedestrian and vehicle) is inadequate</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p><b>OFI-105 Review site escort training and approval processes.</b></p> <p>At Tarkwa Mine, site engineering procedures confirm requirements for providing escorts in operating areas. Workshop participants discussed training for personnel who drive the light vehicles that provide escorts covering radio communications, route planning, speed, load management etc.</p> <p>They recognised that current site practices could lead to situations where less experienced personnel with inadequate site knowledge were used to provide escorts.</p> <p>Consider the benefits of formal training and approval processes for site escorts, based on site procedures.</p>	<p>accordance with site requirements.</p> <p>Required site documents are completed.</p> <p><b>OFI-164 Review site planning for escorts</b></p> <p>Tarkwa Mine has established escort requirements for explosive trucks and non-site equipment such as mobile cranes.</p> <p>Workshop participants discussed requirements and identified situations where site escort processes have not been applied i.e. a driver unfamiliar with site traffic requirements was operating on site.</p> <p>Review site work planning and logistics control processes, confirm they include a step that identifies when escort is required with timely notification to operations so that escorts are available at the required time.</p> <p><b>OFI-160 Review escort process consider qualifications and authorisation.</b></p> <p>Workshop participants advised that there are occasions where external parties provide escorts to site locations.</p> <p>Escorts provided by external parties introduce training and experience issues. The practice can also lead to situations where an external escort is unaware of updated or temporary site traffic requirements and situations.</p>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				Review site minimum standards for escort qualifications and authorisation. Include site communication requirements e.g. radio channels, use of CAS, informing operations etc.		
	<b>BI-MDV.63.01 Established requirements for approaching parked mobile equipment in operational areas</b>	<i>Personnel approaching a vehicle parked in operational areas are protected from unexpected vehicle movements.</i>	<p>Sites set minimum requirements for approaching and accessing parked mobile equipment, these consider the:</p> <ul style="list-style-type: none"> <li>• Possibility of a resting operator who wakes up and moves off without detecting the person accessing the parked equipment.</li> <li>• The position for parking other vehicles.</li> <li>• Communication with parked equipment to confirm the presence of an operator.</li> <li>• Direction of travel if the parked vehicle drives or rolls away.</li> <li>• Isolation requirements on entering the footprint of the parked vehicle.</li> </ul>	<p>Training and assessment in requirements for accessing parked vehicles for:</p> <ul style="list-style-type: none"> <li>• Operators</li> <li>• Supervisors</li> <li>• Maintenance and service personnel</li> <li>• Trainers</li> <li>• Specialist contractors</li> </ul> <p>Requirements are reinforced in site and area inductions.</p>	<p>Training and assessment records.</p> <p>Induction records.</p> <p>Supervisors and mobile equipment operators monitor performance.</p> <p>Reports from CAS Systems</p>	<ul style="list-style-type: none"> <li>⚠ CFM-LDA.43.01 Vehicle parking, including emergency parking is inadequately considered in mine design and routine work planning</li> <li>⚠ CFM-MPA.63.01 Operator does not meet site requirements when parking</li> <li>⚠ CFM-MPA.63.02 Vehicle operator does not check pathway after being parked</li> <li>⚠ CFM-MPA.66.01 Incorrect communication protocol</li> <li>⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</li> </ul>
	<b>BI-MDV.63.05 Established requirements for parking and resting in vehicles</b>	<i>First movement from parking is consistent and well controlled and avoid vehicle interaction incidents.</i>	<p>Where permitted on site, there is a documented requirement for vehicle operators to park in an authorised location, isolate the vehicle prior to resting and complete an around vehicle inspection before moving off.</p>	<p>Where resting in vehicles is permitted on site, there is a documented and communicated process that confirms requirements covering</p> <ul style="list-style-type: none"> <li>• Vehicle operator responsibilities</li> <li>• Authorised locations for resting</li> <li>• Vehicle isolation prior to resting</li> <li>• Inspections and checks before moving off e.g. completing an</li> </ul>	<ul style="list-style-type: none"> <li>• Training and awareness records.</li> <li>• Supervisors and mobile equipment operators monitor performance.</li> </ul>	<ul style="list-style-type: none"> <li>⚠ CFM-LDA.43.01 Vehicle parking, including emergency parking is inadequately considered in mine design and routine work planning</li> <li>⚠ CFM-MPA.63.02 Vehicle operator does not check pathway after being parked</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				around vehicle inspection		
<p><b>OFI-126: Develop a walkway design standard and include in mine design guidelines.</b></p> <p><b>OFI-141: Review, update, and apply the Tarkwa Traffic Management Plan.</b></p>	<p><b>BI-MDV.64.01 Road design guidelines specify walkway designs considering vehicle sight lines</b></p>	<p><i>Walkways are designed, constructed, and maintained to site standards.</i></p>	<p>Walkway design and construction follows site design requirements for protecting walkways near vehicle travel paths. These may include using:</p> <ul style="list-style-type: none"> <li>• Windrows and bunds</li> <li>• Physical barriers</li> <li>• Pedestrian crossings</li> <li>• Under or over passes</li> <li>• Delineation of no-go and danger zones for pedestrians etc.</li> </ul> <p>Vehicle sightlines and other features such as lighting and proximity alarms are considered when designing and constructing walkways.</p> <p><b>OFI-141 Review, update, and apply the Tarkwa Traffic Management Plan</b></p> <p><i>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI was first approved for use on the 01-03-07. It is still current but has not been reviewed and updated since initial publication. It is a comprehensive document that confirms a range of site design and operating requirements that reflect good mine design and operating practice at Tarkwa.</i></p> <p>However, during the Tarkwa 2024 Vehicle Interaction Control Effectiveness (VICE) review, workshop participants identified misalignments between this key reference document and operational practice and conditions. These include:</p> <ul style="list-style-type: none"> <li>• Road and ramp conditions - construction and maintenance</li> <li>• Non-conforming intersections and circles (roundabout) design and construction</li> </ul>	<p>Walkways are constructed and maintained to meet site requirements.</p> <p>Site design requirements are referenced before any walkway modifications are made e.g. new mobile equipment, facility use change etc.</p>	<p>Walkway commissioning and handover records confirming that ‘as built’ meets design requirements</p> <p>Housekeeping and facilities inspection records.</p> <p>Maintenance records.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.03.20 Personnel do not manage heavy vehicle blind spots</li> <li>⚠ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</li> <li>⚠ CFM-LDV.44.08 Blind spots on heavy vehicles are not considered in workplace layout</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<ul style="list-style-type: none"> <li>Limited availability and use of radios for general pit communications</li> <li>Unclear Positive communications e.g. passing, and approaching mobile equipment</li> <li>Obscured or missing Traffic Signage</li> <li>Lack of infrastructure and signage to support management of pedestrians</li> <li>Parking practices not aligned with documented requirements for physical segregation from heavy vehicles</li> </ul> <p>These issues were confirmed by supporting consultants during mine tours and interviews.</p> <p>Consider a review of the Tarkwa Traffic Management plan in conjunction with the development of Gold Fields Minimum Standards for Vehicle interaction controls. At a minimum the review should revisit and update minimum requirements for:</p> <ul style="list-style-type: none"> <li>Intersection design - bench mark against industry developments since 2007 including defaults to T intersections where possible</li> <li>Simplifying intersection design and construction to fully leverage upgrades and to support successful further deployment of CAS technology</li> <li>Road and ramp maintenance</li> <li>Positive communications protocols and practices</li> </ul> <p><b>OFI-126 Develop a walkway design standard and include in mine design guidelines.</b></p> <p>The workshop participants were not aware of any formal specifications around pedestrian walkway designs and construction e.g. for go lines, around workshops.</p> <p>This lack of a site design specification means that there is no consistency in how walkways are created and maintained on site.</p> <p>Benchmark good practice at Gold Fields. Develop a Tarkwa mine walkway standard on the site design guidelines.</p>			
<p><b>OFI-100: OFI-100</b> Review site processes for</p>	<p><b>BI-MDV.65.31</b> Clear requirements for loading and unloading of</p>	<p><i>Loading, transporting and dumping (unloading) of mobile equipment</i></p>	<p>The loading system must be designed so that the vehicle cabin is prevented from being under a load that could exceed the maximum weight impact for the cabin or impact vehicle stability.</p>	<p>Engineering sign-off that the loading system and the vehicle in use meet are fit for use.</p>	<p>Equipment selection records. Training records. Supervisor inspection records of loading operations.</p>	<p>▲ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
managing non-standard loads.	trucks by excavator or loader	with bulk materials is safe and productive.	<p>Operational and safety requirements are specified in procedures and other documents and media e.g. instructional videos. They provide information to the operator about:</p> <ol style="list-style-type: none"> <li>1. Vehicle access</li> <li>2. Vehicle loading, travelling and unloading (including waste)</li> <li>3. Vehicle exit</li> <li>4. Leaving the vehicle during loading</li> <li>5. Emergency response</li> </ol> <p>They include relevant change management thresholds such as:</p> <ol style="list-style-type: none"> <li>1. Changes in vehicle type</li> <li>2. New operators</li> </ol> <p><b>OFI-100 Review site processes for managing non-standard loads.</b></p> <p>Workshop participants discussed site processes and practices for the safe movement of non-standard loads. They identified gaps in how operators are informed and the application of required controls for managing non-standard loads.</p> <p>Review site documentation for movement of loads and associated training modules and confirm that control advice is adequate e.g. maintaining load stability for wet bulk loads, load placement, route planning, use of escorts, the role of spotters when reversing etc.</p>	<p>Vehicle operators are trained and assessed in loading requirements, including emergency response.</p> <p>Supervisor oversight.</p>		
OFI-152: Review the design and application of positive communication processes at site.	BI-MDV.66.05 Positive communication protocol for passing or moving close to a vehicle	Passing of vehicles in operational areas is clear, applied and requires vehicle identification and positive communications.	<p>There are site standards, processes, procedures, and work instructions, that detail communications requirements when passing vehicles. At a minimum these cover:</p> <ol style="list-style-type: none"> <li>1. Where and when passing is permitted</li> <li>2. Radio (or other communications) call up protocols</li> <li>3. Mobile equipment identification</li> <li>4. Confirming that communication has been received</li> </ol>	<p>Training and Assessment in requirements for Positive Communications for passing a vehicle are included and reinforced in multiple training and awareness modules e.g. operator training and area inductions.</p> <p>Requirements are routinely reinforced and communicated at shift briefings covering:</p> <ol style="list-style-type: none"> <li>1. Active haul circuits and work areas.</li> <li>2. Information on where passing is permitted.</li> </ol>	<p>Training system records confirm currency of skills.</p> <p>Supervisors and peers monitor vehicle operator radio calls and actions.</p> <p>Training records confirm the currency of vehicle operator understanding of communication requirements.</p> <p>Specified review period to retain competencies are stated and tracked.</p>	<p>△ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance</p> <p>△ CFM-MPA.66.01 Incorrect communication protocol</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>3. Communications requirements.</p> <p><b>Gold Fields Ghana-Tarkwa Mine Light Vehicle Driver Presentation - Slide 30 - Always ensure there is some contact between you and the person driving the vehicle you want to overtake...</b></p> <p><b>OFI-152 Review the design and application of positive communication processes at site</b></p> <p>Workshop participants discussed the application of positive communication processes to identify vehicles and confirm permissions when entering active haul circuits, work areas, and when passing.</p> <p><b>Consultant Comment:</b> workshop participants comprehensively reviewed the industry good practice references and made comparisons with Tarkwa mining practices and circumstances. Notable discussion points and differences include:</p> <ul style="list-style-type: none"> <li>• Tarkwa mine operates as a typical large long-term metalliferous open cut mine</li> <li>• Positive communication radio protocols are not routinely applied</li> <li>• Communications using horns to notify of movements is undertaken</li> <li>• Pedestrians are routinely in the work</li> </ul>		

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				<p>zone at Tarkwa e.g. leading hands and geologists</p> <ul style="list-style-type: none"> <li>• Load and Haul operations are congested with diggers often working in close proximity</li> <li>• Drill and Blast operations are routinely alongside Load and Haul operations</li> <li>• Multiple workgroups access operational areas using light vehicles that park close to the dig areas</li> <li>• Truck movements are managed through the Fleet Management System including truck approaching the digger</li> <li>• The two contracting groups use different radio channels while sharing some haul roads</li> <li>• Personnel in light vehicles use hand held radios for communication when they are in the pit</li> <li>• Personnel in light vehicles can access active mining areas without having a radio</li> <li>• Vehicle identification and location is more challenging at night</li> </ul> <p>Safe and productive mining operations are delivered when personnel operating</p>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>vehicles remain alert and situationally aware and there is a coordinated and consistent approach to manage interactions. Surface mining operations typically deliver these outcomes using a combination of approaches that include a disciplined positive communications approach.</p> <p>Review Tarkwa site standards, expectations, and practices for positive communication to manage vehicle interactions. Consider benchmarking with other Gold Fields surface operations to confirm minimum standards. Involve Business Partners in the review.</p> <p><b>Consultant Comment -</b>  <i>Positive communication protocols and requirements normally are more formal giving an example like "Light Vehicle 45 to Haul Truck 22 can I pass on your right hand side --&gt; Haul Truck 22 to Light Vehicle 45 - yes, you are Ok to pass --&gt; Light Vehicle 45 to Haul Truck 22 thank you I have now passed and am out of your area"</i></p>		
	<p><b>BI-MPA.62 Handover process between work crews</b></p>	<p><i>There is a formal handover process between work crews that records and communicates operational status.</i></p>	<p>There is a formal handover process between work crews that records and communicates:</p> <ul style="list-style-type: none"> <li>• Progress to plan</li> <li>• Equipment status</li> <li>• Operating and work environment conditions, hazards, and controls in place</li> <li>• Interactions with other work groups or people</li> <li>• Any other current and anticipated issues</li> </ul>	<p>At the beginning of the work period, supervisors brief their work crews on relevant items.</p> <p>At the end of the work period, a log is prepared for the next work crew.</p>	<p>Communications logs are completed and available for the next work crew.</p> <p>Pework briefings are delivered.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</li> <li>⚠ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> <li>⚠ CFM-CTA.10.90 Personnel do not alert others to presence of hazards</li> <li>⚠ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>⚠ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
						<ul style="list-style-type: none"> <li>⚠ CFM-LPV.41.20 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning</li> <li>⚠ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> <li>⚠ CFM-SPA.88 Inadequate management of change</li> <li>⚠ CFM-SRA.87 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained</li> </ul>
<b>OFI-149: Review the holding and availability of no-entry signage</b>	<b>BI-MPA.66.11 Expected routes by vehicle type are effectively communicated</b>	<i>All vehicle operators are aware of the routes that they are expected to travel on based on the vehicle type that they are operating e.g. segregated routes for light vehicles.</i>	<p>There are multiple communication processes that provide expected route information to vehicle operators including:</p> <ul style="list-style-type: none"> <li>• Start of shift briefings</li> <li>• Start of work roster traffic updates</li> <li>• Maps and plans prepared (by surveyors or engineers) of the road network</li> <li>• Despatcher or supervisor advice</li> <li>• Scheduling software</li> <li>• Road signs</li> </ul> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</b> as approved for use 01-03-07</p> <p><b>6.1.6. Traffic Signage Road signs</b> are located on all roads throughout the site. They shall be obeyed at all times and apply to light and heavy vehicle drivers. Sufficient warning signs need to indicate potential dangers. Signs shall be kept clean and well-maintained so that they are always visible. No vehicle is to proceed beyond a no-entry sign or barricade unless the specific authorization of a supervisor has been obtained.</p>	<p>Ongoing briefings and checks that vehicle operators understand the road network and how they are expected to operate i.e. where they are and the direction that are to travel.</p> <p><b>OFI-149 Review the holding and availability of no-entry signage.</b></p> <p>Workshop participants discussed and identified situations where the unavailability of no-entry or restricted access signs have resulted in mobile equipment entering areas with compromised conditions, causing unnecessary vehicle interactions. The limited supply of signage is reported as being frequent.</p> <p>Review the site processes for holding and efficiently deploying no-entry and restricted access signs. Confirm that there are enough signs available in accessible locations for use as required.</p>	<p>Supervisor and despatch oversight.</p> <p>Supervisors and peers monitor vehicle operator performance.</p> <p>By exception hazard reporting and incident investigation.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</li> <li>⚠ CFM-CPA.11.05 Operator does not drive on available segregated roads</li> <li>⚠ CFM-MPA.65.04 Light vehicle remains in heavy vehicle blind spot due to intersection approach speeds</li> <li>⚠ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> </ul>
<b>OFI-100: OFI-100 Review site processes for managing non-standard loads.</b>	<b>BI-MPA.76 Safe and Productive Movement of Loads</b>	<i>Site load movements are well planned, and hazards are identified and managed.</i>	<p>There are site processes in place for planning and managing materials and equipment load movements covering:</p> <p>Load movements</p> <ul style="list-style-type: none"> <li>• Identifying and managing complex or heavy load requirements (including downward forces (excavators and loaders))</li> </ul>	<p>Personnel apply site processes to plan and execute safe and productive load movements.</p> <p>Personnel involved in the movement of loads understand their accountabilities and are</p>	<p>Load movement plans are documented and logged.</p> <p>By exception equipment damage and incident investigation findings.</p> <p>Hazardous material movement audits.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-EPA.25.20 Load shape, or restraints or load securing devices fail causing an incident</li> <li>⚠ CFM-EPV.26.10 Routine or occasional overloading of vehicles</li> <li>⚠ CFM-EPV.39.42 Vehicles are operated outside specified tyre conditions</li> <li>⚠ CFM-ERA.39.20 Overload warning system fails is incorrect or absent</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>OFI-156: Review site towing practices.</b></p> <p><b>OFI-174: Review linking VIMS overload capability to dispatch</b></p>			<ul style="list-style-type: none"> <li>Equipment selection for loading and unloading - confirming the load is within the rated capacity</li> <li>Transport equipment selection - confirming the load is within the rated capacity and appropriate for the planned transport route</li> <li>Load restraints</li> <li>Transport routes consider interactions with other workgroups including travel speeds</li> <li>Unloading locations and tip points are level, stable, and suited to the vehicle and load being unloaded or tipped</li> <li>Notifications and warning e.g. to operations</li> <li>Barriers between the load and personnel in the transport vehicle</li> <li>As required off-site transport permits</li> </ul> <p>Hazardous materials transport</p> <ul style="list-style-type: none"> <li>Flammable liquids or explosives are transported in rated and approved vehicles</li> <li>Site notification, communication, and warnings are deployed</li> </ul> <p><b>SAFE LOADING, TRANSPORTATION AND UNLOADING OF VEHICLES, Ver 6 2/1/23, Ref TGM 2.10.013 WI - Points cover safe loading, load distribution, load size and shape, and vehicle operation</b></p> <p><b>OFI-100 Review site processes for managing non-standard loads.</b></p> <p>Workshop participants discussed site processes and practices for the safe movement of non-standard loads. They identified gaps in how operators are informed and the application of required controls for managing non-standard loads.</p> <p>Review site documentation for movement of loads and associated training modules and confirm that control advice is adequate e.g. maintaining load stability for wet bulk loads, load placement, route planning, use of escorts, the role of spotters when reversing etc.</p>	<p>authorised to apply site processes for:</p> <ul style="list-style-type: none"> <li>Identifying load weights</li> <li>Equipment required for loading and unloading</li> <li>Equipment required for transporting</li> <li>Determining transport route constraints</li> <li>Documentation, notification, communication, and warning</li> <li>Identifying and managing other hazards</li> </ul> <p><b>OFI-174 Review linking VIMS overload capability to dispatch</b></p> <p>Failing to gather, transfer and act on information about loads being carried by haul trucks can result in equipment damage, vehicle over-speeds, and unwanted vehicle interactions e.g. through spillage, mobile equipment breakdown etc.</p> <p>Workshop participants identified that the Tarkwa Mine vehicle information management system (VIMS) has the capability to inform maintainers of overload conditions but this system is not yet linked to the dispatch system.</p> <p>Consider linking VIMS to dispatch so that overloading situations and trends can be monitored and notified to</p>	<p>Transport equipment maintenance records e.g. barriers remain in place</p>	<ul style="list-style-type: none"> <li>⚠ CFM-LPV.41.20 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning</li> <li>⚠ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>effectively manage overloading.</p> <p><b>OFI-156 Review site towing practices.</b></p> <p>Workshop participants advised that there have been incidents when towing broken down equipment from the pit.</p> <p>Inadequate towing practices can result in equipment under tow run aways and uncontrolled interactions on the road network.</p> <p>Review site towing practices, confirm that both business partners have approaches that meet site standards.</p>		
	<b>BI-MPV.61.01 Vehicle interactions are considered during short-term planning processes</b>	<i>Mobile equipment interactions and operating requirements are always considered when approving, planning, and scheduling work.</i>	Short term planning processes consider interactions between workgroups and mobile equipment operating requirements when approving, planning, and scheduling work.	<p>Technical planners and operational superintendents review skills of available operators and vehicle/work group interactions during planning.</p> <p>Supervisors issue instructions based on short term plans.</p>	Performance is monitored referencing instructions from short term plans e.g. through supervisor inspections. Adjustments are made when required.	<p>⚠ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</p> <p>⚠ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</p> <p>⚠ CFM-LDV.42.02 Speed limits and over-speed management are inadequately considered in mine design and routine work planning</p> <p>⚠ CFM-LDV.42.20 Reducing vehicle interactions through intersection design and traffic rules is inadequately considered in mine design and routine work planning</p> <p>⚠ CFM-MDA.61.01 Reducing vehicle interactions by maintaining clearances is inadequately considered routine work planning</p>
<b>OFI-151: Review site processes and confirm that they are adequate to support required radio communications.</b>	<b>BI-MPV.64.01 Pedestrian working in operational area communication and operating protocols</b>	<i>There is an effective and applied communication protocol for managing interactions between pedestrians and mobile equipment.</i>	<p>Sites have consistent, defined, and measurable processes for managing interactions between pedestrians and mobile equipment. These define communication requirements based on the situation including:</p> <ul style="list-style-type: none"> <li>Approaching and accessing heavy vehicles</li> <li>Working independently in an area where vehicles are operating</li> <li>Working alongside a vehicle in the same workgroup</li> <li>How to move past a vehicle when working underground or in a constricted space e.g. if pedestrians cannot move to a position of safety</li> </ul>	<p>Training and assessment in requirements for working in operational areas as a pedestrian.</p> <p>Requirements are reinforced in area inductions and periodically at start of shift or similar briefings.</p> <p>Planners and supervisors identify workgroup interactions and confirm</p>	<p>Training records confirm that relevant personnel are competent e.g. maintainers, service personnel operators, supervisors.</p> <p>Supervisors monitor performance.</p> <p>Records of start of shift or similar awareness briefings.</p> <p>Collision avoidance system logs and reports on</p>	<p>⚠ CFM-MPA.66.01 Incorrect communication protocol</p> <p>⚠ CFM-MPA.72.03 Mobile equipment operator or pedestrian does not notify when entering a controlled work area</p> <p>⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>in a roadway, the vehicle must stop, the operator must acknowledge the pedestrian presence and allow the pedestrians to walk past the vehicle before continuing</p> <p>They also confirm what communication equipment and signage is required for different situations on site, for example</p> <ul style="list-style-type: none"> <li>• When personnel are working on the ground at least one member of the work party must be in possession of a two way radio or equivalent.</li> <li>• Standard radio (or other communications) call-up protocols are followed.</li> <li>• Signage alerting vehicle operators to the presence of work in an area.</li> <li>• Cap lamp signals when working underground.</li> <li>• Collision Avoidance System handshake or acknowledgements etc.</li> </ul>	<p>required communication before entry and during work.</p> <p>Permanent or mobile signs provide call up information</p> <p><b>OFI-151 Review site processes and confirm that they are adequate to support required radio communications.</b></p> <p>Workshop participants discussed site processes and schedules for the routine checking of radios in mobile equipment. This includes prestart checks, defect reporting, and scheduled maintenance of radios and site infrastructure. It also includes confirming minimum requirements for radios in heavy mobile equipment, service vehicles, light vehicles and for pedestrians.</p> <p>Surface mining operations typically deliver safe and productive outcomes using radios to support disciplined positive communications to manage interactions in working areas. Workshop participants report that radio faults do occur and that pre start and routine schedules for checking radios and communication infrastructure are inconsistent.</p> <p>Review site processes and confirm that they are adequate to support required radio communications. Involve Business Partners in the review.</p>	<p>equipment and pedestrian interfaces.</p> <p>By exception hazard and incident reporting.</p>	
	<p><b>BI-MPV.64.02</b> <b>Around vehicle inspection or use of spotters to</b></p>	<p><i>There are no unplanned vehicle to person or vehicle to vehicle</i></p>	<p>Before moving off from being parked or driving into locations with limited clearance, vehicle operators carry out an around vehicle inspection e.g. a HV walk around inspection.</p>	<p>Training and assessment in requirements for vehicle operators to conduct an around vehicle inspection</p>	<p>Supervisors monitor vehicle operator prestart check including around vehicle inspection.</p>	<p>⚠ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance</p> <p>⚠ CFM-CRA.03.20 Personnel do not manage heavy vehicle blind spots</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
	<b>identify hazards before moving</b>	<i>contacts on first movement.</i>	<p>If required by site, horns are used to indicate vehicle operation e.g. once prior to starting the vehicle, twice before forward movement, three times before reversing.</p> <p>Where movement in constrained locations is required, a spotter is requested by the operator and nominated by a supervisor.</p>	<p>prior to first movement after parking.</p> <p>Use of spotters and vision aids as required to manage operation in locations with restricted clearance.</p>	<p>Area cameras provide records of vehicle operation that are regularly reviewed.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-LDA.43.01 Vehicle parking, including emergency parking is inadequately considered in mine design and routine work planning</li> <li>⚠ CFM-MPA.63.02 Vehicle operator does not check pathway after being parked</li> <li>⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</li> <li>⚠ CFM-SRA.87.10 Equipment faults arising from poor standard of maintenance</li> </ul>
	<b>BI-MPV.64.03 Protocols for approaching and accessing heavy mobile equipment</b>	<i>Approaching and accessing mobile equipment follows a consistent, defined, and measurable process.</i>	<p>Sites have consistent, defined, and measurable process for approaching and accessing mobile equipment. The process covers pedestrians and light vehicles approaching:</p> <ul style="list-style-type: none"> <li>• Working heavy vehicles</li> <li>• Parked heavy vehicles</li> <li>• Required positive communications</li> <li>• When it is safe to enter a work area</li> <li>• Heavy vehicle safe state e.g. park brake engaged, access ladder lowered and implements grounded (if relevant)</li> </ul>	<p>Training and assessment in positive communications and the process for accessing a heavy vehicle are included and reinforced in multiple training and awareness modules e.g. operator training and area inductions.</p> <p>The site requirements for managing interactions between:</p> <ul style="list-style-type: none"> <li>• Pedestrians and vehicles</li> <li>• Heavy vehicles and light vehicles</li> </ul> <p>are routinely reinforced and communicated at shift briefings.</p>	<p>Training records confirm that relevant personnel are competent e.g. maintainers, service personnel operators, supervisors.</p> <p>Supervisors monitor performance.</p> <p>Collision avoidance system logs, reports, and heatmaps.</p> <p>By exception hazard and incident reporting.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-MPA.63.01 Operator does not meet site requirements when parking</li> <li>⚠ CFM-MPA.66.01 Incorrect communication protocol</li> <li>⚠ CFM-MPA.67.10 Operations continue when there are significant interaction threats</li> <li>⚠ CFM-MPA.72.03 Mobile equipment operator or pedestrian does not notify when entering a controlled work area</li> <li>⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</li> </ul>
	<b>BI-MPV.65.02 Road demarcation for changing conditions, commissioning, and live testing</b>	<i>There are effective road demarcation processes in place that manage hazards and interactions between workgroups.</i>	<p>There are site standards, processes, procedures, work instructions, that detail road demarcation and hazard communication requirements for:</p> <ul style="list-style-type: none"> <li>• Roadworks and remediation e.g. installing drainage, clearing catch berms etc.</li> <li>• Breakdowns and repairs</li> <li>• Commissioning or decommissioning considering the movement range of the equipment</li> <li>• Live testing</li> <li>• Changes in road conditions</li> <li>• Geotechnical hazards</li> <li>• Other site hazards</li> </ul>	<p>Road demarcation, hazard warning and management requirements are included and reinforced in multiple training and awareness modules e.g. operator training and area inductions.</p> <p>Requirements are routinely reinforced and communicated at shift briefings covering:</p> <ul style="list-style-type: none"> <li>• Demarcated locations and the reason</li> <li>• Other hazard controls</li> </ul> <p>Breakdowns and other events which interrupt or change a travel way are notified to other road users and</p>	<p>Pre work hazard assessments for field crews working on equipment.</p> <p>Supervisor inspection records.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.03.20 Personnel do not manage heavy vehicle blind spots</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				appropriate demarcation and warnings are put into place. Supervisors monitor and update status for shift handover.		
	<b>BI-MPV.65.11 Same direction travelling and queuing separation protocols</b>	<i>Nil vehicle to vehicle contacts during travelling and queuing operations.</i>	Site requirements for separation between vehicles when travelling in the same direction, and when queuing, are clearly stated.	Vehicle operators are trained and assessed on their understanding of required separation distances - including challenge testing and observation to confirm they are alert to road network features which provide additional guidance on how far they are from the vehicle in front.	Training records confirm the currency of vehicle operator understanding of separation distances. Specified review period to retain competencies are stated and tracked. Supervisors monitor vehicle operator performance. Proximity detector logging and exception reporting.	⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots
<b>OFI-152: Review the design and application of positive communication processes at site.</b>	<b>BI-MPV.65.12 Vehicle entering a work area positive communications protocol</b>	<i>All personnel operating vehicles remain alert and situationally aware when working in congested areas.</i>	There are site standards, processes, procedures, and work instructions, that detail vehicle entry requirements to congested work areas e.g. when loading and dumping, or when accessing workshop areas At a minimum, these detail: <ul style="list-style-type: none"> <li>• Work area delineation (where to stop and queue etc.)</li> <li>• Radio (or other communications) call up protocols</li> <li>• Identification</li> <li>• Confirming that communication has been received</li> <li>• Following signs and directions.</li> </ul>	Training and Assessment in requirements for Positive Communications for Entering a Work Area requirements are included and reinforced in multiple training and awareness modules e.g. operator training and area inductions. Requirements are routinely reinforced and communicated at shift briefings covering: <ul style="list-style-type: none"> <li>• Active haul circuits and work areas</li> <li>• Information on the area owners and communications before entry.</li> </ul> Permanent or mobile signs are provided with call up requirements. <b>OFI-152 Review the design and application of positive communication processes at site</b> Workshop participants discussed the application of	<ul style="list-style-type: none"> <li>• Training records confirm the currency of vehicle operator understanding of communication requirements.</li> <li>• Specified review period to retain competencies are stated and tracked.</li> <li>• Supervisors monitor vehicle operator performance.</li> <li>• Supervisors and peers monitor vehicle operator radio calls and actions</li> </ul>	<ul style="list-style-type: none"> <li>⚠ CFM-MPA.66.01 Incorrect communication protocol</li> <li>⚠ CFM-MPA.72.03 Mobile equipment operator or pedestrian does not notify when entering a controlled work area</li> <li>⚠ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>positive communication processes to identify vehicles and confirm permissions when entering active haul circuits, work areas, and when passing.</p> <p><b>Consultant Comment:</b> workshop participants comprehensively reviewed the industry good practice references and made comparisons with Tarkwa mining practices and circumstances. Notable discussion points and differences include:</p> <ul style="list-style-type: none"> <li>• Tarkwa mine operates as a typical large long-term metalliferous open cut mine</li> <li>• Positive communication radio protocols are not routinely applied</li> <li>• Communications using horns to notify of movements is undertaken</li> <li>• Pedestrians are routinely in the work zone at Tarkwa e.g. leading hands and geologists</li> <li>• Load and Haul operations are congested with diggers often working in close proximity</li> <li>• Drill and Blast operations are routinely alongside Load and Haul operations</li> </ul>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<ul style="list-style-type: none"> <li>• Multiple workgroups access operational areas using light vehicles that park close to the dig areas</li> <li>• Truck movements are managed through the Fleet Management System including truck approaching the digger</li> <li>• The two contracting groups use different radio channels while sharing some haul roads</li> <li>• Personnel in light vehicles use hand held radios for communication when they are in the pit</li> <li>• Personnel in light vehicles can access active mining areas without having a radio</li> <li>• Vehicle identification and location is more challenging at night</li> </ul> <p>Safe and productive mining operations are delivered when personnel operating vehicles remain alert and situationally aware and there is a coordinated and consistent approach to manage interactions. Surface mining operations typically deliver these outcomes using a combination of approaches that include a disciplined positive communications approach.</p> <p>Review Tarkwa site standards, expectations, and practices for positive communication to</p>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				manage vehicle interactions. Consider benchmarking with other Gold Fields surface operations to confirm minimum standards. Involve Business Partners in the review.		
<b>OFI-141: Review, update, and apply the Tarkwa Traffic Management Plan.</b>	<b>BI-MPV.66.01 Road design guidelines specify minimum requirements for delineation</b>	<i>The design and installation of delineators assists mobile equipment operators to accurately estimate separation distances.</i>	<p>Road designs and construction requirements include standards for the accurate spacing of delineators along the road network.</p> <p>Spacing guideposts are placed at distances relative to the distance required to be maintained between mobile vehicles.</p> <p>Site design requirements specific the use of reflector colours e.g. Use red reflectors on the left, white on the right.</p> <p><b>OFI-141 Review, update, and apply the Tarkwa Traffic Management Plan</b></p> <p><i>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</i> was first approved for use on the 01-03-07. It is still current but has not been reviewed and updated since initial publication. It is a comprehensive document that confirms a range of site design and operating requirements that reflect good mine design and operating practice at Tarkwa.</p> <p>However, during the Tarkwa 2024 Vehicle Interaction Control Effectiveness (VICE) review, workshop participants identified misalignments between this key reference document and operational practice and conditions. These include:</p> <ul style="list-style-type: none"> <li>• Road and ramp conditions - construction and maintenance</li> <li>• Non-conforming intersections and circles (roundabout) design and construction</li> <li>• Limited availability and use of radios for general pit communications</li> <li>• Unclear Positive communications e.g. passing, and approaching mobile equipment</li> <li>• Obscured or missing Traffic Signage</li> <li>• Lack of infrastructure and signage to support management of pedestrians</li> </ul>	Road construction crews place and maintain delineators at required distances.	Commissioning and handover records confirming that 'as built' meets design requirements  Supervisor inspection records.	⚠️ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<ul style="list-style-type: none"> <li>Parking practices not aligned with documented requirements for physical segregation from heavy vehicles</li> </ul> <p>These issues were confirmed by supporting consultants during mine tours and interviews.</p> <p>Consider a review of the Tarkwa Traffic Management plan in conjunction with the development of Gold Fields Minimum Standards for Vehicle interaction controls. At a minimum the review should revisit and update minimum requirements for:</p> <ul style="list-style-type: none"> <li>Intersection design - bench mark against industry developments since 2007 including defaults to T intersections where possible</li> <li>Simplifying intersection design and construction to fully leverage upgrades and to support successful further deployment of CAS technology</li> <li>Road and ramp maintenance</li> <li>Positive communications protocols and practices</li> </ul>			
<p><b>OFI-154: Review refuelling practices and processes on site.</b></p>	<p><b>BI-MPV.68 Refuelling Practices</b></p>	<p><i>Refuelling of mobile equipment is productive and safe.</i></p>	<p>Operating sites have refuelling procedures that confirm requirements for:</p> <ul style="list-style-type: none"> <li>Mobile equipment refuelling system specifications</li> <li>Operation of fuel transfer systems</li> <li>Refuelling of vehicles, equipment and fixed plant - management of interactions between service vehicles and operating vehicles</li> <li>Housekeeping in refuelling bays and requirements for inspection of fire suppression systems and fire extinguishers</li> <li>Emergency procedures including spill response</li> <li>Replacement or changing of fuel cells or storage tanks</li> <li>For underground operations - refuelling outside refuelling bays</li> </ul>	<p>Training and assessment for personnel responsible for refuelling.</p> <p>Training and assessment for mobile equipment operators.</p> <p>Site refuelling infrastructure and equipment meets site standards.</p>	<p>Housekeeping Inspections.</p> <p>Training system currency of refueller skills.</p> <p>Audits of site refuelling infrastructure and equipment.</p> <p>Approved and in-date emergency response plans and periodic exercises.</p> <p><b>OFI-154 Review refuelling practices and processes on site</b></p> <p>Workshop participants identified situations where mobile equipment refuelling is not happening at designated locations, spotters are not used, and communication between operators and service personnel is inadequate.</p> <p>Unexpected and unintended movement of vehicles during refuelling has resulted in incidents at site and across</p>	<ul style="list-style-type: none"> <li>△ CFM-MPA.63.01 Operator does not meet site requirements when parking</li> <li>△ CFM-MPV.63.02 Light vehicles stop or park in heavy vehicle blind spots</li> <li>△ CFM-SDA.90 Emergency or incident response is inadequate~</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
					<p>the mining industry including fires, and vehicle collisions.</p> <p>Review site refuelling requirements and confirm that they are being applied to deliver safe and effective refuelling operations.</p>	
<p><b>OFI-127: Identify and link VICE workshop outputs relevant to the CAS Project.</b></p> <p><b>OFI-130: Leverage technology to improve vehicle interaction monitoring by category and location.</b></p> <p><b>OFI-139: Confirm and Communicate Plan and Timelines for CAS installation.</b></p>	<p><b>BI-MRA.71.03 Selecting and Deploying Proximity Detection Systems and other Technologies</b></p>	<p><i>Proximity Detection Systems meet site functional, performance, and technical requirements and deliver capable solution outcomes.</i></p>	<p>Proximity Detection Systems are selected to deliver site relevant Capable Solution Use Case</p> <ul style="list-style-type: none"> <li>A capable solution delivers better vehicle interaction control performance by improving the quality of decision-making from task execution through to mine operations and design.</li> <li>A capable solution considers relevant aspects of the operating environment, production requirements and equipment design.</li> <li>Where technology is a part of a capable solution, it is operationally integrated.</li> </ul> <p>The Capable Solution Use Case has these elements:</p> <p><b>Technology Functional Requirements</b> – these define what new technology Vehicle Interaction Controls can and do not do.</p> <ul style="list-style-type: none"> <li>Identify relevant company vehicle interaction requirements for new technology controls (EMESRT Level 8 and 9) based on operation type: e.g. underground coal mining, underground hard rock mining, open cut mining, refinery etc.</li> <li>Upgrade potential, data management and fit with future mine digitisation plans and other relevant information for each option.</li> <li>Compare site and company requirements, identify any difference e.g. additional site-specific requirements and/or restrictions e.g. requirement for machine swing interlocks, orebody precludes use of magnetic field PDS etc.</li> </ul> <p><b>Technology Performance Requirements</b> – site performance requirements are determined by site personnel considering the site personnel considering the consequences of operating without the new technology control in place.</p> <ul style="list-style-type: none"> <li>Review site equipment defect reporting and classification processes.</li> </ul>	<p>Applying User Requirements to assess and select technology to:</p> <ul style="list-style-type: none"> <li>Prepare a comprehensive Request for Proposal (RFP) for potential collision control technology provider Capable Solution User Requirements</li> <li>Issue the RFP to potential technology providers asking for details of how their product performance against site functional and performance requirements.</li> <li>In the RFP, confirm site technical and infrastructure requirements if that technology option is selected.</li> <li>Review each RFP response and summarise capability, installation and maintenance costs, logistical support, upgrade potential, data management and fit with future mine digitisation plans and other relevant information for each option.</li> </ul>	<p>When implementing vehicle interaction control improvement technology projects consider:</p> <ul style="list-style-type: none"> <li>Demands on operations during deployment e.g. releasing personnel for training, making mobile equipment available for technology installations.</li> <li>Logistics and infrastructure upgrade timing, these may be determined by availability of technology and key personnel.</li> <li>Practical management of performance requirements e.g. how are technology failures managed.</li> <li>Following deployment what roles will be accountable and responsible for control effectiveness, involve these roles in operational deployment before project handover.</li> <li>Stakeholder management covering how</li> </ul>	<ul style="list-style-type: none"> <li>△ CFM-CPA.11.01 Equipment operator or pedestrian mistake in estimating clearance distance</li> <li>△ CFM-CRA.10.30 Proximity alarms do not assist operator</li> <li>△ CFM-CTA.11.34 Incorrect action taken on proximity alarm</li> <li>△ CFM-MDA.61.01 Reducing vehicle interactions by maintaining clearances is inadequately considered routine work planning</li> <li>△ CFM-MDV.71.01 Proximity alarms do not perform to specification (false negatives and false positives)</li> <li>△ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<ul style="list-style-type: none"> <li>Working with operational personnel, set version 1 of expected performance parameters.</li> <li>Summarise site expected performance capability, installation and maintenance costs, upgrade potential, data management and fit with future mine digitisation plans and other relevant information in that can be deployed in a Request for Proposal (RFP) and to assess responses.</li> </ul> <p><b>Site Technical and Infrastructure Requirements</b> – where relevant, these cover technical requirements to support the deployment, installation, and operational integration of new controls e.g. extensions of site WiFi networks, installation of private 5G networks.</p> <p>Include questions on technical and infrastructure requirements in Request for Proposal (RFP).</p> <p>Prepare a site functional, performance and technical specification for use when issuing a Request for Proposal (RFP), assessing, and selecting VI Collision Control technology options offered by Original Equipment Manufacturers (OEMs) and Third-party technology suppliers.</p>	<ul style="list-style-type: none"> <li>Select the best fit from technology suppliers and prepare a shortlist for senior management review and decision.</li> <li>Include and assessment of the costs and benefit of each shortlisted option including:                             <ul style="list-style-type: none"> <li>The Credible Failure Mode(s) being addressed from VICE Baseline</li> <li>Potential new Credible Failure Modes</li> <li>Impacts on other current Vehicle Interaction Controls</li> <li>Practicality and impact, has the approach been applied elsewhere?</li> </ul> </li> </ul> <p>Pilot work with technology option personnel and experienced site personnel to:</p> <ul style="list-style-type: none"> <li>Plan a feasibility pilot for vehicle interaction control improvement technology projects approved by senior management (consider a multi-stage feasibility pilot with stage gates to identify and deselect shortlisted options that do meet site expectations)</li> <li>Train people who will work directly with the technology option</li> </ul>	<p>feedback will be captured during deployment and after handover.</p> <ul style="list-style-type: none"> <li>Impacts on existing site process and approaches e.g. supervisor workloads, availability of technicians for maintenance and repairs, capacity of digital infrastructure, reporting capability etc.</li> <li>The direct performance metrics provided by technology, including how the information will be applied to support decision making at multiple levels including:                             <ul style="list-style-type: none"> <li>Responses to non-standard events detected by technology.</li> <li>Adjustment of technology configurations and thresholds based on site functional requirements.</li> <li>Applying aggregated data to review and improve current design and operating approaches.</li> <li>Practical management of performance requirements e.g. how are technology failures managed.</li> </ul> </li> </ul>	

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>and make the balance of the workforce aware of the feasibility pilot(s).</p> <ul style="list-style-type: none"> <li>Report back on feasibility pilot results and confirm the results align with User Requirements, include feedback from operational personnel involved in the feasibility pilot.</li> <li>Summarise the outcomes from each technology option feasibility pilot against Site User Requirements. Consider functional, performance, technical, infrastructure, logistics and support requirements if the technology option is selected.</li> </ul> <p>Based on the pilot results, make a go- or no-go decision on operational deployment.</p> <p><b>OFI-139 Confirm and Communicate Plan and Timelines for CAS installation</b></p> <p>At the time of the November 2024 Vehicle Interaction Control Effectiveness (VICE) review, only part of the mobile equipment fleet at Tarkwa mine was operating with collision avoidance systems (CAS) installed.</p> <p>Mobile equipment operating without an installed CAS system installed is invisible. Workshop participants support the further installation of CAS systems</p>	<ul style="list-style-type: none"> <li>How to leverage new performance metrics indirectly to improve understanding of the effectiveness of existing vehicle interaction controls.</li> </ul> <p><b>OFI-130 Leverage technology to improve vehicle interaction monitoring by category and location.</b></p> <p>As with every other large mining operation, there are thousands of vehicle interactions each day at Tarkwa mine. Without leveraging technology, analysing interaction patterns at scale is not possible.</p> <p>Current approaches to assess and monitor performance are based on observations by individuals.</p> <p>Explore if CAS technology, or technology combinations such as CAS and Dispatch can be used to identify different subsets of vehicle interactions e.g. heavy vehicle to light vehicle, pedestrian interactions, service truck, maintainer vehicles to operations equipment etc. If it can, consider the value of developing performance measures for different categories of vehicle interaction. Include location in the analysis.</p>	

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>and consider that light vehicles are a priority category.</p> <p>Communicate details on project priorities, timelines for installation, and management commitment to further improve vehicle interaction controls at Tarkwa Mine.</p> <p><b>OFI-127 Identify and link VICE workshop outputs relevant to the CAS Project</b></p> <p>Workshop participants highlighted the importance of getting the collision avoidance system in place and operating at Tarkwa.</p> <p>Lack of complete coverage of CAS leads vehicles not being readily visible in operations and there are many failure modes. Many of these can be addressed by having test stations installed at all go lines.</p> <p>Workshop participants support the CAS project and support linking their issues and opportunities for improvement captured in the VICE workshop to the project.</p>		
<p><b>OFI-114: Improve implementation of consistent fleet ID across site systems.</b></p> <p><b>OFI-115: Improve quality of data networks on site.</b></p> <p><b>OFI-130: Leverage technology to improve vehicle</b></p>	<p><b>BI-MRA.71.05 Proximity detection system data send</b></p>	<p><i>Installed proximity detection systems are fully leveraged to assist equipment operators, pedestrians, supervisors, and site management improve operational performance.</i></p>	<p>Installed proximity detection systems are fully leveraged to assist equipment operators, pedestrians, supervisors, and site management improve operational performance.</p>	<p>When proximity detection systems are fitted, data is from vehicles, pedestrians, and infrastructure is sent to:</p> <ul style="list-style-type: none"> <li>• Support and monitor operator performance, including making interventions.</li> <li>• Alert and update supervisors on operator performance.</li> </ul>	<p>Reports confirm proximity data is being captured, transmitted, aggregated, analysed and applied improve vehicle interaction performance for:</p> <ul style="list-style-type: none"> <li>• Individuals</li> <li>• Supervisors</li> <li>• Operating sites</li> </ul> <p>Confirmation that site privacy management standards are</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.10.30 Proximity alarms do not assist operator</li> <li>⚠ CFM-CRA.11.21 No action taken on over speed alarm</li> <li>⚠ CFM-CRA.11.22 Operator ignores or bypasses alarm or safety device</li> <li>⚠ CFM-CTA.11.34 Incorrect action taken on proximity alarm</li> <li>⚠ CFM-MDV.71.01 Proximity alarms do not perform to specification (false negatives and false positives)</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>interaction monitoring by category and location.</b></p>				<ul style="list-style-type: none"> <li>Analyse and improve operational processes.</li> </ul> <p>Data and associated information are managed following site privacy and record keeping standard.</p> <p>Reports and analysis may include:</p> <ul style="list-style-type: none"> <li>Inputs to operator score cards.</li> <li>Heat maps that check planning assumptions.</li> <li>Checks on operating environment layouts.</li> </ul> <p><b>OFI-114 Improve implementation of consistent fleet ID across site systems.</b></p> <p>The Tarkwa VICE review confirmed that fleet identification for vehicle types is not always available and may be inconsistent.</p> <p>Without adequate knowledge of vehicle types then unwanted proximity alarms may be generated.</p> <p>Further define the issues and work with the technology provider to resolve how fleet IDs are loaded and tracked inside and across multiple systems. Establish agreed points of truth and checks.</p>	<p>being maintained e.g. through audits or reviews.</p> <p>Performance metrics e.g. operator score cards, supervisor interactions, construction and maintenance of the operating environment meets design standards.</p> <p><b>OFI-130 Leverage technology to improve vehicle interaction monitoring by category and location.</b></p> <p>As with every other large mining operation, there are thousands of vehicle interactions each day at Tarkwa mine. Without leveraging technology, analysing interaction patterns at scale is not possible.</p> <p>Current approaches to assess and monitor performance are based on observations by individuals.</p> <p>Explore if CAS technology, or technology combinations such as CAS and Dispatch can be used to identify different subsets of vehicle interactions e.g. heavy vehicle to light vehicle, pedestrian interactions, service truck, maintainer vehicles to operations equipment etc. If it can, consider the value of developing performance measures for different categories of vehicle interaction. Include location in the analysis.</p> <p><b>OFI-115 Improve quality of data networks on site.</b></p> <p>Workshop participants noted that there are frequent disconnects due to poor</p>	

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					<p>signal and network challenges around the Tarkwa operations.</p> <p>With loss of signal the ability for dispatch to contact and advise operators of responses to alarm states is impaired.</p> <p>Improve quality and reliability of site data networks to support timely and reliable alarm responses.</p>	
<p><b>OFI-134: Consider mandating fitted radios for all mine vehicles.</b></p> <p><b>OFI-158: Review work area access processes.</b></p>	<p><b>BI-MRA.72.01 Controlled Access to Operational Areas</b></p>	<p><i>Site access infrastructure controls are in place and permissions to enter operational areas are clear, applied, and well managed.</i></p>	<p>There are site standards, processes, procedures, work instructions, and specification to manage site and area access for personnel (including third parties), animals, and mobile equipment. These cover:</p> <ul style="list-style-type: none"> <li>• Site operational areas, other locations, and circumstances where access controls are required e.g. blasting, autonomous mining, and other high consequence activities etc.</li> <li>• How these areas are delineated and identified e.g. sign posts, site maps, geo fencing, (boom) gates, barriers etc</li> <li>• Who is accountable for controlling access e.g. security or sentries for blasting</li> <li>• Specifications for any required physical infrastructure e.g. fences, permanent barriers, temporary barriers, light curtain interlocks, security gates, turnstiles etc.</li> <li>• Minimum standards for authorised access to a controlled area e.g. vehicle marking and lights, PPE, training and awareness, permitted persons (inspectors, etc.), notification requirements (in and out) etc.</li> <li>• How access standards are monitored e.g. regular inspections to confirm boundary, barrier and delineation performance integrity.</li> <li>• How access permissions are monitored e.g. access system reports</li> <li>• The process for dealing with unauthorised access by direct and indirect employees and by third-parties or animals.</li> </ul>	<ul style="list-style-type: none"> <li>• Training and assessment in applying relevant site access requirements are included and reinforced in multiple training and awareness modules for direct and indirect employees.</li> <li>• Fences and gates are included in site maintenance strategies and are regularly inspected and maintained</li> <li>• Security patrols confirm integrity of boundary and alert site personnel if entry is occurring or has occurred.</li> <li>• Sentries provide warning to approaching vehicles and notify workers inside perimeter if an entry is required to occur.</li> <li>• Security patrols, sentries and others complete inspection forms to confirm site</li> </ul>	<ul style="list-style-type: none"> <li>• Training and induction records are created and controlled in site information management systems.</li> <li>• Inspection records are created and reviewed by more senior personnel on site.</li> <li>• Access logs and reports are generated and maintained.</li> <li>• By exception reporting and investigation of access barrier failures.</li> <li>• Audits of high consequence site activities e.g. blasting, autonomous mining etc.</li> </ul>	<p>⚠ CFM-MPA.72.01 Access control infrastructure is inadequate</p>

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			<p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</b> as approved for use 01-03-07</p> <p><b>6.1.4. Pedestrian Segregation</b></p> <p>The greatest risk to pedestrians is from vehicles and mobile equipment. Pedestrian activity within the operational areas shall be restricted wherever possible, particularly in hours of darkness. For certain operations, “no entry” zones shall be identified and clearly marked by signs, fencing, cones, etc. Employees shall not enter active operational areas as pedestrians unless authorized to do so.</p> <p>Where practicable, pedestrian routes or zones shall be established and designated with suitable signs, barriers, road markings, etc., particularly where equipment is operating or maneuvering. Such areas would be equipment and vehicle parking areas, around static equipment and buildings, particularly workshops.</p> <p><b>6.1.4.1. Segregation between Heavy Equipment and Light Vehicles</b></p> <p>Segregation shall be observed at the following locations:</p> <ul style="list-style-type: none"> <li>• <ul style="list-style-type: none"> <li>○ At the digging floor in-pit, light vehicle parking shall be demarcated with cones/delineators. Where this is not possible, light vehicles shall park close to light equipment locations at digging floors.</li> <li>○ At the Stockpiles/ Waste Dump, light vehicles shall park far away from active dumping locations or next to light equipment locations.</li> <li>○ At the drilling site, designated light vehicle locations shall be established and used appropriately.</li> <li>○ Parking locations (such as the Go-Line, HME Workshop, TSF), shall be so designed to prevent both light vehicles and heavy equipment parking together. Designated areas for heavy equipment must be separate from light vehicles.</li> <li>○ The Clear 20-Rule shall be observed at all times in the mining area for equipment/equipment, equipment/light</li> </ul> </li> </ul>	<p>requirements are being met.</p> <ul style="list-style-type: none"> <li>• Barriers to high consequence areas are installed and maintained to meet requirements.</li> <li>• Work area barriers are regularly inspected and maintained.</li> </ul> <p><b>OFI-158 Review work area access processes.</b></p> <p>Workshop participants discussed and identified situations when operational area access controls have not been applied. This includes missing signs and failures to communicate.</p> <p>This has resulted in incidents where unexpected vehicles enter working areas.</p> <p>Review site processes for controlling access to operational areas including work area inspections that confirm signs are in place.</p>		

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			<p>vehicle and equipment/human interactions.</p> <p><b>OFI-134 Consider mandating fitted radios for all mine vehicles.</b></p> <p>Workshop participants discussed situations where vehicles are routinely entering the mine without functioning radios. Many personnel operating light vehicles in the pit use hand held radios.</p> <p>Inability to contact other vehicles, or be contacted, can lead to misunderstandings and cause vehicle collisions.</p> <p>Confirm the site equipment specifications requirements for fitted and functioning radios. Communicate site requirements and consider having radio checks when buggy whips are fitted to light vehicles. Reduce the reliance on portable radios e.g. to pedestrians and escorts. Consider mandating fitted radios on all mine vehicles.</p>			
<p><b>OFI-137: Review understanding for applying processes when there are significant changes in operating conditions or circumstances.</b></p> <p><b>OFI-150: Update emergency response requirements across all roles.</b></p> <p><b>OFI-155: Review processes for managing equipment breakdowns and field repairs.</b></p> <p><b>OFI-156: Review site towing practices.</b></p>	<b>BI-MTV.65.01 Ceasing Operations Procedure - significant interaction threats</b>	<i>Significant interaction threats will initiate the site cease operations process and plans.</i>	<p>There is a process and threshold for ceasing mobile equipment operations at site because of significant interaction threats caused by:</p> <ul style="list-style-type: none"> <li>• Unauthorised access (pedestrian, wildlife, or vehicles).</li> <li>• Non reversible equipment moving on a roadway (e.g. into underground or down a narrow ramp).</li> <li>• Breakdowns.</li> <li>• Emergency response e.g. fires, compromised tyres etc.</li> <li>• Escorted vehicles.</li> <li>• Other relevant site circumstances.</li> </ul>	<p>Significant interaction threat awareness, training and assessment for vehicle operators, supervisors and management covering:</p> <ul style="list-style-type: none"> <li>• Anticipating and identifying significant interaction threats</li> <li>• Notifying</li> <li>• Expect actions e.g. using Trigger Action response Plan (TARP) thresholds and actions</li> <li>• Worker observations of potentially dangerous situations</li> </ul> <p>Real world examples are used for training, induction, and start of shift briefings. Examples include an explanation of how interaction threats develop</p> <p><b>OFI-150 Update emergency response requirements across all roles.</b></p>	<p>Training and assessment records.</p> <p>Approved and in-date TARPs or equivalent.</p> <p>By exception post incident reviews.</p> <p><b>OFI-137 Review understanding for applying processes when there are significant changes in operating conditions or circumstances.</b></p> <p>Workshop participants confirmed that there are site processes in place for dealing with changes in operating conditions and circumstances e.g. third parties on mine site.</p> <p>However, they questioned knowledge and awareness levels on the application of these processes, including triggers for their implementation and key actions that follow.</p> <p>Review understanding and capability of operators and</p>	<ul style="list-style-type: none"> <li>△ CFM-LPA.56.01 Operations continue when operating environment is significantly compromised</li> <li>△ CFM-MPA.67.10 Operations continue when there are significant interaction threats</li> <li>△ CFM-MPA.72.02 Operational access control (pedestrian and vehicle) is inadequate</li> <li>△ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> <li>△ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> </ul>

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				<p>Workshop participants discussed site emergency response processes and identified situations where personnel have not acted as expected based on emergency response process design and training. Issues discussed include continuing to operate during an emergency and entering the emergency locations.</p> <p>Unexpected vehicle or pedestrian movements while responding to an emergency can compromise the response.</p> <p>Review operator understanding of their expected actions for a range of typical site emergencies e.g. fire, tyre incident, vehicle incident, third-part on site etc. Include site response processes including ceasing operations and not entering emergency locations. Review current training and awareness materials and refresher schedules and update as required.</p>	<p>other in-field personnel e.g. drillers and field maintenance to notify and act on changes in operating conditions and circumstances.</p>	
	<p><b>BI-SDA.81 Organizational structure, role requirements and reporting</b></p>	<p><i>All decision makers on site have clarity around the business input activities they are accountable and responsible for - and how they should be reporting on them</i></p>	<p>The site requirements for achieving alignment with the business mission include:</p> <ol style="list-style-type: none"> <li>1. Establishing an organisational structure which nominates roles that are accountable and responsible for performance of required business inputs</li> <li>2. The structure provides guidance on reporting lines and authority for different aspects of the business input activities</li> <li>3. Accountable role holders have site (or broader) duties to coordinate execution or improvement, and report on the performance of required activities</li> <li>4. Responsible role holders execute the required activities, report on the quantity and quality of</li> </ol>	<ol style="list-style-type: none"> <li>1. The business identifies site requirements through assessment of site issues with adoption and refinement of leading practices to match prevailing conditions</li> <li>2. Role structures based on RACI (responsible to the task, accountable for the business input requirements, consulted on implementation/chan</li> </ol>	<ol style="list-style-type: none"> <li>1. Reports on business input execution are reviewed by accountable role holders and reported, as appropriate, to more senior personnel</li> <li>2. Internal and external audits and inspections are commissioned, reviewed and acted upon by senior leadership</li> </ol>	<ul style="list-style-type: none"> <li>⚠ CFM-CTA.11.01 Supervisor does not identify or act when operator is fatigued or intoxicated</li> <li>⚠ CFM-SDA.83 Organisation Work Scheduling and Planning is inadequate</li> <li>⚠ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> <li>⚠ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> <li>⚠ CFM-SPA.83.02 Inconsistent application of performance management processes</li> <li>⚠ CFM-STA-91 Regulator prosecution</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>execution, and recommend improvement opportunities</p> <p>5. Role descriptions include required certification and qualification, and associated resources provide clarity for role holders on their role's requirements</p> <p>6. Performance standards, aligned with role descriptions are developed and available to the senior leadership team</p>	<p>ge, and informed on performance) match the identified site requirements</p> <p>3. Persons are formally appointed to the role (in a permanent or relief capacity), provided with the role description requirements and assessed, or trained and assessed, to confirm understanding</p> <p>4. Activities are executed in line with prevailing site requirements including reporting on: performance; identifying and escalating problems; identifying improvements opportunities, and; mentoring other responsible role holders to lift standards</p>	<p>3. Non-conformances with role requirements are addressed through performance management processes</p>	
	<p><b>BI-SDA.85 Effective contractor selection and management processes</b></p>	<p><i>Nominated personnel assist contractors, and other service providers, to deliver site business and operational objectives, efficiently and effectively.</i></p>	<p>Contractors are selected based on their ability to provide required services and their alignment with company business, environmental, community, and health and safety values and management systems.</p> <p>Nominated personnel assist contractors, and other service providers, to deliver site business and operational objectives, efficiently and effectively.</p> <p>At contract commencement nominated site personnel provide information on site requirements including:</p> <ul style="list-style-type: none"> <li>• Mobilisation information</li> <li>• Access and induction information</li> <li>• Allocation of facilities e.g. workshops, parking, offices, equipment laydown, operating areas etc.</li> </ul>	<p>Site contract managers regularly meet with contractors and other service providers and review:</p> <ul style="list-style-type: none"> <li>• Performance against contract or service agreement obligations</li> <li>• Personnel are meeting site requirements e.g. for access control, traffic management, fatigue management etc.</li> <li>• Equipment meets site requirements e.g. plant files,</li> </ul>	<p>Contractor performance review meeting records.</p> <p>Records that contractor issues are documented and resolved e.g. hazard management.</p> <p>Observations and audit findings e.g. contractor equipment matches site minimum standards.</p> <p>Feedback from contractors.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.10.02 Operators unaware of give way requirements for light vehicles</li> <li>⚠ CFM-CPA.10.04 Operators unaware of right of way requirements or operating constraints</li> <li>⚠ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</li> <li>⚠ CFM-SPA.83.01 Operator fails to comply with site requirements</li> <li>⚠ CFM-SRA.87 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<ul style="list-style-type: none"> <li>• Equipment minimum standards e.g. vehicle markings, lighting requirements, fire detection and suppression standards</li> <li>• Traffic management and other operational interfaces</li> <li>• Site induction and training requirements</li> <li>• Emergency management</li> </ul> <p>After project commencement, there is an agreed meeting or series of meeting to review performance, consult and resolve issues.</p> <p><b>HSMP 5.4 PR–CONTRACTOR MANAGEMENT comprehensively details site contractor management processes.</b></p>	<p>maintenance records, minimum requirements for access, fire detection and suppression system etc.</p> <ul style="list-style-type: none"> <li>• Issues and hazard management</li> </ul>		
	<p><b>BI-SDA.86.01 Risk and Control Management for Routine Tasks</b></p>	<p><i>Practical hazard identification, risk assessment, and control management processes are applied by task-level decision makers to safely and productively complete routine work.</i></p>	<p>For routine tasks in standard work situations, the site has a documented process that that can be applied by all employees and contractors before and during their work to identify hazards, assess risks, and apply required controls.</p> <p>The process is well designed and supports workgroup members to manage minor variations in work steps or work settings.</p> <p>The process:</p> <ol style="list-style-type: none"> <li>Describes the situations and thresholds for its application e.g. before beginning a new task.</li> <li>Supports an individual worker to identify hazards and confirm their controls using a checklist, task instruction, digital workflow, procedure, and other resources directly relevant to the work being undertaken.</li> <li>Supports a team to identify hazards and confirm their controls using a checklist, task instruction, digital workflow, procedure, and other resources directly relevant to the work being undertaken.</li> <li>Confirms when additional risk and control requirements must be applied, such as JSEA, permit processes and critical control verifications, for routine tasks with high potential consequences e.g. hot work, work in high voltage areas, process and equipment isolation, confined space entry etc.</li> <li>Confirms the site requirements for documenting or recording process steps e.g. permits, Take 5,</li> </ol>	<ol style="list-style-type: none"> <li>1. Workgroup members and supervisors are trained, and competency assessed in application of site risk and control management processes for routine tasks in standard work conditions.</li> <li>2. Workers understand thresholds and seek further guidance when identifying hazards, assessing risks, and implementing required controls for non-routine tasks and routine tasks in non-standard conditions.</li> <li>3. Supervisors are trained, and competency assessed in coaching and assisting workgroups to apply site risk and control management processes.</li> <li>4. Supervisors are trained, and competency assessed</li> </ol>	<ol style="list-style-type: none"> <li>1. Performance reporting on the actual vs expected records of process being applied.</li> <li>2. Training and competency records are generated and maintained for task-level decision makers. Records of field observations and inspections by supervisors and more senior personnel that confirm: Processes are understood and have been applied; Required controls are in place; Any follow-up actions are logged, monitored, and closed-out</li> <li>3. Periodic reviews and audits of the design, application, and process outputs.</li> <li>4. Quality analysis of task-level risk management records including</li> </ol>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.10.04 Operators unaware of right of way requirements or operating constraints</li> <li>⚠ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</li> <li>⚠ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</li> <li>⚠ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>Stop-Look-Assess-Manage (SLAM) forms, and digital workflows.</p> <p>f. Details how records are captured, monitored, and analysed.</p> <p>Checklists, task instructions, digital workflows, procedures, and other relevant resources are: Designed by subject matter experts and authorised by an accountable senior person, and; Current and available for review and application e.g. through document and Information management systems.</p>	<p>in reviewing how workgroups have applied site risk and control management processes.</p> <p>5. Site records are kept</p> <p>6. Senior leaders monitor the application of the site risk and control management processes including supervisor checks and reviews.</p> <p>7. Periodic audits and reviews confirm that site processes for hazard identification, risk assessment, and control management are practical, applied, align with good practice, and meet legislative and company requirements.</p> <p>8. Leaders consider opportunities for improvement arising from reviews, audits, incident investigations, employee feedback etc. and when required they assign appropriate corrective actions.</p>	<p>improvement feedback to users.</p> <p>5. As required post incident reviews.</p>	
	<p><b>BI-SDA.86.02 Risk and Control Management for Routine Tasks in a non-standard or changing work setting.</b></p>	<p><i>Practical hazard identification, risk assessment, and control management processes are applied by supervisors and experienced task-level decision</i></p>	<p>For <b>routine tasks in non-standard work situations</b>, the site has a documented process that can be applied and authorised by supervisors to work with experienced employees and contractors, before and during their work to identify hazards, assess risks, and apply required controls. The process is well designed and supports workgroup members to safely and productively complete routine work in non-standard situations, with supervisory oversight and approval.</p>	<p>1. Short-term planners confirm when routine work in non-standard situations is scheduled and provide guidance on which site risk and control management approaches should</p>	<p>1. Periodic audits and reviews confirm that site designs, planning, and processes for hazard identification, risk assessment, and control management are practical, applied, align with good practice, and meet</p>	<p>△ CFM-MDA.61.06 Inadequate work planning means that heavy vehicle operators approach fixed structures that are incidental to achieving operational outcomes</p> <p>△ CFM-MPA.63.04 Parked vehicles block view for pedestrians and other equipment operators</p> <p>△ CFM-MPA.67.10 Operations continue when there are significant interaction threats</p> <p>△ CFM-MPA.72.03 Mobile equipment operator or pedestrian does not notify when entering a controlled work area</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
		<p><i>makers to safely and productively complete routine work in non-standard situations.</i></p>	<p>Non-standard situations include changing work environments and where there may be non-standard interactions between workgroups.</p> <p>The process:</p> <ol style="list-style-type: none"> <li>1. Confirms situations and thresholds for its application</li> <li>2. Supports supervisors and experienced work group members to review normal procedures and work steps to identify hazards, assess risks, and confirm controls</li> <li>3. Defines site requirements for documenting or recording the review and confirming control application e.g. Critical Control Verification records, Job Safety and Environment Analysis JSEA, Workplace Risk Assessment and Control forms (WRAC), etc.</li> <li>4. Confirms additional risk and control requirements, and requires them to be included in the prepared JSEA or other assessment form</li> <li>5. Details how all involved personnel are briefed on hazards, risks, and the maintenance of controls including handovers between shifts or work crews</li> <li>6. Details how all involved personnel acknowledge their understanding of their required tasks and the maintenance of relevant controls</li> <li>7. Details how, where, and when related documents are stored, communicated, and updated e.g. JSEAs, shift pre-start and control acknowledgement records</li> <li>8. Details how records of the process are captured, monitored, and analysed.</li> </ol> <p>Checklists, task instructions, digital workflows, procedures, permits and other relevant resources are: Designed by subject matter experts and authorised by an accountable senior person, and; Kept current and available for review and application e.g. through document and Information management systems.</p>	<p>apply for work crews and supervisors.</p> <ol style="list-style-type: none"> <li>2. Experienced workgroup members and supervisors are trained, and competency assessed in application of site risk and control management processes for routine work in non-standard conditions.</li> <li>3. Workers understand thresholds and seek further guidance when identifying hazards, assessing risks, and implementing required controls for non-routine tasks and routine tasks in non-standard conditions.</li> <li>4. Supervisors are trained, and competency assessed in coaching and assisting workgroups to apply site risk and control management processes.</li> <li>5. Supervisors are trained, and competency assessed in reviewing how workgroups have applied site risk and control management processes.</li> <li>6. Site records are kept.</li> </ol>	<p>legislative and company requirements.</p> <ol style="list-style-type: none"> <li>2. Leaders consider opportunities for improvement arising from reviews, audits, incident investigations, employee feedback etc. and when required, they assign appropriate corrective actions</li> <li>3. Performance reporting on the actual vs expected records of process being applied.</li> <li>4. Training and competency records for task-level decision makers.</li> <li>5. Senior leaders monitor the application of the site risk and control management processes including supervisor checks and reviews. Records of field observations and inspections by supervisors and more senior personnel that confirm: <ul style="list-style-type: none"> <li>○ Processes are understood and have been applied,</li> <li>○ Required controls are in place</li> <li>○ Any follow-up actions are logged,</li> </ul> </li> </ol>	

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
					monitored, and closed-out  6. Quality analysis of task-level risk management records including improvement feedback to users.  7. As required post incident reviews.	
	<b>BI-SDA.86.03 Risk and Control Management - Permit Process</b>	<i>Practical hazard identification, risk assessment, and control management processes are formalised in site permit processes with oversight from manager-level decision makers</i>	<ol style="list-style-type: none"> <li>1. The site has a permit process for identifying hazards and applying controls for defined activities such as confined space entry, electrical work, maintenance isolations, hot work, dig permits, etc. The process is well designed and supports the safe and productive completion of high consequence tasks in complex work situations. .</li> <li>2. The process:                             <ol style="list-style-type: none"> <li>a. Confirms situations and thresholds for its application (tasks and workflows requiring permits)</li> <li>b. Is managed by trained, competent, and manager approved personnel (permit authoriser).</li> <li>c. Details how all involved personnel are briefed on hazards, risks, and the maintenance of controls including handovers between shifts (permit issue and sign-on or off).</li> <li>d. Details how all involved personnel acknowledge their understanding of their required tasks and the maintenance of relevant controls (risk assessment for tasks covered in the permit as part of sign-on).</li> <li>e. Details how, where, and when related documents are stored, communicated, and updated (permits with signatures, and associated risk assessments).</li> <li>f. Details how records of the process are captured, monitored, and analysed (for continuous improvement).</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Short-term planners confirm when permits are required.</li> <li>2. Permit issuers and authorisers are trained, competent, and authorised to issue permits.</li> <li>3. Personnel are trained, and competency assessed in their accountabilities in the permit processes.</li> <li>4. Workers understand thresholds (TARPs) and seek further guidance when permit situations change.</li> <li>5. Supervisors are trained, and competency assessed in coaching and assisting workgroups to apply site permit processes.</li> <li>6. Supervisors are trained, and competency assessed in reviewing how workgroups have applied site permit processes.</li> <li>7. Site records are kept.</li> </ol>	<ol style="list-style-type: none"> <li>1. Training, competency, and authorisation records for permit issuers.</li> <li>2. Records of field observations and inspections by supervisors and more senior personnel that confirm:                             <ol style="list-style-type: none"> <li>a. Processes are understood and have been applied,</li> <li>b. Required controls are in place</li> <li>c. Any follow-up actions are logged, monitored, and closed-out</li> </ol> </li> <li>3. Periodic audits and reviews confirm that site permit processes for hazard identification, risk assessment, and control management are practical, applied, align with good practice, and meet legislative and</li> </ol>	<ul style="list-style-type: none"> <li>⚠ CFM-CTA.11.01 Supervisor does not identify or act when operator is fatigued or intoxicated</li> <li>⚠ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</li> <li>⚠ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</li> <li>⚠ CFM-MPA.67.10 Operations continue when there are significant interaction threats</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<p>3. Permits and other relevant resources are: Designed by subject matter experts and authorised by an accountable senior person, and; kept current and available for review and application e.g. through document and Information management systems.</p>		<p>company requirements.</p> <p>4. Senior leaders monitor the application of the permit processes including supervisor checks and reviews. as input to the quality analysis of permit records generating improvement feedback to users.</p> <p>5. As required post incident reviews.</p>	
<p><b>OFI-150: Update emergency response requirements across all roles.</b></p>	<p><b>BI-SDA.89 Emergency Preparedness</b></p>	<p><i>There should be a formal approach to emergency preparedness on site. It should include local response, emergency response through to crisis management.</i></p>	<p>There should be a formal approach to emergency preparedness on site. It should include local response, emergency response through to crisis management and may include formal liaison with external agencies.</p> <p>Specific response plans for foreseeable site emergencies e.g. traumatic injuries, entrapment, rescue from heights, fires, spills etc. are:</p> <ul style="list-style-type: none"> <li>• Prepared</li> <li>• Resourced (equipment and personnel)</li> <li>• Practiced and tested</li> <li>• Reviewed and improved</li> <li>• Maintained</li> </ul> <p>At a minimum, site emergency response capability requires that:</p> <ul style="list-style-type: none"> <li>• All personnel at site know how to notify a site emergency</li> <li>• All employees (direct and indirect) understand first-response actions after notification for fires, injuries, spills, and other foreseeable incidents</li> <li>• There are trained and competent emergency responders, supported with appropriate equipment, and who may be supported by external agencies</li> <li>• There are processes to notify and carry out emergency evacuations</li> </ul>	<p>A senior site position is accountable for site emergency and crisis management response and recovery capability.</p> <p>Emergency response plans have a review cycle and are also reviewed after incidents. Emergency response information is available in the workplace in a format that is audience appropriate.</p> <p>Visitor inductions include emergency notification and evacuation requirements.</p> <p>Employees (direct and indirect) are trained in:</p> <ul style="list-style-type: none"> <li>• Emergency notification</li> <li>• First response - first aid, fire fighting etc.</li> <li>• Evacuation</li> <li>• Where relevant - the use of self-rescuers and refuge chambers</li> </ul> <p>Emergency responders:</p> <ul style="list-style-type: none"> <li>• Are trained and competent to manage</li> </ul>	<p>Capability reports for Emergency Responders, Employees, and Visitors.</p> <p>Reviews of emergency response drills.</p> <p>Maintenance reports on the status of site emergency response equipment.</p> <p>By exception incident reviews.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-SDA.90 Emergency or incident response is inadequate</li> <li>⚠ CFM-SPA.90 Emergency response is significantly delayed</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>foreseeable site emergencies</p> <ul style="list-style-type: none"> <li>• Have access to up to date plans, support materials, and navigation aids</li> <li>• Have access to adequate equipment to manage foreseeable emergencies</li> </ul> <p><b>OFI-150 Update emergency response requirements across all roles.</b></p> <p>Workshop participants discussed site emergency response processes and identified situations where personnel have not acted as expected based on emergency response process design and training. Issues discussed include continuing to operate during an emergency and entering the emergency locations.</p> <p>Unexpected vehicle or pedestrian movements while responding to an emergency can compromise the response.</p> <p>Review operator understanding of their expected actions for a range of typical site emergencies e.g. fire, tyre incident, vehicle incident, third-part on site etc. Include site response processes including ceasing operations and not entering emergency locations. Review current training and awareness materials and refresher schedules and update as required.</p>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>OFI-150: Update emergency response requirements across all roles.</b></p> <p><b>OFI-172: Review Site Capability to manage foreseeable Vehicle Related Emergencies.</b></p>	<p><b>BI-SDA.89.01 Vehicle Incident Emergency Preparedness</b></p>	<p><i>The site has a formal approach for emergency preparedness that includes vehicle incidents.</i></p>	<p>There should be a formal approach to emergency preparedness on site that includes vehicle incidents. Planning should consider multiple scenarios and locations and the corresponding capabilities for local response, site emergency response, and assistance from external agencies.</p> <p>Vehicle incident scenarios include:</p> <ul style="list-style-type: none"> <li>• Pedestrians struck by vehicles</li> <li>• Single vehicle crashes</li> <li>• Crashes between multiple vehicles</li> <li>• Vehicle roll overs</li> <li>• Equipment fires</li> <li>• Emergency escapes from heights</li> <li>• Entrapment</li> <li>• Engulfment e.g. stockpile dozer falls into a void, vehicle in water</li> <li>• Environmental incidents - spills of material being carried and releases of fuels and lubricants</li> </ul> <p>Consider all locations taking into account potential response times, the capability of local and site emergency responders, and the availability of recovery equipment and other resources.</p>	<p>A senior site position is accountable for site emergency and crisis management response and recovery capability.</p> <p>Emergency response plans have a review cycle and are also reviewed after incidents. Emergency response information is available in the workplace in a format that is audience appropriate.</p> <p><b>OFI-172 Review Site Capability to manage foreseeable Vehicle Related Emergencies.</b></p> <p>There is an established emergency response capability at Tarkwa mine to cover medical, fire, and other emergencies. There is also a hospital on the mining estate.</p> <p>Workshop participants discussed how often specific vehicle incident emergency drills were carried out covering; light vehicle roll over, entrapment, crash, rescue from HME, mobile equipment fires, etc.</p> <p>Confirm that site and local community emergency response planning and capability for foreseeable vehicle incidents is adequate.</p> <p><b>OFI-150 Update emergency response requirements across all roles.</b></p> <p>Workshop participants discussed site emergency response processes and identified situations where personnel have not acted as expected based on emergency response process design and training. Issues</p>	<p>Reviews of vehicle related emergency response drills.</p> <p>By exception incident reviews.</p>	<p>⚠ CFM-SDA.90 Emergency or incident response is inadequate</p> <p>⚠ CFM-SPA.90 Emergency response is significantly delayed</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>discussed include continuing to operate during an emergency and entering the emergency locations.</p> <p>Unexpected vehicle or pedestrian movements while responding to an emergency can compromise the response.</p> <p>Review operator understanding of their expected actions for a range of typical site emergencies e.g. fire, tyre incident, vehicle incident, third-part on site etc. Include site response processes including ceasing operations and not entering emergency locations. Review current training and awareness materials and refresher schedules and update as required.</p>		
<p><b>OFI-101: Resolve document reference duplicates for different GHG operations.</b></p>	<p><b>BI-SDA.91 Document and Information Management System is fit for purpose</b></p>	<p><i>There is an effective document and information management system in place that meets requirements and prevents sensitive information being shared inappropriately.</i></p>	<ul style="list-style-type: none"> <li>• Company information is documented, applied by operating sites projects, and continually improved.</li> <li>• Management System components are prepared in a style appropriate for their intended audience.</li> <li>• Storage duration and access restrictions are specified for different information and document types.</li> <li>• Provision of information to required onsite, company, and third parties is enabled by the system.</li> </ul> <p><b>OFI-101 Resolve document reference duplicates for different GHG operations</b></p> <p><b>Consultant Comment:</b> During 'work as documented' mapping for Tarkwa, documents for Damang were also provided. Some of these had duplicate or similar titles.</p> <p>If these duplicate or similar documents are accessible by decision makers at both sites then choosing the incorrect document could result in site inappropriate design or planning decisions.</p>	<ul style="list-style-type: none"> <li>• Relevant management System components are available and used at an operational level.</li> <li>• Information from operational and technical teams is stored in line with site requirements</li> <li>• Documents and information are shared with site, company workers, and third parties in line with requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• Document management system effectiveness and efficiencies are periodically audited with improvement opportunities actioned as appropriate.</li> <li>• Leaders routinely check that resources are available and applied at a task level during task observations, inspections, and other interactions.</li> </ul>	<ul style="list-style-type: none"> <li>⚠ CFM-CRA.11.21 No action taken on over speed alarm</li> <li>⚠ CFM-ERV.33.20 Compromised vehicle cabin no longer meets OEM or site specific specifications</li> <li>⚠ CFM-SDA.83 Organisation Work Scheduling and Planning is inadequate</li> <li>⚠ CFM-STA-91 Regulator prosecution</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			Review how the document information protocol applies to documents across all GHG operations. Identify situations where common standards apply and where site specific approaches apply and update document management processes.			
	<b>BI-SDA.95.50 Consultation and Engagement with Regulators and Third Parties</b>	<i>Site status and requirements are shared with the Regulator and other stakeholders.</i>	<p>Site requirements for consultation and engagement include:</p> <ol style="list-style-type: none"> <li>1. Nomination of an accountable role holder to coordinate all communication with government agencies and third-parties</li> <li>2. Development of a schedule for communicating that aligns with all requirements of leases, licenses and commitments</li> <li>3. Implementing a process for communicating any incidents or complaints to relevant parties providing information on the event and site plans for managing these</li> <li>4. Summary reports being prepared on all communication and consultation activities</li> <li>5. Engagement with lobbying groups to be alerted to and provide guidance on government policies which could impact site operations</li> </ol>	<ol style="list-style-type: none"> <li>1. Accountable and responsible role holders are informed of obligations for consultation and communication as part of their role descriptions</li> <li>2. Scheduled communication activities are tracked and executed on</li> <li>3. Any events on site which could trigger interest (either mandated or generally) from third-parties are pro-actively communicated to relevant stakeholders</li> <li>4. Advocacy activities occur in line with emerging interests by site and external stakeholders</li> </ol>	<ol style="list-style-type: none"> <li>1. Senior management on site regularly confirm understanding of consultation requirements with nominated role holders</li> <li>2. Reports on communication activities are reviewed by senior management on site</li> <li>3. Information provided to third-parties is included in site information management systems, with tracking to generate follow-up or review as appropriate</li> <li>4. Senior leadership updated on advocacy activities</li> </ol>	<p>⚠ CFM-STA-91 Regulator prosecution</p>
	<b>BI-SDV.94.01 External to site obligations for Vehicle Interaction Controls are effectively met.</b>	<i>The site Traffic Management Plan (or equivalent), and associated documents, describe how relevant external to site expectations are met.</i>	<p>The Traffic Management Plan (TMP) and associated documents detail how relevant external to site expectations are met for:</p> <ul style="list-style-type: none"> <li>• Regulatory and legal obligations</li> <li>• Company requirements</li> <li>• International Standards and good practice</li> </ul> <p>This information is maintained and updated as part of site document management requirements.</p>	<p>External expectations and obligations are:</p> <ul style="list-style-type: none"> <li>• Mapped to site activities</li> <li>• Assigned to responsible personnel based on their role</li> </ul> <p>If the mapping process identifies gaps and opportunities for improvement, then these are reviewed by management for relevance and possible action.</p>	<p>The Traffic Management Plan lists all relevant external requirements with details of how they are met on site.</p> <p>The status of the site activities mapped to external expectations are monitored and reviewed.</p> <p>The Traffic Management Plan is periodically updated.</p>	<p>⚠ CFM-STA-91 Regulator prosecution</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
	<b>BI-SPA.82.11 Comprehensive fitness for work processes</b>	<i>Site requirements that all employees, contractors and visitors are fit for duty (unimpaired) while in the workplace.</i>	<p>There is an effective site fitness for duty approach that:</p> <ul style="list-style-type: none"> <li>• Applies equally to all, influences positive behaviours, and assist people</li> <li>• Emphasizes self-management, individuality accountability, and shared responsibilities</li> <li>• Includes credible threat AOD (alcohol and other drugs) impairment screening processes and consequential discipline</li> <li>• Recognizes and responds to the multiple reasons why people may be impaired at work covering fatigue, stress, intoxication, and workplace stressors e.g. hot working conditions</li> <li>• Supports supervisors to remove impaired persons from workplaces and then deal with the reason for impairment</li> <li>• Minimizes inconvenience to the majority, while delivering required business outcomes</li> </ul>	<p>Training and awareness for all personnel on site fitness for work process and their responsibilities.</p> <p>Associated infrastructure for amenity, hygiene, meal breaks, and rest are provided.</p> <p><b>DRUG AND ALCOHOL TESTING PROCEDURE TGM 9.29 PR V10 24/5/2023 - S6.1 and 6.2 - Trained testers using approved instruments and requirement to blow 0. S6.3 Test for cause (incident) 6.3.4 all personnel to be tested. S6.8 only tests above 0.05 are reported as a positive case.</b></p>	<p>A comprehensive fitness for work processes is in place and being applied.</p> <p>Screening reports.</p> <p>Employee assistance reports.</p> <p>Training and awareness sessions completed to schedule.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</li> <li>⚠ CFM-CPA.11.21 Operator fails to see signage installed to standard</li> <li>⚠ CFM-CTA.11.01 Supervisor does not identify or act when operator is fatigued or intoxicated</li> <li>⚠ CFM-SDA.83 Organisation Work Scheduling and Planning is inadequate</li> </ul>
	<b>BI-SPA.83.02 Supervisor performance requirements</b>	<i>Leadership and supervisory expectations of supervisors are documented, communicated, and performance is routinely assessed.</i>	<p>There is a supervisor development and appointment pathway. Reference company supervisory and leadership models are in place and available for ready reference by supervisors.</p> <p><b>Leadership Skills reinforced:</b></p> <ul style="list-style-type: none"> <li>• Motivates and builds the team</li> <li>• Safety and productivity leadership - emphasising safe production without undue pressure or coercion of workers</li> <li>• Judgment and timely decision making</li> <li>• Understanding of company requirements</li> </ul> <p><b>Supervisory Skills:</b></p> <ul style="list-style-type: none"> <li>• Planning and communication</li> <li>• Delegation</li> <li>• Conflict management</li> <li>• Delivering outcomes and maintaining standards</li> <li>• Employee performance management</li> <li>• Employee appraisal and development</li> </ul>	<p>Supervisors apply their leadership and supervisory skills to deliver safe and productive outcomes.</p> <p>Line managers support the supervisors who report to them.</p> <p>Functional roles such as Human Resources and Safety assist supervisors with information and support.</p>	<p>Supervisor appraisals completed to schedule.</p> <p>Supervisor development plans are prepared and implemented.</p> <p>There are records and evidence that supervisor are applying their skill e.g. completed employee appraisals, task reviews, inspections, performance management commend or correct records, daily planning, prestart meetings, review of operational logs etc.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.11.02 Impaired or inattentive operator operates mobile equipment</li> <li>⚠ CFM-EPV.26.10 Routine or occasional overloading of vehicles</li> <li>⚠ CFM-EPV.39.42 Vehicles are operated outside specified tyre conditions</li> <li>⚠ CFM-ERA.32.20 Operator fails to conduct effective pre-start that meets requirements</li> <li>⚠ CFM-LPV.44.02 Operational personnel do not maintain minimum standards for berms, windrows and other zone protection.</li> <li>⚠ CFM-MPA.63.01 Operator does not meet site requirements when parking</li> <li>⚠ CFM-SDA.83 Organisation Work Scheduling and Planning is inadequate</li> <li>⚠ CFM-SPA.83.02 Inconsistent application of performance management processes</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
	<b>BI-SPA.83.03 Supervisors have management and HR support when applying performance management approaches</b>	<i>Competent supervisors are supported when they apply site performance management processes.</i>	Accountabilities are clearly defined in site performance management processes. This includes details about how managers and support personnel such as human resources or industrial relations advisors are expected to support supervisors.	<p>Site performance management processes are documented and current and approved by senior managers.</p> <p>Supervisors are trained and supported when they apply site performance management processes to:</p> <ul style="list-style-type: none"> <li>• Recognise and reward good performance</li> <li>• Coach for performance improvement</li> <li>• Manage ongoing inadequate performance and non-conformance</li> <li>• Respond to significant operating breaches</li> </ul>	<p>Review personnel records to confirm that performance management processes are applied routinely and consistently by supervisors to:</p> <ul style="list-style-type: none"> <li>• Recognise and reward good performance</li> <li>• Coach for performance improvement</li> <li>• Manage ongoing inadequate performance and non-conformance</li> <li>• Respond to significant operating breaches</li> </ul>	<ul style="list-style-type: none"> <li>⚠ CFM-ERA.32.20 Operator fails to conduct effective pre-start that meets requirements</li> <li>⚠ CFM-SPA.83.01 Operator fails to comply with site requirements</li> <li>⚠ CFM-SPA.83.02 Inconsistent application of performance management processes</li> </ul>
<b>OFI-136: Improve Communication of Incident Learnings</b>	<b>BI-SPA.86 Hazard and incident reporting and response processes are in place, effective, and well used.</b>	<i>The site has an effective and well used hazard and incident response and reporting process which avoids placing workers at risk of injury.</i>	<p>There is an effective site hazard and incident reporting processes that:</p> <ul style="list-style-type: none"> <li>• Can be applied by all personnel, including contractors and visitors.</li> <li>• Aligns with the site emergency response and notification process (such as provision of first aid).</li> <li>• Allows personnel to efficiently report and resolve work area problems including allowances for not working if there is a threat to health or safety, or a potential to cause environmental or community harm.</li> <li>• Captures information for investigation, reporting and trend analysis.</li> </ul>	<p>Personnel on site:</p> <ul style="list-style-type: none"> <li>• Are trained in site processes for incident and hazard identification, reporting and control. The training includes guidance on when to cease work and also when to preserve an incident scene.</li> <li>• Identify any hazard present is reacted to by removing or isolating the hazard (ceasing work as required)</li> <li>• Report any incident which occurs.</li> </ul> <p><b>OFI-136 Improve Communication of Incident Learnings</b></p> <p>Tarkwa Mine has a comprehensive incident and hazard reporting process</p>	<ul style="list-style-type: none"> <li>• Reviews are made on the quantity and quality of hazard and incident reports.</li> <li>• Tracking of corrective actions.</li> <li>• Time to complete incident investigations is tracked and reported on.</li> <li>• Timing and quality of feedback to personnel who reported hazards or incident is tracked and reported on to senior personnel on and off site.</li> </ul>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.11.21 Operator fails to see signage installed to standard</li> <li>⚠ CFM-CRA.11.21 No action taken on over speed alarm</li> <li>⚠ CFM-CTA.10.90 Personnel do not alert others to presence of hazards</li> <li>⚠ CFM-LDV.42.02 Speed limits and over-speed management are inadequately considered in mine design and routine work planning</li> <li>⚠ CFM-LPA.44.05 Appropriate distances from fixed and overhead structures are not maintained</li> <li>⚠ CFM-LPV.54 Excessive water (Dust Control) is applied to road surface</li> <li>⚠ CFM-MDA.61.06 Inadequate work planning means that heavy vehicle operators approach fixed structures that are incidental to achieving operational outcomes</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>supported by the INX platform.</p> <p>While comprehensive information is captured and recorded in the INX platform, workshop participants discussed situations where the post incident learnings have not been communicated well to the general workforce.</p> <p>Review incident learnings communication format. Consider key information required by field personnel and improve the process, if required.</p>		
<p><b>OFI-108: Review and Align Mining Operations Inspection and Task Observation processes.</b></p>	<p><b>BI-SPA.87 Planned Inspections and Task Observations</b></p>	<p><i>Planned inspections and task observations assess and provide timely feedback about the effectiveness and efficiency of performance standards (work as documented) as they are applied in the workplace (work as done).</i></p>	<p>Planned inspections and task observations assess and provide timely feedback about the effectiveness and efficiency of performance standards (work as documented) as they are applied in the workplace (work as done).</p> <p>The site processes for inspections and task observations have these elements:</p> <ul style="list-style-type: none"> <li>• Inspections and task observations are scheduled and assigned to site roles, and consider the work intensity and exposure of workers to harm (including checks on work environments, workers performing tasks alone or in remote locations, and work group interactions),</li> <li>• Minimum competence and experience requirements, based on inspection or task observation type, are detailed,</li> <li>• Reference to available information e.g. checklists, aide memoirs detailing expected standards and performance requirements,</li> <li>• There is process for performance reporting, identifying defects, and assigning remedial actions,</li> <li>• Outputs from multiple inspections and task observations monitored for performance drift trends.</li> </ul> <p>Task Observations provide additional information about:</p> <ul style="list-style-type: none"> <li>• Training effectiveness,</li> </ul>	<p>Senior site personnel confirm that scheduled inspections and task observations match schedule and quality expectations.</p> <p>Site Inspection and Task Observations processes are applied to:</p> <ul style="list-style-type: none"> <li>• Assess operating conditions,</li> <li>• Review work practices,</li> <li>• Confirm the status of plant and equipment status,</li> <li>• Identify effects from changes in materials and process</li> <li>• Confirm the close out of remedial actions</li> <li>• Evaluate management performance</li> <li>• Analyse the effectiveness and efficiency of workflows from approval, through</li> </ul>	<p>Inspection and task Observation reports meet site performance expectations for quantity and quality.</p> <p>There is a process that manages defects, non-conformances, and other performance issues identified from inspections and task observations. These are assessed and where necessary remedial actions with due by dates are assigned.</p> <p>Performance reports track remedial action status.</p> <p>Trend analyses reports that identify drift from expected performance.</p> <p><b>OFI-108 Review and Align Mining Operations Inspection and Task Observation processes.</b></p> <p>Tarkwa Mine has a mature and well designed Planned Task Observation (PTO) process that is applied across the operation.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>⚠ CFM-EPA.33.40 Communication equipment absence, failure or poor reception</li> <li>⚠ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</li> <li>⚠ CFM-ERA.39.21 Speedometer does not indicate actual speed</li> <li>⚠ CFM-ERA.40.22 Over speed warning alarm fails to operate</li> <li>⚠ CFM-LDV.44.08 Blind spots on heavy vehicles are not considered in workplace layout</li> <li>⚠ CFM-LPA.42.03 Obscured or missing signage</li> <li>⚠ CFM-LPV.54 Excessive water (Dust Control) is applied to road surface</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<ul style="list-style-type: none"> <li>• Task assignment and performance expectations,</li> <li>• Procedures and task instructions,</li> <li>• Employee engagement and contributions.</li> </ul> <p>Site Planned Inspections:</p> <ul style="list-style-type: none"> <li>• Assess the application of methods and practices performance standards in a systematic and organised way,</li> <li>• Confirm that people have the resources required to complete their work safely and productively, in an appropriate work environment,</li> <li>• Identify and deal with potential problems and issues before losses occur,</li> <li>• Identify effects of changes,</li> <li>• Identify equipment defects,</li> <li>• Confirm the status of remedial actions.</li> </ul>	<p>planning, scheduling, resourcing, and task execution</p>	<p>While Task Observations on mobile equipment operations are carried out at Tarkwa, there are limits in providing timely performance feedback to the operators and collating and analyzing findings. Also, PTOs on mining operations assess both the actions of individual operators and the collected outcomes e.g. congested areas with multiple workgroups.</p> <p>Consider reviewing and aligning PTO, Critical Control Verification, Senior Supervisor checks, and other mining operations inspection processes. Confirm that all processes reference relevant site standards, use consistent good performance criteria, and that feedback and corrective action tracking processes are effective.</p> <p>Explore options to leverage technology data streams to assist the process e.g. through traffic interaction heat maps.</p>	
<p><b>OFI-103: Consider including a mobile equipment change example in MoC documentation and training.</b></p> <p><b>OFI-128: Simplify management of change</b></p> <p><b>OFI-161: Review the consistent application of site change</b></p>	<p><b>BI-SPA.88 Change and Risk Management Process</b></p>	<p><i>Applied and effective change management processes, incorporating comprehensive risk and control management steps, assist senior manager decision-makers to deliver safe and productive outcomes for the business.</i></p>	<p>There is a defined change and risk management process that:</p> <ul style="list-style-type: none"> <li>• Confirms the reason and goals</li> <li>• Engages stakeholders and communicates reasons as a business case (risk and rewards)</li> <li>• Uses good practice project management approaches to develop a plan with a schedule and outcomes.</li> <li>• Includes and references inputs from subject matter and technical experts in the project plan.</li> <li>• Where appropriate, the plan and associated work program are reviewed and formally analysed using a facilitated group process involving subject matter and technical experts, site leaders, workers, designers, suppliers, and other stakeholders.</li> </ul>	<p>Senior managers identify when thresholds for applying the change and risk management process are crossed such as:</p> <ul style="list-style-type: none"> <li>• New technology implementations</li> <li>• A change in work process e.g. moving from development to production, transitioning from surface to underground mining, changes in traffic flows</li> </ul>	<p>Reports on change and risk management activities are reviewed by maintenance planners, technical services and engineering personnel.</p> <p>Process change reports are reviewed by the relevant Manager.</p> <p>Changes are authorised by an accountable supervisor or manager who confirm that the change has been:</p> <ul style="list-style-type: none"> <li>• Assessed over a representative period and under a variety of operational conditions.</li> </ul>	<p>△ CFM-SPA.88 Inadequate management of change</p>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>management processes.</b></p>			<ul style="list-style-type: none"> <li>• Applies risk and control management processes that support the work program by identifying hazards, considering relevant loss experiences, assessing risks including critical risks and confirming their controls.</li> <li>• Gains senior manager approval to resource and execute the plan.</li> <li>• Monitors and evaluates progress to plan</li> <li>• Continues to communicate with stakeholders.</li> <li>• Adapts and adjusts to hazards and controls based on work program schedule.</li> <li>• Confirms and delivers the operating processes, procedures, equipment, infrastructure, risk and control management processes required after the change is fully implemented.</li> <li>• Recognises milestones and celebrates success.</li> </ul> <p>The level of effort and rigour applied to the hazard identification, risk assessment, and application of controls during change management considers situation complexity, the range of potential outcomes, and the likelihood of a loss of one or more required operating states.</p> <p><b>HSMP 5.3 PR TGM OPERATIONAL PROCEDURE MANAGEMENT OF CHANGE</b></p> <p>The scope of the procedure covers changes to new product, plant, equipment, machinery, software, staffing or process that take place on the mine including changes to existing process, products or services. Scope examples include changes to roads (construction or diversion).</p> <p><b>OFI-103 Consider including a mobile equipment change example in MoC documentation and training</b></p> <p><b>Consultant Comment:</b> The Tarkwa HSMP PR 5.3 PR Management of Change document is a comprehensive document that provides a structured approach including managing stakeholder communications. It has multiple examples of the types of change that will trigger its application.</p> <p>However, the list of examples do not include changes to mobile equipment.</p> <p>Consider adding a mobile equipment as a change example. Also, check the change management document</p>	<ul style="list-style-type: none"> <li>• The introduction of new equipment types</li> <li>• Scale up of workforces</li> <li>• Significant workforce changes e.g. use of contractors</li> <li>• Significant operational changes in infrastructure e.g. for road network layouts</li> <li>• Opening of new operating areas</li> <li>• Significant onsite capital works</li> <li>• Regulated and periodic review triggers for existing risk analyses supporting site controls</li> </ul> <p>Accountability for applying the process is assigned to a role e.g. project manager.</p> <p>The level of effort and rigour applied to the hazard identification, risk assessment, and application of controls during change management considers situation complexity, the range of potential outcomes, and the likelihood of a loss of one or more required operating states.</p> <p><b>HSMP 3.3 PR – Hazard Identification and Assessment of Risks and Opportunities</b> details site hazard identification, risk assessment and determining controls. This document describes site processes for identifying, analysing,</p>	<ul style="list-style-type: none"> <li>• Included in all relevant processes including training, maintenance, documents and future specifications.</li> <li>• Communicated to all relevant stakeholders including the Regulator when applicable</li> <li>• Detailed on relevant plans, process maps, schematic diagrams, documents and procedures.</li> </ul>	

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			reference from HSMP 1.0 MN (the current reference is TGM 9.14 PR)	<p>evaluating, managing and communicating risks and their potential safety, health and environmental impact on employees, contractors and other stakeholders. Section 3 includes accountabilities.</p> <p>Gold Fields Ghana apply four types of Risk Assessment:</p> <ol style="list-style-type: none"> <li>1. Baseline risk assessment</li> <li>2. Issue-based risk assessment (e.g. WRAC, HAZOP, BOWTIE, etc)</li> <li>3. Task planning risk assessment</li> <li>4. Continuous Risk Assessment (Take 5 risk assessment)</li> </ol>		
<p><b>OFI-103: Consider including a mobile equipment change example in MoC documentation and training.</b></p> <p><b>OFI-112: Apply Site Management of Change processes for new mobile equipment.</b></p>	<b>BI-SPA.88.01 Site change management processes apply to the introduction of new types and models of mobile equipment</b>	<i>Applied and effective change management processes are in use at the operating site, and these apply to the introduction of new types and models of mobile equipment.</i>	<p>The introduction of new mobile equipment components, new models and new types e.g. introduction of electric battery powered equipment follow a defined change management process that:</p> <ul style="list-style-type: none"> <li>• Confirms the scope</li> <li>• Identifies potential impacts for mobile equipment and personnel</li> <li>• Confirms how hazards will be controlled e.g. equipment fires</li> <li>• Communicates relevant information to personnel</li> </ul> <p><b>HSMP 5.3 PR TGM OPERATIONAL PROCEDURE MANAGEMENT OF CHANGE</b></p> <p>The scope of the procedure covers changes to new product, plant, equipment, machinery, software, staffing or process that take place on the mine including changes to existing process, products or services.</p> <p><b>OFI-103 Consider including a mobile equipment change example in MoC documentation and training</b></p> <p><b>Consultant Comment:</b> The Tarkwa HSMP PR 5.3 PR Management of Change document is a comprehensive document that provides a structured approach including managing stakeholder communications. It has multiple</p>	<p>When senior managers confirm that change management thresholds for new equipment will be crossed, relevant parts of the process are applied to manage the introduction of the equipment e.g. for new models, different types etc.</p> <p><b>OFI-112 Apply Site Management of Change processes for new mobile equipment.</b></p> <p>Workshop participants discussed how site change management process are used to assist with the introduction of new types and models of mobile equipment.</p> <p>New equipment introduced can have insufficient other resources such as training modules considerations in mind design and availability of maintenance resources.</p>	New equipment controls are communicated and implemented.	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</li> <li>⚠ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> <li>⚠ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>⚠ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</li> <li>⚠ CFM-LPV.41.20 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning</li> <li>⚠ CFM-LRA.44.01 Inadequate Inspection and Management of Operating Environment</li> <li>⚠ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> <li>⚠ CFM-SPA.88 Inadequate management of change</li> <li>⚠ CFM-SRA.87 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained</li> </ul>

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			<p>examples of the types of change that will trigger its application.</p> <p>However, the list of examples do not include changes to mobile equipment.</p> <p>Consider adding a mobile equipment as a change example. Also, check the change management document reference from HSMP 1.0 MN (the current reference is TGM 9.14 PR)</p>	<p>Confirm thresholds for the application of site change management approaches for mobile equipment and monitor application of the process.</p>		
<p><b>OFI-109: Improve management of change for road and traffic flow changes</b></p> <p><b>OFI-120: Review how changes to traffic flows and road networks are communicated to stakeholders.</b></p>	<p><b>BI-SPA.88.02 Site change management processes apply to changes in road networks and traffic flows</b></p>	<p><i>Applied and effective change management processes are used when there are changes in road networks and traffic flows.</i></p>	<p>Changes to road networks and traffic flow adjustments follow a defined change management process that:</p> <ul style="list-style-type: none"> <li>• Confirms the scope</li> <li>• Identifies potential impacts for mobile equipment and personnel</li> <li>• Confirms how hazards will be controlled e.g. signs, barriers, etc.</li> <li>• Communicates relevant information to personnel</li> </ul> <p><b>HSMP 5.3 PR TGM OPERATIONAL PROCEDURE MANAGEMENT OF CHANGE</b></p> <p>The scope of the procedure covers changes to new product, plant, equipment, machinery, software, staffing or process that take place on the mine including changes to existing process, products or services. Scope examples include changes to roads (construction or diversion).</p>	<p>When change management thresholds for modifying the road network or traffic flows are crossed, supervisors apply relevant parts of the site change management process.</p> <p><b>OFI-109 Improve management of change for road and traffic flow changes</b></p> <p>Workshop participants report that changes to the road networks and traffic flows are not always communicated to all stakeholders.</p> <p>Lack of vehicle operator knowledge about changes to traffic flows and road networks can lead to significant vehicle interactions.</p> <p>When changes to road networks and traffic flows are made, apply the stakeholder notification process detailed in site procedures. Consider developing a communication logs communications with key stakeholders such as maintenance and service personnel, Business Partners, Emergency Response, Drill and Blast, Technical department etc.</p>	<p>New performance standards controls are communicated and implemented.</p> <p>Traffic modifications, new hazards and their controls are logged and communicated to shift crews.</p> <p><b>OFI-120 Review how changes to traffic flows and road networks are communicated to stakeholders.</b></p> <p>Workshop participants confirm that site management of change processes are applied to manage changes in road networks and traffic flows.</p> <p>However, communication of changes to all stakeholders is reported as being inconsistent. This has caused vehicle interaction issues.</p> <p>Review how communication about traffic management changes is planned and executed. Identify all stakeholders and confirm communication channels, review recent examples and apply for future changes to traffic management and road networks.</p>	<ul style="list-style-type: none"> <li>△ CFM-CPA.10.20 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path</li> <li>△ CFM-CRA.03.01 Operator fails to identify and act on changes in conditions: reduced visibility, road narrowing, road surface etc.</li> <li>△ CFM-EPA.31.20 Equipment or component failure during operations e.g. brakes or steering or controlled functions</li> <li>△ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</li> <li>△ CFM-LPV.41.20 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning</li> <li>△ CFM-LRA.44.01 Inadequate Inspection and Management of Operating Environment</li> <li>△ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> <li>△ CFM-SPA.88 Inadequate management of change</li> <li>△ CFM-SRA.87 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained</li> </ul>
	<p><b>BI-SPA.90 Effective incident reporting, and</b></p>	<p><i>Incident investigation is a business improvement process for</i></p>	<p>Sites have formal approach for incident reporting, investigation and determining corrective actions. The approach is effective at a site level while meeting</p>	<p>The site incident investigation approach and supporting processes:</p>	<p>Incident management process is in place and personnel know how to apply it.</p>	<ul style="list-style-type: none"> <li>△ CFM-EDA.21.10 Equipment or Component Design is not error tolerant</li> <li>△ CFM-LDA.43.01 Vehicle parking, including emergency parking is inadequately considered in mine design and routine work planning</li> </ul>

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	<b>corrective action closeout.</b>	<i>identifying and solving issues that can compromise site safety and productivity.</i>	<p>company and regulatory requirements for incident reporting, scene preservation, and management.</p> <p>Incident reports include what happened, loss potential, why it happened, likelihood of recurrence and provide a business case for corrective actions.</p>	<ul style="list-style-type: none"> <li>• Set the investigation scope.</li> <li>• Confirm training requirements for personnel leading investigations.</li> <li>• Detail incident report contents e.g. what happened, its loss potential, why it happened, the likelihood of recurrence and making the business case for corrective actions.</li> <li>• Describe the process for senior manager review and approval of corrective action recommendations and opportunities for improvement.</li> <li>• Explain how site information feedback about the incident, investigation findings, and corrective actions.</li> <li>• Document the thresholds for externally reporting investigation findings e.g. within a company, to regulators, and OEM relevant information if equipment design has contributed to an incident.</li> </ul>	<p>Senior management records of</p> <ul style="list-style-type: none"> <li>• Incident investigation reviews</li> <li>• Approval of corrective actions and opportunities for improvement</li> </ul> <p>Assignment of approved corrective actions</p> <p>Progress tracking of corrective actions</p> <p>Periodic analysis of incident patterns including</p> <ul style="list-style-type: none"> <li>• Who makes the reports.</li> <li>• Causes.</li> <li>• Incident location and time.</li> <li>• Equipment involved.</li> <li>• Corrective actions types.</li> <li>• The adequacy of any emergency response.</li> </ul>	
	<b>BI-SPA.94 Managing Legal and Other External to Site Expectations.</b>	<i>All legal expectations, company policies, standards, and other obligations</i>	Sites shall ensure that general and specific external requirements are mapped directly to the Management System Framework and, as required, to other business processes so that commitments to meet external expectations are effectively delivered.	Legal and other requirements shall be communicated appropriately to direct and indirect employees and inform operational work processes.	There are periodic checks to confirm that sites have identified and mapped all relevant external expectations to company processes.	<ul style="list-style-type: none"> <li>⚠ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> <li>⚠ CFM-STA-91 Regulator prosecution</li> </ul>

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		<p>are mapped to site processes.</p>	<p>Source documents (e.g. legislation, ISO Standards etc.) shall be available to all employees.</p> <p><b>GFWA ESG Contractors and Suppliers June 2023</b></p> <p>Part 2 - point 3 confirms requirement for contractor and their subcontractors to comply with approved codes, relevant health and safety legislation, industry standards etc.</p> <p>Part 2 - points 4 and 5 confirm requirements for meeting site standards and applying site approved processes including GFG standards,</p>	<p>Sites shall implement and maintain a process that systematically identifies, registers, updates, and assigns both general and specific external requirements, including contractual and legal, to organisational positions.</p> <p>Information and plans as required are generated, transmitted to external parties, and kept secure and private.</p> <p><b>HSMP 3.4 – PR LEGAL AND OTHER REQUIREMENTS</b></p> <p>PURPOSE</p> <p>The purpose of this Health and Safety Management Procedure (HSMP) is to ensure that processes are in place to:</p> <ul style="list-style-type: none"> <li>Identify, track and review legislative and other OH&amp;S requirements applicable to the Tarkwa Gold Mine operations; and</li> <li>Where required, ensure that appropriate action is taken to comply with these obligations.</li> </ul> <p>Key External Requirements Referenced include</p> <ul style="list-style-type: none"> <li>Minerals and Mining (Health and Safety) Regulations, 2012 (L.I.2182)</li> <li>Labour Act (Act 651), 2003</li> </ul>	<p>Reviews also confirm that these company processes meet the requirements of these external expectation requirements and this is appropriately recorded.</p> <p><b>HSMP 3.4 – PR LEGAL AND OTHER REQUIREMENTS</b></p> <p><b>6.6 Legal Compliance Audit</b></p> <p>A legal compliance audit shall be conducted once per year by an external party to ensure the mine’s compliance with legal requirements and other standards as may be applicable. The audit shall include actual performance evaluation against applicable laws.</p> <p>The report will be submitted to the Health and Safety Manager for review and inclusion in the Management Review process.</p>	

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				<ul style="list-style-type: none"> <li>• Workmen’s Compensation Law (PNDCL 187), 1987</li> <li>• Workmen’s Compensation (Calculations of Compensation Instrument) L.I. 1371 1989, LI 1342, 1987, Act 546, 1998, Act 597, 2001, Act 330, 1993, Act 582, 2001, LI 1342, 1987, Act 179, 1963, Act 592, 2000</li> <li>• ICMM - Health and Safety Critical Control Management – 2015</li> <li>• Group Health and Safety Reporting Guideline</li> </ul>		
<p><b>OFI-141: Review, update, and apply the Tarkwa Traffic Management Plan.</b></p> <p><b>OFI-163: Review Road Construction and Maintenance Standards.</b></p>	<p><b>BI-SPV.81.05 Clear accountabilities for managers, superintendents, and supervisors in site relevant road design guidelines and traffic management plans</b></p>	<p><i>Site road design guidelines and traffic management plans identify specific accountabilities by organisation position.</i></p>	<p>Site road design guidelines and traffic management plans confirm site performance requirements and assign accountability for their delivery to an organisation position.</p> <p>Competent senior managers, line managers, engineers and technical workers, and supervisors understand their responsibilities and accountabilities to:</p> <ul style="list-style-type: none"> <li>• Develop and maintain roads and supporting infrastructure that meet site, company, and regulatory design standards and requirements.</li> <li>• Anticipate, identify, prevent, and mitigate compromises to roads and supporting infrastructure</li> <li>• Develop, communicate, and maintain effective traffic management plans.</li> </ul> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI as approved for use 01-03-07</b></p> <p><b>Part 3 Responsibility</b></p> <p>This section confirms functions and tasks by responsible position for Managing Director, General Manager, Designated Managers and department Managers, Mining Manager, Protection Service Manager, Learning and</p>	<p>There are formal processes and design references that are applied by competent and experienced line managers to:</p> <ul style="list-style-type: none"> <li>• Develop, maintain, review, and update the site traffic management plan (or equivalent)</li> <li>• Maintain existing roads and supporting infrastructure.</li> <li>• Develop new roads and supporting infrastructure.</li> </ul> <p>The design references set site performance standards and consider site, company, and regulatory design standards and requirements.</p> <p><b>OFI-163 Review Road Construction and Maintenance Standards</b></p>	<p>Traffic management plans are applied and maintained.</p> <p>Site inspection and reporting processes confirm that new and existing roads and supporting infrastructure meet site performance expectations, for example:</p> <ul style="list-style-type: none"> <li>• Supervisors monitor road construction and maintenance crews to confirm their activities meet site requirements</li> <li>• Superintendents and planners schedule operations for safe and productive traffic management outcomes</li> <li>• Mine planners consider future vehicle interaction</li> </ul>	<ul style="list-style-type: none"> <li>⚠ CFM-CPA.11.05 Operator does not drive on available segregated roads</li> <li>⚠ CFM-CTA.11.01 Supervisor does not identify or act when operator is fatigued or intoxicated</li> <li>⚠ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</li> <li>⚠ CFM-LDV.42.02 Speed limits and over-speed management are inadequately considered in mine design and routine work planning</li> <li>⚠ CFM-LDV.44.08 Blind spots on heavy vehicles are not considered in workplace layout</li> <li>⚠ CFM-LRA.44.01 Inadequate Inspection and Management of Operating Environment</li> <li>⚠ CFM-SDA.90 Emergency or incident response is inadequate</li> <li>⚠ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> <li>⚠ CFM-SPA.90 Emergency response is significantly delayed</li> <li>⚠ CFM-STA-91 Regulator prosecution</li> </ul>

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			<p>Development Training Coordinator, Human Resources, direct and indirect employees, and visitors.</p> <p><b>Design and Construction Accountabilities Reference 6.1.2.6</b></p> <p>All road designs by the planning team outside the mine site must be reviewed by the Chief Surveyor, Senior Mine Engineer, and Unit Manager Mining before the mine manager's final approval. However, all in-pit roads (permanent and temporary) must be reviewed by the Chief Surveyor and Senior Mine Engineer before the mining manager's final approval. After the road is constructed, it should be signed off.</p> <p><b>OFI-141 Review, update, and apply the Tarkwa Traffic Management Plan</b></p> <p><i>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI</i> was first approved for use on the 01-03-07. It is still current but has not been reviewed and updated since initial publication. It is a comprehensive document that confirms a range of site design and operating requirements that reflect good mine design and operating practice at Tarkwa.</p> <p>However, during the Tarkwa 2024 Vehicle Interaction Control Effectiveness (VICE) review, workshop participants identified misalignments between this key reference document and operational practice and conditions. These include:</p> <ul style="list-style-type: none"> <li>• Road and ramp conditions - construction and maintenance</li> <li>• Non-conforming intersections and circles (roundabout) design and construction</li> <li>• Limited availability and use of radios for general pit communications</li> <li>• Unclear Positive communications e.g. passing, and approaching mobile equipment</li> <li>• Obscured or missing Traffic Signage</li> <li>• Lack of infrastructure and signage to support management of pedestrians</li> <li>• Parking practices not aligned with documented requirements for physical segregation from heavy vehicles</li> </ul>	<p>Workshop participants report that haul road construction and maintenance is sometimes inadequate.</p> <p>Issues include steep ramps sometimes greater than 10%, rough ramps, substandard maintenance on haul roads. This situation increases equipment and tyre damage, slows production, and physically stresses operators.</p> <p>Confirm Tarkwa Mine road design standards and update processes to construct and maintain infrastructure to site standards.</p>	<p>hazards and reliable controls</p>	

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			<p>These issues were confirmed by supporting consultants during mine tours and interviews.</p> <p>Consider a review of the Tarkwa Traffic Management plan in conjunction with the development of Gold Fields Minimum Standards for Vehicle interaction controls. At a minimum the review should revisit and update minimum requirements for:</p> <ul style="list-style-type: none"> <li>• Intersection design - bench mark against industry developments since 2007 including defaults to T intersections where possible</li> <li>• Simplifying intersection design and construction to fully leverage upgrades and to support successful further deployment of CAS technology</li> <li>• Road and ramp maintenance</li> <li>• Positive communications protocols and practices</li> </ul>			
<p><b>OFI-141: Review, update, and apply the Tarkwa Traffic Management Plan.</b></p> <p><b>OFI-163: Review Road Construction and Maintenance Standards.</b></p>	<p><b>BI-SPV.81.10 Clear accountabilities for designers, surveyors, engineers, and planners in site relevant management plans</b></p>	<p><i>Site mine and road design guidelines and execution plans identify specific accountabilities for designers, engineers, and planners.</i></p>	<p>Site mine and road design guidelines and execution (e.g. traffic) management plans confirm site performance requirements and include specific accountabilities for designers, engineers, and planners.</p> <p>Designers, Surveyors, Engineers, and Planners reference and apply relevant site management plans (for stability, road design and traffic management) to provide for safe and productive operations.</p> <p>Designers, Surveyors, Engineers, and Planners manage and allocate resources to:</p> <ul style="list-style-type: none"> <li>• Develop and maintain work areas, roads and supporting infrastructure that meet site, company, and regulatory design standards and requirements.</li> <li>• Develop, maintain, review, and update the site management plans (as required).</li> </ul>	<p>Designers, surveyors and engineers generate designs by applying site requirements and, as required, conducting risk assessments for new locations or requirements.</p> <p>Short term planners trained and assessed in mine design guidelines and develop plans according to the guidelines.</p> <p>Issued designs are formally reviewed and marked as approved to mine or construct.</p> <p>Traffic management is considered at each process step.</p> <p><b>OFI-141 Review, update, and apply the Tarkwa Traffic Management Plan</b></p> <p><i>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI was first approved for use on the 01-03-07. It is still current but has not been reviewed and updated since initial publication. It is a comprehensive document</i></p>	<p>Regular planning meetings review traffic management.</p> <p>Design plans and related instructions are signed off by competent accountable personnel confirming that relevant road design and traffic management requirements are being met.</p> <p>Mine planners consider future vehicle interaction hazards and reliable controls.</p>	<ul style="list-style-type: none"> <li>⚠ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</li> <li>⚠ CFM-LRA.44.01 Inadequate Inspection and Management of Operating Environment</li> <li>⚠ CFM-MDA.61.06 Inadequate work planning means that heavy vehicle operators approach fixed structures that are incidental to achieving operational outcomes</li> <li>⚠ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> <li>⚠ CFM-SRA.87 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained</li> </ul>

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				<p>that confirms a range of site design and operating requirements that reflect good mine design and operating practice at Tarkwa.</p> <p>However, during the Tarkwa 2024 Vehicle Interaction Control Effectiveness (VICE) review, workshop participants identified misalignments between this key reference document and operational practice and conditions. These include:</p> <ul style="list-style-type: none"> <li>• Road and ramp conditions - construction and maintenance</li> <li>• Non-conforming intersections and circles (roundabout) design and construction</li> <li>• Limited availability and use of radios for general pit communications</li> <li>• Unclear Positive communications e.g. passing, and approaching mobile equipment</li> <li>• Obscured or missing Traffic Signage</li> <li>• Lack of infrastructure and signage to support management of pedestrians</li> <li>• Parking practices not aligned with documented requirements for physical segregation from heavy vehicles</li> </ul>		

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				<p>These issues were confirmed by supporting consultants during mine tours and interviews.</p> <p>Consider a review of the Tarkwa Traffic Management plan in conjunction with the development of Gold Fields Minimum Standards for Vehicle interaction controls. At a minimum the review should revisit and update minimum requirements for:</p> <ul style="list-style-type: none"> <li>• Intersection design - bench mark against industry developments since 2007 including defaults to T intersections where possible</li> <li>• Simplifying intersection design and construction to fully leverage upgrades and to support successful further deployment of CAS technology</li> <li>• Road and ramp maintenance</li> <li>• Positive communications protocols and practices</li> </ul> <p><b>OFI-163 Review Road Construction and Maintenance Standards</b></p> <p>Workshop participants report that haul road construction and maintenance is sometimes inadequate.</p> <p>Issues include steep ramps sometimes greater than 10%, rough ramps, substandard maintenance on haul roads.</p>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<p>This situation increases equipment and tyre damage, slows production, and physically stresses operators.</p> <p>Confirm Tarkwa Mine road design standards and update processes to construct and maintain infrastructure to site standards.</p>		
	<p><b>BI-SPV.82.01 Traffic Management Plan consultation and communication</b></p>	<p><i>Operators and other involved personnel contribute to the safe and productive use of mobile equipment at site.</i></p>	<p>The site has a formal consultation and communication approach that includes the development and maintenance of a traffic management plan.</p> <p>The process:</p> <ul style="list-style-type: none"> <li>• Involves knowledgeable and experienced personnel in planning</li> <li>• Informs all personnel about their responsibilities and expected actions</li> <li>• Engages with all personnel as part of any updating of the plan, technology selection or introduction of new processes</li> <li>• Gathers information about concerns, hazards, incidents, and other matters related to safe and productive operations</li> </ul>	<p>The traffic management plan is signed off.</p> <p>Operators, and other personnel who work around mobile equipment:</p> <ul style="list-style-type: none"> <li>• Are trained about formal and informal processes for health and safety consultation and communication at site.</li> <li>• Participate in traffic management planning and review processes including equipment changes, layout changes, and process changes.</li> <li>• Contribute to mobile equipment incident reviews</li> <li>• Workers/operators report hazards, incidents and other concerns to supervisors and more senior site personnel as required</li> </ul> <p>Supervisors routinely communicate and reinforce Traffic Management Plan requirements for:</p> <ul style="list-style-type: none"> <li>• Maintaining vehicle interaction controls</li> </ul>	<p>The site Traffic Management Plan is current, signed by a senior manager, and has a process for formal consultation and communication with operators and other personnel who work around mobile equipment.</p> <p>Contribution measures such as:</p> <ul style="list-style-type: none"> <li>• Incident and hazard reporting records related to mobile equipment</li> <li>• Records of training, awareness, and employee feedback sessions - content, attendance, and participation</li> <li>• Records of reviews that involve operators and other personnel who work around mobile equipment e.g. job safety analyses, task observations, change management reviews etc.</li> </ul> <p>Interviews with operators and other personnel who work around mobile equipment confirm knowledge about Site Traffic Management plan</p>	<ul style="list-style-type: none"> <li>⚠ CFM-LRA.44.01 Inadequate Inspection and Management of Operating Environment</li> <li>⚠ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> <li>⚠ CFM-SRA.87 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>OFI-162: Review mine planning input to speed limits.</b></p> <p><b>OFI-168: Confirm that experienced senior managers have oversight of site Traffic Management Plans.</b></p>	<p><b>BI-SPV.98.01</b></p> <p><b>There is a documented site Traffic Management Plan</b></p>	<p><i>There is a documented and current site Traffic Management Plan that assigns accountabilities and details the processes required for safe and operationally integrated outcomes when working with mobile equipment.</i></p>	<p>There is a site process for developing, implementing, and maintaining a traffic management plan (TMP) or equivalent that:</p> <ul style="list-style-type: none"> <li>• Documents the safe and productive outcomes required when working with or around mobile equipment</li> <li>• Includes requirements covering travel to and from the site (journey management) and addresses health and hygiene considerations for site rest and comfort areas</li> <li>• Identifies the situations and circumstances, where working with or around mobile equipment can result in fatalities, injuries and incidents (assessing hazards and risks)</li> <li>• Details the business and operational processes that prevent or mitigate the development of these potentially harmful situations and circumstances</li> <li>• Confirms how the status of these business and operational processes is monitored</li> <li>• Describes how these business and operational processes are maintained and improved</li> </ul> <p><b>GHG Tarkwa Traffic Management Plan, Mining Operations Procedure, TGM 1.10.54 WI as approved for use 01-03-07</b></p> <p><b>Part 2 Scope</b></p> <p>The scope of this document encompasses all Tarkwa Mine surface operations including contractors and near mine exploration activities. This plan applies to all roads that are serviced and controlled by Gold Fields Tarkwa Mine including all haul roads to the mining areas and any other areas used by vehicles and equipment on site such as car parks, Tailings Dam access roads, ROM pads, Waste dump and workshop areas. This plan outlines and controls the operation of all vehicles and equipment operating on site and the required vehicle and equipment standards that must be met. All personnel, including contractors and visitors, shall comply with the requirements outlined in this document.</p>	<ul style="list-style-type: none"> <li>• Reporting hazards and incidents</li> </ul> <p>The Traffic Management Plan details the site processes:</p> <ul style="list-style-type: none"> <li>• That ensure that people who operate or work around mobile equipment are trained, competent and authorised.</li> <li>• That govern how fit-for-purpose mobile equipment is selected and approved for site use.</li> <li>• For managing pedestrian and mobile equipment interactions and mobile equipment to mobile equipment interactions.</li> <li>• That guide knowledgeable and experienced people through the design, construction, and maintenance of the operating environment for mobile equipment.</li> </ul> <p>The TMP also confirms there is adequate capability and a plan for managing mobile equipment emergencies involving:</p> <ul style="list-style-type: none"> <li>• Trauma first aid</li> <li>• Freeing trapped or pinned personnel</li> <li>• Rescue from heights</li> <li>• Equipment fires</li> <li>• Equipment contacts with powerlines</li> </ul>	<p>responsibilities and key processes.</p> <p>The TMP is reviewed, updated, and confirmed as being fit-for-purpose by senior management:</p> <ul style="list-style-type: none"> <li>• After high potential mobile equipment incidents</li> <li>• Before significant operational changes e.g. engagement of contractors, opening of new production areas, deployment of new equipment etc.</li> <li>• Before the introduction of new technology e.g. mobile equipment operator fatigue monitoring, proximity detection systems etc.</li> <li>• Periodically – at least annually</li> </ul>	<ul style="list-style-type: none"> <li>△ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</li> <li>△ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</li> <li>△ CFM-LDA.43.01 Vehicle parking, including emergency parking is inadequately considered in mine design and routine work planning</li> <li>△ CFM-LDV.42.02 Speed limits and over-speed management are inadequately considered in mine design and routine work planning</li> <li>△ CFM-LDV.42.20 Reducing vehicle interactions through intersection design and traffic rules is inadequately considered in mine design and routine work planning</li> <li>△ CFM-LPV.41.20 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning</li> <li>△ CFM-LPV.44.02 Operational personnel do not maintain minimum standards for berms, windrows and other zone protection.</li> <li>△ CFM-MDA.61.01 Reducing vehicle interactions by maintaining clearances is inadequately considered routine work planning</li> <li>△ CFM-MPA.72.01 Access control infrastructure is inadequate</li> <li>△ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> <li>△ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> <li>△ CFM-SPA.88 Inadequate management of change</li> <li>△ CFM-SRA.87 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
				<ul style="list-style-type: none"> <li>• Equipment struck by lightning</li> </ul> <p>The TMP also documents how relevant external to site expectations are met for:</p> <ul style="list-style-type: none"> <li>• Regulatory and legal obligations</li> <li>• Company requirements</li> <li>• International Standards and good practice</li> </ul> <p><b>OFI-168: Confirm that experienced senior managers have oversight of site Traffic Management Plans</b></p> <p>Workshop participants discussed how experienced senior management from both Business Partners and Gold Fields have oversight and approve site traffic management plans and related processes. They also noted the extensive experience of senior managers from both Business Partners and Gold Fields.</p> <p>While processes are in place to delegate authority and review effectiveness, participants noted that pit conditions were not always to standard with variation in design and construction.</p> <p>Review and implement processes for maintaining, updating, and communication site traffic management plans. Confirm that site design and construction standards are applied and monitored.</p>		

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
	<b>BI-SRA.82 Consultation and communication</b>	<i>Multiple processes are in place to support effective health and safety communications between and across all organisational levels.</i>	<p>Multiple processes are in place to support effective two-way health and safety communication between and across all organisational levels, including:</p> <ul style="list-style-type: none"> <li>• Consultative hazard identification and control management processes at operational, task and individual levels (risk assessments, job safety analysis, and personal task checklists (risk analyses)).</li> <li>• Start of shift meetings addressing: Relevant operational information (general and from the preceding shift); Reinforcing task level hazard identification and control requirements; Promoting discussions and feedback on safety, health and operational matters, as required.</li> <li>• Representative committees with nominated worker representatives reflecting operating site structure, are established and monitor processes, performance, and progress against improvement plans and respond to incidents on and off site.</li> </ul> <p><b>GFWA ESG Contractors and Suppliers June 2023 - Part 36</b> summarises requirements for safety representatives and safety committee. Part 37 sets requirements for holding safety meetings and requires a minimum attendance of one per month for contractors and subcontractors.</p> <p><b>HSMP 2.3 PR CONSULTATION, COMMUNICATION AND PARTICIPATION</b></p> <p><b>PURPOSE</b></p> <p>The purpose of this document is to ensure that;</p> <ul style="list-style-type: none"> <li>• There are clear lines of communication for health and safety issues; and</li> <li>• Tarkwa Gold Mines (TGM) employees have the opportunity to contribute to the Health and Safety</li> <li>• management on site with regards to: <ul style="list-style-type: none"> <li>○ Programme development and implementation;</li> <li>○ Changes that affect workplace Occupational Health and Safety;</li> <li>○ The selection of people who will represent them in Occupational Health and Safety matters;</li> </ul> </li> </ul>	<p>Health and safety consultation and communication processes are in place that:</p> <ul style="list-style-type: none"> <li>• Are accessible and understood by everybody, including contractors, and people who are culturally or linguistically diverse</li> <li>• Are part of routine communications e.g. during tool-box talks, start of shift meetings, presentations, surveys and feedback forms, workplace observations</li> <li>• Where necessary include formal structured processes such as health and safety committees supported by worker representatives e.g. in large complex workplaces or team based risk analyses</li> </ul> <p>These consultation and communication processes:</p> <ul style="list-style-type: none"> <li>• Provide information about workplace changes</li> <li>• Communicate health and safety performance including progress against plans</li> <li>• Share information about issues and incidents</li> </ul>	<ul style="list-style-type: none"> <li>• Records from training, assessment, induction, and other meetings confirm that all personnel are aware of the site health and safety consultation and communication processes are maintained in site information management platforms.</li> <li>• Meeting and communication records include details on items and issues discussed.</li> <li>• Records of communication are collected, stored and accessed based on site document (information) control and privacy requirements.</li> <li>• Internal and external audits monitor the quality and quantity of hazard, incident and other reports to supervisors and more senior site personnel, as required.</li> </ul> <p><b>Contractor minutes from safety committee meeting are copied to the Health and Safety Department.</b></p>	<ul style="list-style-type: none"> <li>△ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</li> <li>△ CFM-LDA.43.01 Vehicle parking, including emergency parking is inadequately considered in mine design and routine work planning</li> <li>△ CFM-LDV.42.20 Reducing vehicle interactions through intersection design and traffic rules is inadequately considered in mine design and routine work planning</li> <li>△ CFM-SDA.90 Emergency or incident response is inadequate</li> <li>△ CFM-SPA.83.01 Operator fails to comply with site requirements</li> <li>△ CFM-SRA.87 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
			<ul style="list-style-type: none"> <li>○ Be informed as to who is/are their employee Occupational Health and Safety representative(s) and</li> <li>○ specified management representative(s) nominated by heads of department.</li> <li>○ Procedures exist for receiving, documenting and responding to relevant Health and Safety communication from external interested parties</li> </ul>	<ul style="list-style-type: none"> <li>● Reinforce health and safety hazards and their controls</li> <li>● Gather information about concerns, practical hazard management, and other matters relating to safe and productive operation</li> <li>● Allow workers to participate in workplace planning and review processes such as: Improvement planning and tracking; Incident reviews; Planning for workplace layout and process changes; Changes to equipment and plant in use</li> </ul>		
	<b>BI-SRA.97.10 Auditing of Management Systems</b>	<i>The safety management system conforms with requirements, is operationally integrated and adds value.</i>	<b>Requirements -</b> <ol style="list-style-type: none"> <li>1. An annual external audit is commissioned and formally received and actioned</li> <li>2. A schedule of internal audits, carried out by trained and competent leaders, is established for key elements of the HSMS. The frequency of internal audits carried out for each element is decided on a risk based approach.</li> <li>3. A system of recording the outcomes of audits is maintained.</li> </ol>	<ol style="list-style-type: none"> <li>1. Arrangements are made with an external auditor to carry out the required annual audits of the HSMS</li> <li>2. Site leaders delegated with the task of completing internal audits are trained and assessed in the audit process and have access to required audit instruments/tools</li> <li>3. The outcomes of both external and internal audits are reviewed by site senior leaders with non conformances addressed as required</li> </ol>	<ol style="list-style-type: none"> <li>1. Audit findings and reports are included in site document and information management systems.</li> <li>2. Recommendations from audits are reviewed by senior leaders and included in action tracking systems as appropriate.</li> </ol>	<ul style="list-style-type: none"> <li>△ CFM-CPA.10.04 Operators unaware of right of way requirements or operating constraints</li> <li>△ CFM-CPA.11.10 Operators or co-workers have required communications equipment but are not contactable</li> <li>△ CFM-SDA.90 Emergency or incident response is inadequate</li> <li>△ CFM-STA-91 Regulator prosecution</li> </ul>

Opportunity	BI Name	BI Expectation	Specify	Implement	Monitor	Related Credible Failure Modes
<p><b>OFI-168: Confirm that experienced senior managers have oversight of site Traffic Management Plans.</b></p>	<p><b>BI-SRV.83.02 Senior management review, update, and confirm the Traffic Management Plan as being fit-for-purpose</b></p>	<p><i>Senior managers periodically confirm that the site Traffic Management Plan (or equivalent) is fit-for-purpose.</i></p>	<p>The Traffic Management Plan is reviewed, updated, and confirmed as being fit-for-purpose by senior management:</p> <ul style="list-style-type: none"> <li>• After high potential mobile equipment incidents;</li> <li>• Before significant operational changes e.g. engagement of contractors, opening of new production areas, deployment of new equipment etc.</li> <li>• Before the introduction of new technology e.g. mobile equipment operator fatigue monitoring, proximity detection systems etc.</li> <li>• Periodically - at least annually.</li> </ul> <p><b>Occupational Health and Safety (OH&amp;S) Management System Manual Ref No - HSMP 1.0 MN Implementation Date – 24/12/2004</b></p> <p><b>5.1 LEADERSHIP AND COMMITMENT</b></p> <p>TGM Management shall demonstrate its commitment to Health and Safety leadership by:</p> <p>Leading by example;</p> <ul style="list-style-type: none"> <li>• Communicating positive health and safety values and behaviours throughout TGM;</li> <li>• Allocating adequate resources to health and safety management;</li> <li>• Establish processes to identify and assess health and safety hazards and to ensure compliance with legal and other obligations;</li> <li>• Co-ordinating, planning and delegating authority as appropriate;</li> <li>• Committing to measurable objectives, performance indicators and targets aimed at the elimination of occupational injuries and illness;</li> <li>• Ensuring that employees can participate in Health and Safety Management System activities;</li> <li>• Measuring performance and maintaining corrective action systems; and</li> <li>• Regularly reviewing the effectiveness of the Health and Safety Management System.</li> </ul>	<p>Traffic Management Plan reviews are prepared by Technical and Operational superintendents and reviewed by relevant stakeholders representing Survey, Engineering, Maintenance, Development, Services, and other relevant sections.</p> <p>The review process also involves inputs from knowledgeable and experienced operators, supervisors and health and safety committee members.</p> <p><b>OFI-168: Confirm that experienced senior managers have oversight of site Traffic Management Plans</b></p> <p>Workshop participants discussed how experienced senior management from both Business Partners and Gold Fields have oversight and approve site traffic management plans and related processes. They also noted the extensive experience of senior managers from both Business Partners and Gold Fields.</p> <p>While processes are in place to delegate authority and review effectiveness, participants noted that pit conditions were not always to standard with variation in design and construction.</p> <p>Review and implement processes for maintaining, updating, and communication site traffic management plans. Confirm that site design and construction standards are applied and monitored.</p>	<p>Routine operational reports confirm that the road network has been constructed and is being maintained to standard.</p> <p>By exception incident reporting.</p> <p>Formal reviews of the Traffic Management Plan to confirm if the site performance requirements are being met.</p> <p>Reviews also consider alignment between site performance requirements and</p> <ul style="list-style-type: none"> <li>• Industry good practice</li> <li>• Regulatory requirements</li> <li>• Company standards</li> </ul>	<ul style="list-style-type: none"> <li>⚠ CFM-EPV.27.20 Mobile Equipment does not meet standards for safe access, lighting, signage and identification markings</li> <li>⚠ CFM-LDA.42.01 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning</li> <li>⚠ CFM-LDA.43.01 Vehicle parking, including emergency parking is inadequately considered in mine design and routine work planning</li> <li>⚠ CFM-LDV.42.02 Speed limits and over-speed management are inadequately considered in mine design and routine work planning</li> <li>⚠ CFM-LPV.41.20 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning</li> <li>⚠ CFM-SDA.86 Work Environment and Work Demands result in Fatigued Mobile Equipment Operators or other Health Affects</li> <li>⚠ CFM-SDV.81.20 Inadequate mine traffic management plan (specification)</li> <li>⚠ CFM-SPA.81.07 Inadequate implementation of site traffic management plan</li> </ul>

