ADDENDUM TO THE PHASE 2 ENVIRONMENTAL IMPACT ASSESSMENT FOR THE EXPANSION PROJECT AT THE TASIAST MINE IN MAURITANIA

Prepared For
Tasiast Mauritanie Limited S.A.

Report Prepared by
SRK Consulting (UK) Limited
UK6646
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EXECUTIVE SUMMARY

ADDENDUM TO THE PHASE 2 ENVIRONMENTAL IMPACT ASSESSMENT FOR THE EXPANSION PROJECT AT THE TASIAST MINE IN MAURITANIA

This document is an Addendum to the Environmental Impact Assessment (EIA) for Phase 2 of the Tasiast Expansion Project at the Tasiast Gold Mine in Mauritania (the Mine) (URS, 2012). It focuses on the outcome of an optimisation exercise for Phase 2 of the Tasiast Expansion Project (the Expansion Project) and concerns incremental increases in production rates at the Mine. Two development steps are described in this Addendum and are named “Step 1” and “Step 2”. In summary, the optimisation is expected to result in the relocation or amendment of some of the infrastructure that was approved under the Phase 2 Environmental Impact Assessment as follows:

- The upgrade of the existing processing facilities and addition of new ore processing facilities next to the existing process plant, rather than the development of a new plant to the west of the pit (Steps 1 and 2);
- The potential relocation of Cell 1 in Step 1 (and if needed, Cell 2 in Step 2) of Tailings Storage Facility 3 (TSF3) to either the east of the pit or to a location slightly to the south of its original location to the west of the pit;
- The potential relocation of the new Phase 2 heavy fuel oil power plant from the west of the pit to a location adjacent to the existing processing plant (Step 2); and
- The addition of a new water supply pipeline from the borefield (Sondage) running parallel to existing pipelines (Step 2).

To evaluate if any change in the impact assessment undertaken for the Phase 2 EIA were required, SRK Consulting UK Ltd was appointed to review the available baseline and the proposed changes to the project description. It was confirmed by SRK that the baseline data collected during previous EIAs are sufficient to inform this EIA Addendum and no additional baseline data needed to be collected. The relevant sections of the impact assessment given in the Phase 2 EIA were then re-evaluated to determine if any changes were required.

Based on review of the available baseline data and the previously described impacts it has been concluded that the impact significance at the Mine site will not increase and there is potential for a slight reduction in the significance of some impacts. The slightly smaller area of disturbance may reduce the significance of impacts on biodiversity and cultural heritage, the lower production rate will result in lower overall emissions and greenhouse gases and the change in TSF construction method will reduce the risk of long term seepage from TSF3.

No changes to the recommended management measures presented in the Phase 2 EIA are required and the proposed Step 1 and 2 activities will be implemented under the requirements of TMLSA’s existing environmental and social management system and the associated plans.
and procedures.

TMLSA therefore considers the optimisation of Phase 2 of the Expansion Project can be implemented by TMLSA under the auspices of the Phase 2 EIA on the basis of:

- Smaller open pits: the optimized pit lies within the 60 000 t/day pit shell;
- Waste rock dumps (WRDs): waste rock will go into the approved dump areas;
- Smaller process plant: process plant capacity will be less than 60 000 t/day at up to 12,000 t/day (Step 1) and between 30,000 and 38,000 t/day (Step 2);
- TSF3: the two options being considered lying within areas already approved for mine residue disposal; and
- Smaller power generation facilities: the new power plant (50-60 MWe) is smaller than the approved one (120 MWe).

With respect to ongoing use of the borefield, TMLSA has permission to abstract at the current rate of 30,000 m$^3$/day until 2020. TMLSA recognise that an extension to this abstraction permit will be required to continue abstracting until the end of life of mine (currently expected to be around 2030). TMLSA is currently undertaking the necessary studies and preparing a technical report to support this permit extension application, therefore the continued use of the borefield does not form part of this EIA addendum.
Table of Contents

1 INTRODUCTION ........................................................................................................... 1
   1.1 Background on the project and this Addendum ......................................................... 1
   1.2 Background to environmental approvals ................................................................. 2
   1.3 Approach to the Addendum process ......................................................................... 2
   1.4 Project setting (adapted from Phase 2 EIA non-technical summary) ....................... 7

2 CHANGES TO PROJECT DESCRIPTION ....................................................................... 8

3 AVAILABLE BASELINE DATA FOR NEW INFRASTRUCTURE AREAS ............. 15

4 AMENDMENTS TO PHASE 2 EIA IMPACT ASSESSMENT .................................. 21
   4.1 Surface water and groundwater ............................................................................. 23
       4.1.1 Available baseline data .................................................................................. 23
       4.1.2 Impact discussion ......................................................................................... 23
       4.1.3 Management measures ............................................................................... 26
       4.1.4 Re-evaluation of impact significance .......................................................... 26
   4.2 Air quality ................................................................................................................. 26
       4.2.1 Available baseline data .................................................................................. 27
       4.2.2 Impact discussion ......................................................................................... 28
       4.2.3 Management measures ............................................................................... 29
       4.2.4 Re-evaluation of impact significance .......................................................... 29
   4.3 Noise and vibration ................................................................................................. 30
       4.3.1 Available baseline data .................................................................................. 31
       4.3.2 Impact discussion ......................................................................................... 31
       4.3.3 Management measures ............................................................................... 31
       4.3.4 Re-evaluation of impact significance .......................................................... 32
   4.4 Ecology and biodiversity ........................................................................................ 32
       4.4.1 Available baseline data .................................................................................. 32
       4.4.2 Impact discussion ......................................................................................... 33
       4.4.3 Management measures ............................................................................... 34
       4.4.4 Re-evaluation of impact significance .......................................................... 35
   4.5 Archaeology and cultural heritage .......................................................................... 35
       4.5.1 Available baseline data .................................................................................. 36
       4.5.2 Impact discussion ......................................................................................... 36
       4.5.3 Management measures ............................................................................... 37
       4.5.4 Re-evaluation of impact significance .......................................................... 37
   4.6 Landscape and visual .............................................................................................. 38
       4.6.1 Available baseline data .................................................................................. 39
       4.6.2 Impact discussion ......................................................................................... 39
       4.6.3 Management measures ............................................................................... 40
       4.6.4 Re-evaluation of impact significance .......................................................... 40
5 CONCLUSIONS .................................................................................................. 40
6 REFERENCES .................................................................................................. 42
List of Tables

Table 1.1: Existing Environmental Permits for Tasiast Mine (adapted from Tables 1-1 and 3-1 in the Phase 2 EIA, URS 2012a) ....................................................................................... 5
Table 2.1: Step 1 and 2 activities compared to Phase 2 EIA project description ...................... 9
Table 3.1: Baseline data used to assess Step 1 and 2 changes ............................................. 15
Table 4.1: Modified Leopold Matrix to evaluate Step 1 and 2 activities against the environmental and social aspects assessed in the Phase 2 EIA .................................................... 22
Table 4.2: Summary of potential residual impacts - surface water and groundwater .......... 26
Table 4.3: Summary of Tasiast air quality data from Phase 2 EIA ......................................... 28
Table 4.4: Summary of potential residual impacts - air quality .......................................... 30
Table 4.5: Summary of potential residual impacts - noise and vibration ............................. 32
Table 4.6: Summary of potential residual impacts - biodiversity ....................................... 35
Table 4.7: Summary of potential residual impacts – archaeology and cultural heritage ....... 38
Table 4.8: Summary of potential residual impacts – landscape and visual .......................... 40

List of Figures

Figure 1-1: Tasiast Mine location ....................................................................................... 4
Figure 2-1: Alternative 1 (12 kt/d + 18 kt/d) for new process layout (with Step 1 and Step 2 changes showing) ................................................................. 12
Figure 2-2: Alternative 2 (30 kt/d) for new process plant layout (Step 2 only) .......................... 13
Figure 2-3: Orientation of proposed Step 1 and 2 infrastructure (red) in relation to conceptual layout proposed in Phase 2 EIA (blue), with existing infrastructure (grey) ......... 14
Figure 3-1: Geology and location of groundwater monitoring boreholes ............................ 17
Figure 3-2: Air quality monitoring and weather station locations ........................................ 18
Figure 3-3: Location of biological monitoring sites during the Phase 2 EIA ........................... 19
Figure 3-4: Location of archaeological and cultural heritage sites identified at Tasiast Mine ..... 20
Figure 4-1: Old and new construction methods for TSF3 .................................................. 25
Figure 4-2: Wind direction for Tasiast Mine power plant weather station from July 2013 to July 2015 .............................................................................................................. 28

GLOSSARY, ABBREVIATIONS, UNITS ........................................................................ 1
# GLOSSARY, ABBREVIATIONS, UNITS

## Glossary

<table>
<thead>
<tr>
<th>Terms</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aquifer</strong></td>
<td>An underground layer of water-bearing permeable rock, or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be usefully extracted using a water well</td>
</tr>
<tr>
<td><strong>Biodiversity</strong></td>
<td>Biodiversity is the variety of life in all forms, including genetic, species and ecosystem diversity</td>
</tr>
<tr>
<td><strong>Brackish</strong></td>
<td>A description of water quality for water with total dissolved solids concentrations between 1500-5000 mg/L</td>
</tr>
<tr>
<td><strong>Carbon-in-leach circuit</strong></td>
<td>A method used to recover gold from fine ground ore by dissolution and adsorption of the metal onto fine carbon</td>
</tr>
<tr>
<td><strong>Dump leach facility</strong></td>
<td>Ore is taken directly from the Mine and stacked on a constructed, engineered surface with drainage features known as a leach pad. The ore is placed by end dumping from haul trucks (Dump) on the pad without crushing. For gold ore, the dump is irrigated with a dilute cyanide solution that percolates through the ore to dissolve gold. The solution containing gold exits the base of the dump, is collected and precious metals extracted. The resultant barren solution is recharged with additional cyanide and returned to the dump.</td>
</tr>
<tr>
<td><strong>Ecosystem</strong></td>
<td>A community of living organisms in conjunction with the components (air, water, soil) of their environment, interacting as a system</td>
</tr>
<tr>
<td><strong>Elution circuit</strong></td>
<td>Separation of material by washing to separate the heavier constituents from the lighter ones</td>
</tr>
<tr>
<td><strong>Gold doré</strong></td>
<td>A semi-pure alloy of gold and silver created at a Mine site</td>
</tr>
<tr>
<td><strong>Groundwater</strong></td>
<td>The level below the earth’s surface at which the ground becomes saturated with water</td>
</tr>
<tr>
<td><strong>Harmattan</strong></td>
<td>A dry and dust-laden West African trade wind</td>
</tr>
<tr>
<td><strong>Impact significance</strong></td>
<td>The significance of the unmanaged and managed impacts taking into consideration the probability of the impact occurring, the extent over which the impact will be experienced, and the intensity/severity of the impact</td>
</tr>
<tr>
<td><strong>Inchiri Wilaya</strong></td>
<td>A region in northwest Mauritania covering 44,672 km²</td>
</tr>
<tr>
<td><strong>Infrastructure</strong></td>
<td>The supporting installations and services that supply the needs of the Project</td>
</tr>
<tr>
<td><strong>IUCN Red List</strong></td>
<td>The IUCN Red List of Threatened Species™ catalogues and highlights plants and animals that are facing a higher risk of global extinction</td>
</tr>
<tr>
<td><strong>Management measures</strong></td>
<td>The measures attempting to prevent hazards from developing into disasters</td>
</tr>
<tr>
<td><strong>Open pit</strong></td>
<td>Mine excavation produced by the removal of surface and subsurface rock utilizing earthmoving equipment</td>
</tr>
<tr>
<td><strong>Ore</strong></td>
<td>Accumulation of minerals containing substances which can be economically recovered</td>
</tr>
<tr>
<td><strong>Permeability</strong></td>
<td>Degree to which fluids can move through rock or soil</td>
</tr>
<tr>
<td><strong>Receptors</strong></td>
<td>Comprises biological components such as vegetation and fauna or people or human-made systems, such as local residents, communities and social infrastructure</td>
</tr>
<tr>
<td><strong>Reverse osmosis</strong></td>
<td>A membrane-technology filtration method that removes many types of large molecules from solution by applying pressure</td>
</tr>
<tr>
<td><strong>Saline</strong></td>
<td>A description of water quality for water with total dissolved solids concentrations of more than 5000 mg/L</td>
</tr>
<tr>
<td><strong>Seepage</strong></td>
<td>The escape of liquids downward through the soil/substrate, in this case from engineering containment</td>
</tr>
<tr>
<td><strong>Stakeholder</strong></td>
<td>A person or group that has an investment, share, or interest in the Project.</td>
</tr>
</tbody>
</table>
Terms | Components
--- | ---
Tasiast Mine | The site of the existing Tasiast Mine comprising open pit mining, processing facilities and operations, and infrastructure within the El Gaïcha exploration permit PE 229
Waste rock | Mined rock that contains uneconomic quantities of minerals or substances, in this case gold. Typically waste rock surrounds the higher concentration economic rock, known as ore, and must be removed for access. Waste rock from open pit mining is trucked to and stacked in areas referred to as waste rock dumps (WRDs)

Abbreviations

| Abbreviation | Definition |
--- | ---
ADR | Adsorption, Desorption, Regeneration |
BP | Before Present |
CIL | Carbon-in-leach |
DLF | Dump Leach Facility |
EIA | Environmental Impact Assessment |
EIN | Environmental Impact Notice |
EU | European Union |
HCN | Hydrogen cyanide |
HFO | Heavy Fuel Oil |
IFC | International Finance Corporation |
ISO | International Organization for Standardization |
IUCN | International Union for Conservation of Nature |
LFO | Light fuel oil |
a | not applicable |
NO₂ | Nitrogen dioxide |
O₃ | Ozone |
PNBA | Parc National du Banc d’Arguin |
PM | Particulate Matter |
RN4 | Nouakchott-Nouâdhibou RN4 highway |
RO | Reverse Osmosis |
SO₂ | Sulfur dioxide |
SRK | SRK Consulting UK, Ltd |
SWS | Schlumberger Water Services |
TMLSA | Tasiast Mauritanie Limited SA |
TSF | Tailings Storage Facility |
UK | United Kingdom |
WHO | World Health Organization |
WRD | Waste Rock Dump |
### Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>Percent</td>
</tr>
<tr>
<td>µm</td>
<td>Micrometre</td>
</tr>
<tr>
<td>µS/cm</td>
<td>Micro-Siemens per centimeter</td>
</tr>
<tr>
<td>dB L\text{Aeq, 1 hour}</td>
<td>Decibels equivalent continuous level</td>
</tr>
<tr>
<td>dB(A)</td>
<td>A-weighted decibels</td>
</tr>
<tr>
<td>ha</td>
<td>Hectare</td>
</tr>
<tr>
<td>km</td>
<td>Kilometer</td>
</tr>
<tr>
<td>km(^2)</td>
<td>Square kilometre</td>
</tr>
<tr>
<td>m</td>
<td>Metre</td>
</tr>
<tr>
<td>m(^3)</td>
<td>Cubic metre</td>
</tr>
<tr>
<td>mg/L</td>
<td>Milligram per litre</td>
</tr>
<tr>
<td>mm</td>
<td>Millimetre</td>
</tr>
<tr>
<td>Mt</td>
<td>Megatonne or Million metric tone</td>
</tr>
<tr>
<td>Mtpa</td>
<td>Million tonnes per annum</td>
</tr>
<tr>
<td>MWe</td>
<td>Megawatt equivalent</td>
</tr>
<tr>
<td>t</td>
<td>Tonne</td>
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</tbody>
</table>
ADDENDUM TO THE PHASE 2 ENVIRONMENTAL IMPACT ASSESSMENT FOR THE EXPANSION PROJECT AT THE TASIAST MINE IN MAURITANIA

1 INTRODUCTION

This document is an Addendum to the Environmental Impact Assessment (EIA) for Phase 2 of the Tasiast Expansion Project (the Expansion Project) at the Tasiast Gold Mine (the Mine) in Mauritania. It focuses on the outcome of an optimisation exercise on Phase 2 of the Expansion Project. It considers incremental increases in production rates by means of two development steps named “Step 1” and “Step 2”. In summary, the optimisation is expected to result in the relocation or amendment of some Phase 2 infrastructure as follows:

- The upgrade of the existing processing facilities and addition of new ore processing facilities next to the existing process plant, rather than the development of a new plant to the west of the pit (Steps 1 and 2);
- The potential relocation of Cell 1 in Step 1 (and if needed, Cell 2 in Step 2) of Tailings Storage Facility 3 (TSF3) to either the east of the pit or to a location slightly to the south of its original location to the west of the pit;
- The potential relocation of the new Phase 2 heavy fuel oil power plant from the west of the pit to a location adjacent to the existing processing plant (Step 2); and
- The addition of a new water supply pipeline from the borefield (Sondage) running parallel to existing pipelines (Step 2).

1.1 Background on the project and this Addendum

The Mine is an operational gold mine, situated in the Inchiri Wilaya of north western Mauritania (Figure 1-1). Operations at the Mine commenced in July 2007, initially under the ownership of Rio Narcea Gold Mines and subsequently, following acquisition, under Red Back Mining Inc. Kinross Gold Corporation (Kinross) completed the acquisition of the Mine on September 17, 2010 as part of its combination with Red Back Mining Inc. Tasiast Mauritanie Limited SA (TMLSA), a wholly owned subsidiary of Kinross, is the operator of the Mine.

On commissioning, the Mine had a predicted life of ten years, at a nominal milling rate of 3,200 tonnes per day (t/day). As a consequence of identifying further gold resources through its continuing exploration within the mining licence area (MLA), TMLSA planned to expand its operations. The expansion is being implemented in phases. As a result of recent development activities presented within previous impact assessments (Section 1.2), the Mine has a current production of about 9,000 t/day. Some elements of Phase 2 of the expansion (relating to on-site expansion activities) and Phase 3 (relating to off-site expansion activities) have not yet commenced.
The Phase 2 Environmental Impact Assessment (Phase 2 EIA) (URS 2012) was approved in July 2012 (Approval Letter Reference: 1049/M.P.E.M/MM, 25 July 2012). The Phase 2 EIA allowed for expansion of production up to between 60,000 to 70,000 t/day but indicated that the capacities of the various expansion components would be refined as part of appropriate feasibility studies and detailed design processes (Section 3.2.1 of the Phase 2 EIA).

In early 2015, a decision was made to postpone proceeding with Phase 2 of the Expansion Project due to the unfavourable market conditions and, since then, the Mine has continued to operate at a loss. TMLSA therefore initiated a process to identify opportunities for improving and optimizing its operations, within the constraints of the current gold price.

As explained in TMLSA’s advisory letter submitted to the Mauritanian Government on the 4 December 2015, the optimisation of Phase 2 of the Expansion Project has resulted in a decision to not build a new carbon-in-leach (CIL) as proposed in the Phase 2 EIA. Rather a two-step expansion of the existing CIL process plant is now proposed. This would facilitate increased production without the significant costs associated with construction of a standalone CIL plant to the west of the pit. The proposed Step 1 expansion of the existing CIL plant would seek to increase production capacity of the existing processing plant to a nominal 12,000 t/day. Once that level of production is achieved, TMLSA would consider further expansion(s) up to approximately 38,000 t/day (Step 2).

The optimisation of the Expansion Project is also considering the potential move of certain infrastructure within the Phase 2 permitted footprint, such as TSF3 and the power station. Although the environmental impacts of these changes are discussed in this document the final decision to relocate infrastructure will also need to be based on project economics. This addendum will feed into the final decision making process. The timing of further expansion(s) beyond 12,000 t/day (Step 1) is contingent upon many factors including market conditions (gold price) and technical considerations.

This document provides clarity on the expansion activities that TMLSA intends to implement during Steps 1 and 2 of the Expansion Project. It highlights any differences from the project description provided in the Phase 2 EIA and provides an explanation and justification of why the changes will not result in any major alteration to the impact significance or management measures identified in the Phase 2 EIA.

1.2 Background to environmental approvals

Previous impact assessments and current status of permitting for operations and the proposed expansions are summarised in Table 1.1, which has been adapted from Table 1-1 and Table 3-1 in the Phase 2 EIA. This information shows there have been extensive investigations of the areas currently disturbed by mining operations and water supply to the mine, as well as the areas likely to be disturbed by known future expansions.

Where relevant to support this Addendum, reference has been made to the different EIAs in Table 1.1 as they contain project description, baseline or impact information to support the evaluation of the Step 1 and 2 activities. Full references are not given each time the different documents are referenced, as these can be found in the table and in the reference section at the end of this report (Section 6).

1.3 Approach to the Addendum process

The scope of work undertaken to compile this EIA Addendum involved the following activities:

- Desktop review of available Environmental & Permitting data;
- Evaluation of the Phase 2 EIA project description with respect to the location and type of activities proposed for Steps 1 and 2 to determine whether the activities are significantly different to those originally proposed (Section 2);

- Evaluation of available baseline data (collected as part of the Phase 2 EIA or subsequent to the completion of the Phase 2 EIA) that characterise areas potentially affected by the activities proposed as part of Steps 1 and 2, to confirm there are sufficient data to inform the review of the Phase 2 EIA impact assessment (Section 3);

- Review of the impacts identified and evaluated in the Phase 2 EIA to determine if the proposed changes to the Phase 2 project description will alter the nature of the impacts, the potential receptors affected by the impacts and thus the significance of the predicted impacts (Section 4); and

- Identification of any changes needed to the management measures proposed in the Phase 2 EIA (Section 4).

No specific stakeholder engagement is proposed to be undertaken as part of this Addendum but the proposed changes to Phase 2 of the Expansion Project will be discussed with project stakeholders as part of the routine engagement undertaken by TMLSA.
LEGEND

- Borefield pipeline
- Sondage borefield
- Banc d'Arguin National Park
- Tasiast Mine boundary
- Tasiast mine access road
- RN4 highway
- Settlement

Coordinate System: WGS 1984 UTM Zone 28N
Datum: WGS 1984

Figure 1-1

Tasiast Mine Location
Table 1.1: Existing Environmental Permits for Tasiast Mine (adapted from Tables 1-1 and 3-1 in the Phase 2 EIA, URS 2012a)

<table>
<thead>
<tr>
<th>EIAs for the Mine and new developments</th>
<th>Outline of project components covered</th>
<th>Approval status</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Original Environmental Impact Assessment (EIA) | Initial mine design allowing for:  
- Open pit mining of 5 open pits  
- Crushing and milling of ore  
- Processing through a conventional carbon-in-leach (CIL) gold plant to produce gold doré treating 3,200 tonnes/day (t/day) of ore (3,600 t/day design)  
- Waste rock dumps (WRDs)  
- Tailing storage facility (TSF)  
- Support infrastructure including an accommodation camp, air strip, offices, laboratory and clinic. | Approved – Permit No. 407/MDAPMCEDD/M | SNC Lavalin 2004 |
| EIA Addendum I | Update to address requirements of new legislation, in particular a non-technical summary of original EIA | Approved under Permit No. 407/MDAPMCEDD/M | Scott Wilson 2008a |
| EIA Addendum II | Supporting infrastructure:  
- Access road  
- Additional TSF storage | | Scott Wilson 2008b |
| EIA Addendum III | Update to address requirements of new legislation, in particular an environmental management plan for original EIA | | Scott Wilson 2008c |
| EIA Addendum IV | Update to address requirements of new legislation, in particular a preliminary rehabilitation and closure plan | | Scott Wilson 2008d |
| EIA for New Developments | Support increased process plant productivity up to 9,000 t/day (up to 3.3 Million tonnes per annum or Mtpa) with:  
- New Tailings Storage Facility (TSF II)  
- Dump Leach Facility (DLF)  
- Expansion of the borefield | Approved – Permit No. 408/MDAPMCEDD/M | Scott Wilson 2009 |
| West Branch EIA | Support increased process plant productivity with:  
- A new open pit  
- New DLF  
- Additional power generation near the existing power generation facility  
- Additional WRDs | Approved – Permit No. 00001209/M.P.E.M/M | Scott Wilson 2010a |
## EIAs for the Mine and new developments

<table>
<thead>
<tr>
<th>EIA Type</th>
<th>Outline of project components covered</th>
<th>Approval status</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expansion Phase 1a(i) Environmental Impact Notice (Phase 1a(i) EIN)</td>
<td>Supporting infrastructure and preliminary upgrades to meet the objective of 9,000 t/day:</td>
<td>Approved</td>
<td>URS Scott Wilson 2011a</td>
</tr>
<tr>
<td></td>
<td>- Access road upgrade</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Borrow pits and mobile crusher</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Increase in borefield water abstraction to 17,000 m³/day</td>
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<tr>
<td></td>
<td>- New water pipeline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expansion Phase 1a(ii) EIN (Phase 1a(ii) EIN)</td>
<td>Supporting infrastructure and preliminary upgrades:</td>
<td>Approved</td>
<td>URS Scott Wilson 2011b</td>
</tr>
<tr>
<td></td>
<td>- Additional accommodation (500 beds)</td>
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<tr>
<td></td>
<td>- New warehouse and office facilities</td>
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<tr>
<td></td>
<td>- Expanded fuel farm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Temporary increase in borefield abstraction to 17,000 m³/day</td>
<td></td>
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</tr>
<tr>
<td>Expansion Phase 1b EIA (Phase 1b EIA)</td>
<td>Supporting infrastructure and preliminary upgrades:</td>
<td>Approved – Permit No. 00001210/M.P.E.M/M</td>
<td>URS Scott Wilson 2011c</td>
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<tr>
<td></td>
<td>- New TSF3 (starter cell)</td>
<td></td>
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<tr>
<td></td>
<td>- Foundation works for new CIL process plant, mill and new power plant</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>- Power plant expansion and new fuel farm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Additional accommodation (6,000 beds)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- New Waste Management Facility</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- New airstrip</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- Temporary (up to four years) increase in borefield abstraction to 30,000 m³/day and increase reverse osmosis (RO) capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expansion Phase 2 EIA (Phase 2 EIA)</td>
<td>Main developments (on-site) to enable increased production of up to between 60,000 and 70,000 t/day:</td>
<td>Approved – Permit No. 00001049/M.P.E.M/M</td>
<td>URS 2012a</td>
</tr>
<tr>
<td></td>
<td>- Expanded open pit and new WRDs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- New CIL process plant and mill and new heap and dump leach facilities</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- New TSF3 (Cells 1, 2 and expansion area)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- New power plant and distribution system</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- New ancillary facilities and infrastructure required for on-going operations including accommodation and internal roads</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>- Continued use of continue three pipelines from the borefield at a rate of approximately 30,000 m³/day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expansion Phase 3 EIA (Phase 3 EIA)</td>
<td>Main infrastructure developments to support Phase 2 of the Expansion (off-site):</td>
<td>Approved – Permit No. 00000844/M.P.E.M/MM</td>
<td>URS 2013a</td>
</tr>
<tr>
<td></td>
<td>- Sea water abstraction system and sea water pipeline (approx. 150 km)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- Access road from RN4 highway to sea water abstraction point and along sea water pipeline</td>
<td></td>
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<tr>
<td></td>
<td>- Power generation and distribution at abstraction point or a transmission line from the Mine</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Off-Site ancillary facilities, such as offices and accommodation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expansion Phase 3 EIA Addendum</td>
<td>Clarification of queries raised by Institut Mauritanien de Recherches Océanographiques et des Pêches (IMROP) and the Parc National du Banc d’Arguin (PNBA)</td>
<td>Approved – Permit No. 00000751/M.P.E.M/MM</td>
<td>URS 2013b</td>
</tr>
</tbody>
</table>
1.4 Project setting (adapted from Phase 2 EIA non-technical summary)

The Inchiri region is a sparsely populated, arid-desert area and contains a population of 9,936 or approximately 0.3% of the country’s population. The nearest towns and industries are over 100 km from the Mine at Boulanol in Dakhlet-Nouâdhibou, and Bennichab (water bottling) and Akjoujt (Guelb Moghrine copper-gold mine) in Inchiri.

There are no permanent settlements within the vicinity of the Mine however a number of isolated families have set up structures and reside within three communities: Imkebdene (5 households), Guelb Dawass (48 households) and Ntalve (11 households)\(^1\). Residents practice animal husbandry and other subsistence forms of livelihood. Similarly at the junction of the Mine access road and the Nouakchott-Nouâdhibou RN4 highway, a few families have set up structures and provide a range of services (such as an inn, restaurant, and shop) for travellers.

Mining forms an important part of Mauritania’s economy and is the largest source of foreign exchange for the country.

The Mine is the only permanent land use in the area. Use of the surrounding area is limited to grazing of livestock owned by the local resident families and by passing nomadic groups that occasionally transit the area.

Average annual rainfall is low (approximately 90 mm) and there are no permanent surface watercourses at the Mine or within the vicinity but storms can cause temporary floods in wadis and across open ground. There is no viable aquifer at the Mine site and although groundwater is present in pores and fractures of the rock, the volumes of water are small and difficult to extract. The limited groundwater at the Mine site has a high salt content (brackish to saline). Due to the small volume and poor quality of the groundwater, it is not feasible to extract it and it has no usable value. Water for the mine is supplied by a saline borefield (known as the Sondage) that has a high transmissivity and thus enables abstraction more readily.

The soil is minimal and dominated by sand deposits, numerous rock outcrops, gravel and small pockets of sediment in wadi channels.

Due to the remote location of the Mine, existing noise levels and ambient air quality are influenced by the operation of the existing Mine and the surrounding desert conditions.

Vegetation cover is sparse, although three tree species, protected by national decree, have been identified within the Mine site. The fauna (birds, mammals and invertebrates) identified have relatively low diversity of species. None of the floral or faunal species recorded are officially classed as rare, threatened or protected. The nearest protected area (65 km to the west of the Mine site) is the internationally renowned PNBA.

The Mine area is characterised by three key types of archaeological sites, which are protected by national/Islamic law and customary practice: Neolithic (c.6000 – 2800 Before Present “BP”) occupation sites on stable ogolian dunes; Protohistoric (c.2500 BP – 1000 BP) tombs clustered on gravels and rocky ridges; and historic Muslim tombs (8th century to present). None of the sites identified during previous surveys at the Mine site have been formally designated according to national or international standards in terms of their outstanding aesthetic, artistic, documentary, environmental, historic, scientific, social or spiritual value.

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\(^1\) According to social data collected in 2013 (BEAS, 2013)
2  CHANGES TO PROJECT DESCRIPTION

Table 2.1 summarises the project description given in the Phase 2 EIA and the optimised activities now proposed for Steps 1 and 2 of Phase 2 of the Expansion Project. The table highlights where there may be differences between the two project descriptions and comments on the implications of these. It is noted that the feasibility study for Step 1 and the pre-feasibility study for Step 2 are still underway and thus the description given here is indicative. Trade off studies to support final decision making regarding the location of TSF3 and the Phase 2 power plant are underway and the alternatives being considered are presented in Table 2.1.

This EIA Addendum focuses on aspects of the Step 1 or 2 activities that could result in differences to the impacts described in the Phase 2 EIA. Where differences are possible, these are further discussed in Section 4.

Some of the Phase 2 infrastructure components described in the Phase 2 EIA report and the associated impacts are not envisaged to occur during Steps 1 and 2 (Table 2.1) either because they have already taken place or because they are no longer planned to occur in the immediate future.

With respect to ongoing use of the borefield, TMLSA has permission to abstract at the current rate of 30,000 m$^3$/day until 2020. TMLSA recognise that an extension to this abstraction permit will be required to continue abstracting until the end of life of mine (currently expected to be around 2030). It is currently undertaking the necessary studies and preparing a technical report to support this permit extension application, therefore the continued use of the borefield does not form part of this EIA addendum.
### Table 2.1: Step 1 and 2 activities compared to Phase 2 EIA project description

<table>
<thead>
<tr>
<th>Phase 2 EIA Section</th>
<th>Project description from Phase 2 EIA</th>
<th>Project description of Steps 1 and 2</th>
<th>Implications of proposed project description changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2.2: Mining</td>
<td>Development of one large pit approximately 10-13 km long, 2 km wide and 700 m deep, Staged increase in mining fleet</td>
<td>Development of multiple pits along a 13 km long strike with the largest pit (West Branch) being 3km long, 1.5km wide and 500m deep, Staged increase in mining fleet</td>
<td>None – no change in impacts or management measures expected</td>
</tr>
<tr>
<td>3.2.3.1: Processing with new carbon-in-leach (CIL) plant</td>
<td>New CIL plant to the west of the pit comprising: Primary crusher, Grinding using 12.2 m diameter semi-autogenous grinding mill followed by two parallel 8.2 m diameter ball mills (includes recirculation of oversize back to the ball mills), Gravity concentration and intensive leach reactor, Thickening and leaching using dilute cyanide solution before feeding into series of eight 17.5 m diameter tanks with activated carbon, Carbon elution by acid wash, hot caustic solution elution and carbon regeneration, Electro-winning and refining at existing Adsorption, Desorption, Regeneration (ADR) plant with some additional equipment, Thickening and new tailings cyanide destruction</td>
<td>Upgrade of the existing process plant and addition of new processing circuits to the east of the pit comprising: New primary crusher with gyratory and pebble crushing facilities (Step 1), addition of second pebble crusher (Step 2) and a new ore stockpile and conveyors (Step 1), New semi-autogenous grinding (SAG) mill (Step 1) and replacement of the ball mills (Step 2), No change to gravity circuit, Additional carbon-in-leach tanks (Step 1) followed by new tanks in Step 2, as well as new oxygen plants (Step 1 and Step 2) and a lime slaking plant to improve gold recoverability (Step 1), Upgrade and slight expansion of elution and regeneration circuit (Step 1) with further elution capacity added in Step 2, New Gold Room next to CIL Plant (Step 2), New thickeners for pre-leach material and tailings, including the cyanide destruction circuit (Step 2)</td>
<td>There is no change in the proposed type of equipment or ore processing techniques to be used, however rather than a new CIL plant to the west of the pit, the new processing activities will comprise the upgrade of the existing plant for Step 1 (12 kt/day). In Step 2 the additional processing circuits may be sized to complement ongoing use of the existing plant (18 kt/day) or be sized to completely replace the existing plant (30 kt/day) (Figure 2-1 and Figure 2-2)</td>
</tr>
<tr>
<td>3.2.3.2: Processing by dump leach</td>
<td>Additional dump leach pads and pond system adjacent to Piment dump leach facility (DLF), New ADR plant</td>
<td>No change to Phase 2 EIA plan</td>
<td>None – no change in impacts or management measures expected</td>
</tr>
<tr>
<td>3.2.3.3: Processing by heap leach</td>
<td>If required, new pads of crushed ore using similar ponds and pipework to those of dump leach</td>
<td>No change to Phase 2 EIA plan</td>
<td>None – no change in impacts or management measures expected</td>
</tr>
<tr>
<td>3.2.4.1: Waste rock dump (WRD)</td>
<td>Used for construction and land bridge across central zone of pit, Development of four WRDs (two near Piment Pit and two near West Branch area)</td>
<td>Used for construction as required, Continued development of four WRDs to either side of the larger pits as proposed in Phase 2 EIA</td>
<td>None – no change in impacts or management measures expected</td>
</tr>
<tr>
<td>Phase 2 EIA Section</td>
<td>Project description from Phase 2 EIA</td>
<td>Project description of Steps 1 and 2</td>
<td>Implications of proposed project description changes</td>
</tr>
<tr>
<td>---------------------</td>
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<td>-----------------------------------------------------</td>
</tr>
</tbody>
</table>
| 3.2.4.2: Tailings storage facilities | - Development of Cells 1 & 2 of TSF3 adjacent to the starter cell for TSF3 built to the west of the pit (to contain up to 276 Mt of tailings)  
- Constructed as a lined ring dyke facility with a series of lifts until Cell 1 attains its maximum design elevation (approximately 40 m) | - Development of Cell 1 of TSF3 in a new location either to the east of the pit (Option 1) or slightly further south of the original site to the west of the pit (Option 2)  
- Cell 1 will contain up to 80 Mt (Step 1) and be built using downstream construction methods with lining of all four sides and the base  
- If needed, development of Cell 2 of TSF3 next to Cell 1 to contain a potential further 80Mt (Step 2) | The final location will be decided based on the trade-off studies (the options are shown on Figure 2-3) and the construction method is changing from upstream construction to downstream construction (discussed further in Section 4.1.2) |
| 3.2.5: Power supply | - New power plant to the west of the pit comprising either a 120 MWe Heavy Fuel Oil (HFO) reciprocating power plant or a multi-fuel 140-160 MWe gas turbine combined cycle power plant  
- New fuel farm/s  
- New 33 kV outdoor switch yard designed to meet electrical loads and buried or over-head transmission lines | - Power plants:  
  - Step 1: Continue to use existing Power Plants 1, 1B and TTV  
  - Step 2: Continue using Plant 1B & build a new HFO reciprocating engine power plant (sized at 50-60 Mega Watt electrical (MWe)) either to the original location next to Power Plant 1B to the west of the pit or to a proposed new location to the east of the pit - continue using Power Plants 1 and TTV for backup if needed  
- New fuel farm adjacent to the new power plant  
- New power line route (33kV distribution) from Plant 1B to existing process plant to provide redundancy | There will still be two operational power plants running as presented in the Phase 2 EIA but the location of the new plant may move to the east of the pit (pending final trade-off studies and with the alternative location shown in Figure 2-3) and the new plant is smaller than originally envisaged in the Phase 2 EIA |
| 3.2.6: Ancillary facilities | - New offices to both the west and east of the pit  
- New workshops to both the west and east of the pit  
- New warehouse and laydown area  
- New reagent storage facility to the west of the open pit  
- Possible increase in explosive storage  
- Expanded accommodation facilities  
- Expanded medical facilities  
- New 5 t waste incinerator and new waste laydown areas  
- New raw water storage pond  
- Four new reverse osmosis (RO) plants  
- Expanded stormwater management system  
- Additional internal access roads | - No further planned increase of the accommodation camp, workshop and office spaces, explosive storage, medical facilities or RO treatment envisaged for Steps 1 and 2 (over and above what has already occurred as part Phase 2 of the Expansion Project)  
- Some additional internal roads to support the new processing infrastructure (Steps 1 and 2)  
- Upgrade existing reagent storage (Step 1) and develop new reagent storage near expanded plant to east of pit (Step 2)  
- Relocation of the emergency storage pond (Steps 1 and 2)  
- Temporary re-establishment of existing decommissioned construction camp and laydown areas | No change in impacts or management measures expected as many of the proposed expansion activities have already taken place or will not take place during Steps 1 and 2 and those that are required will be located within the existing disturbed footprint of the general process plant area |
<table>
<thead>
<tr>
<th>Phase 2 EIA Section</th>
<th>Project description from Phase 2 EIA</th>
<th>Project description of Steps 1 and 2</th>
<th>Implications of proposed project description changes</th>
</tr>
</thead>
</table>
| 3.2.7 Water supply  | • Licenced 30,000 m³/day supply from Sondage borefield  
• Increase water supply covered by Phase 3 EIA of the Expansion Project (seawater supply) | • No proposed amendments with water requirements met by continued use of existing borefield - Steps 1 is expected to use a maximum of 20,000 m³/day and an average of about 13,000 m³/day. Step 2 will use between 24,000 m³/day and the maximum allowable amount of 30,000 m³/day  
• To ensure security of supply, construction of a fourth pipeline from the borefield to the Mine site running in parallel with the existing three pipelines (Step 2) | Continued use of the borefield rather than a new seawater pipeline with a new pipeline in existing pipeline corridor (Figure 1-1) |
| 3.2.8 Access       | • Access road will continue to be maintained during the Project construction period  
• New air strip may be developed as part of the Project (permitted in Phase 1b) | • No proposed amendments to what was in the Phase 2 EIA | No change in impacts or management measures expected |
| 3.2.9 Labour       | • Labour force will increase in relation to the scale of the construction, operation and closure activities subject to the refinement of the Project scope and construction sequencing schedule, which will be confirmed following completion of the feasibility studies | • Changes in workforce parameters commensurate with change in other expansion parameters and subject to refinement of the Project scope and construction sequencing schedule | As production rates are lower and the Project scope will be lesser, the workforce numbers will necessarily be less than originally envisaged |
| 3.2.10 Traffic     | • Transportation requirements to increase in relation to the scale of the construction, operation and closure activities - a variety of transportation types and frequencies are required | • Increases in transport to and from mine to support expansion will be required with the exact quantities subject to refinement of the Project scope and construction sequencing schedule being done as part of the feasibility studies | No increase in impacts or management measures expected above those predicted in Phase 2 EIA (as overall vehicle movement likely to be less than originally envisaged) |
| 3.2.11 Closure     | • Retention of pit  
• Dismantling of structures (plant, offices, workshop, power plant etc.) and foundations broken up/covered  
• Retain but make chemically and physically safe dump and heap leach facilities  
• Natural revegetation of WRDs  
• Cap TSFs with fill and manage slopes to minimise erosion  
• Compaction and rockfill capping of waste management facility  
• Storm water system left in place  
• Roads ripped and regraded | • No change to Phase 2 EIA plan, though tailings deposition to the TSF3 starter cell will cease once TSF3 Cell 1 is operational | No change in impacts or management measures expected |
Notes

1. Number of Leach and CIL tanks to be confirmed
2. Diameter of Pre-Leach and Tailings Thickener to be confirmed
3. Reagents preparation facilities location to be confirmed
4. Gold room location to be confirmed

Figure 2-1: Alternative 1 (12 kt/d + 18 kt/d) for new process layout (with Step 1 and Step 2 changes showing)
Notes
1. Number of Leach and CIL tanks to be confirmed
2. Diameter of Pre-Leach and Tailings Thickener to be confirmed
3. Reagents preparation facilities location to be confirmed
4. Gold room location to be confirmed

Figure 2-2: Alternative 2 (30 kt/d) for new process plant layout (Step 2 only)
Orientation of proposed Step 1 and 2 infrastructure (red) in relation to conceptual layout proposed in Phase 2 EIA (blue), with existing infrastructure (grey).

Coordinate System: WGS 1984 UTM Zone 28N
Datum: WGS 1984
3 AVAILABLE BASELINE DATA FOR NEW INFRASTRUCTURE AREAS

To support the re-evaluation of environmental and social impacts (Section 4) an evaluation was done of the available baseline data to confirm there was sufficient coverage for the areas potentially affected (Table 3.1). Reference is made both to the previous EIAs as well as more recent data collected by TMLSA as part of its routine environmental monitoring programme.

The proposed changes and extensions to the existing CIL process plant and the alternative location for the new power plant infrastructure are proposed to be built in an area that is already disturbed as a result of the existing Mine infrastructure. The alternative TSF3 location is in an area designated for waste rock disposal in the Phase 2 EIA. Nevertheless, the availability of data to evaluate possible impacts was still reviewed.

Review of this information concludes that the available data adequately cover the spatial areas potentially impacted by changes to Phase 2 of the Expansion Project within the Mine area and are used to inform the impact assessment below. No additional baseline data were collected to inform this Addendum. Relevant baseline data to support the impact assessment are summarised as part of the discussion below.

Table 3.1: Baseline data used to assess Step 1 and 2 changes

<table>
<thead>
<tr>
<th>Environmental component</th>
<th>Reference</th>
<th>Status of available baseline data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface water and groundwater</td>
<td>Phase 2 EIA, §6.2</td>
<td>Regional climatic data from Atar weather station in the Phase 2 EIA with more recent site specific data from TMLSA’s on-site weather stations</td>
</tr>
<tr>
<td></td>
<td>Phase 1b EIA, §6.4.2</td>
<td>Surface water drainage shown on Figure 6.1 in the Phase 2 EIA and covers the mine site</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface water drainage for the borefield and pipeline is qualitatively described in the Phase 1a EINs (Table 1.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 boreholes at the mine site described in the Phase 2 EIA and a total of 18 currently monitored at site (Figure 3-2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring of the effects of drawdown at the borefield are described in the Phase 1b EIA with further evaluation undertaken by Schlumberger Water Services (SWS) in 2015 (unpublished)</td>
</tr>
<tr>
<td>Air quality</td>
<td>Phase 2 EIA §7.3.2 and §7.3.3 Emissions monitoring report²</td>
<td>Five air quality monitoring locations at the mine site sampled as part of the Phase 2 EIA (Figure 3-2) measuring sulfur dioxide, nitrogen dioxide and ozone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operational hydrogen cyanide (HCN) gas detection at four sites around the storage pond and dump leach facilities as reported in the Phase 2 EIA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One set of emissions data from the HFO power plant, gold kiln and incinerator (January 2015)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Qualitative evaluation of particulate matter in Phase 2 EIA</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Phase 2 EIA §8.2</td>
<td>Qualitative evaluation of noise and vibrations in Phase 2 EIA</td>
</tr>
<tr>
<td>Ecology and biodiversity</td>
<td>Phase 2 EIA, §10.1</td>
<td>Botanical, ornithological and fauna driving and point surveys at the mine site (Figure 3-3) in the Phase 2 EIA</td>
</tr>
<tr>
<td></td>
<td>Phase 1b EIA, §10.3</td>
<td>Historical data available from earlier EIAs is described in the Phase 2 EIA, Table 10-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flora and fauna along the pipeline and at the borefield is qualitatively described in Phase 1b EIA</td>
</tr>
</tbody>
</table>

² Emissions Monitoring – Kinross Gold Mine, Tasiast, Mauritania, Pacific Environment Limited, 30 January 2015
<table>
<thead>
<tr>
<th>Environmental component</th>
<th>Reference</th>
<th>Status of available baseline data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-economic</td>
<td>Phase 2 EIA, §11.3.2 &lt;br&gt; Phase 1b EIA, §8.2 &lt;br&gt; BEAS, 2013</td>
<td>• Secondary national, regional and local data presented in Phase 2 EIA &lt;br&gt; • Household surveys near the mine site and borefield undertaken in 2011 as part of Phase 1b EIA &lt;br&gt; • Social survey conducted by BEAS in 2013 &lt;br&gt; • Social survey conducted by SRK in 2015 (unpublished)</td>
</tr>
<tr>
<td>Archaeology and cultural heritage</td>
<td>Phase 2 EIA, §12.1.2 &lt;br&gt; Phase 1b EIA, §12.5</td>
<td>• A summary of the archaeological and cultural heritage surveys undertaken up to and including March 2011 is given in Phase 2 EIA, Table 12-1 &lt;br&gt; • Further investigations undertaken by URS in 2012 for the Mine site (URS 2012c) &lt;br&gt; • Comment on the status of sites at the borefield is provided in the Phase 1b EIA and in a further study of off-site infrastructure undertaken by URS in 2012 (URS 2012b) &lt;br&gt; • Records of chance finds found by the Mine and accurate siting of the Phase 2 EIA sites as part of ongoing operations (Figure 3-4)</td>
</tr>
<tr>
<td>Landscape and visual</td>
<td>Phase 2 EIA, §13.2</td>
<td>• Qualitative evaluation in Phase 2 EIA</td>
</tr>
<tr>
<td>Traffic and transport</td>
<td>Phase 2 EIA, §14.2</td>
<td>• Qualitative evaluation of road conditions in Phase 2 EIA &lt;br&gt; • Traffic counts undertaken for Phase 2 EIA at three locations (RN4/access road junction, Gamel Abdul Nassar Avenue/RN4 Junction, Gamel Abdul Nasser Avenue/Port access road) &lt;br&gt; • Traffic counts undertaken at RN4/access road junction in 2015</td>
</tr>
<tr>
<td>Waste management</td>
<td>Phase 2 EIA, §15.2</td>
<td>• Phase 2 EIA describes current operational waste disposal procedures and facilities</td>
</tr>
<tr>
<td>Climate change (greenhouse gas emissions)</td>
<td>Phase 2 EIA, §16</td>
<td>• Quantification of existing and proposed expansion greenhouse gas emissions given in Phase 2 EIA</td>
</tr>
</tbody>
</table>

§ = section reference
Geology and Location of Groundwater Monitoring Boreholes

JANUARY 2016 | U6646 | TASIIST ADDENDUM TO THE PHASE 2 EIA

srk consulting
TASIAST ADDENDUM TO THE PHASE 2 EIA

Air Quality Monitoring and Weather Station Locations

Figure 3-2

Coordinate System: WGS 1984 UTM Zone 28N
Datum: WGS 1984

LEGEND
- Receptor locations in air quality model
- TMLSA current weather station
- TMLSA historic weather station
- Phase 2 EIA air quality monitoring location
- Upgraded and new infrastructure
- Proposed TSF pipeline
- Existing TSF pipeline
- Tasiast Mine boundary
- Existing mine layout

JANUARY 2016

P:\U6646 Tasiast Optimization EIA\Project\CAD\MXDs\Existing Mine Layout with Weather and Air Quality.mxd
Location of Biological Monitoring Sites During the Phase 2 EIA

Figure 3-3
LEGEND

- Muslim Tomb (8th century - present)
- Protohistoric Tomb (c.2500-1000 Before Present)
- Neolithic Occupation Site (c.6000-2800BP)
- Neolithic Burials
- Stray Find
- Undated

Upgraded and new infrastructure
Proposed TSF pipeline
Existing TSF pipeline
Existing mine layout
Tasiast Mine boundary

Location of Archaeological Sites Identified at Tasiast Mine

Figure 3-4
4 AMENDMENTS TO PHASE 2 EIA IMPACT ASSESSMENT

As identified in Section 2 and Table 2.1, a number of changes to the project description given in the Phase 2 EIA have arisen as a result of the optimisation of Phase 2 of the Expansion Project. Potential changes to the outcome of the impact assessments presented in the Phase 2 EIA arising from these changes are discussed further below.

A modified Leopold Matrix\(^3\) has been used to evaluate the activities associated with Step 1 and 2 against environmental and social aspects assessed in the Phase 2 EIA. Only the environmental and social aspects that could be affected (marked with an X in Table 4.1) have been evaluated in more detail in the following sub-sections. These include surface and ground water (Section 4.1), air quality (Section 4.2), noise and vibration (Section 4.3), ecology and biodiversity (Section 4.4), archaeology and cultural heritage (Section 4.5) and landscape and visual (Section 4.6). It is assumed the impact assessments and associated management measures for the other environmental and social aspects will remain as presented in the Phase 2 EIA and so these are not discussed further.

As the nature of the planned construction and closure activities associated with Steps 1 and 2 is similar to the activities originally proposed in the Phase 2 EIA, the construction and closure aspects (for example of the new pipeline) are not considered in this addendum. It is expected the impacts and associated management measures for the construction and closure activities will be the same as those presented in the Phase 2 EIA.

In line with information presented in the Phase 2 EIA, the proposed activities associated with Steps 1 and 2 will take place within the mine site perimeter fence (12,300 hectares) except for the construction of a new pipeline from the borefield to the mine site.

The re-evaluation of impacts for each affected environmental and social aspect, described in sub-sections below, is structured as follows:

- Summary of available baseline data (as referenced in Section 3);
- Discussion of how the impact may change;
- Comment on the appropriateness of management measures; and
- Re-evaluation of impact significance.

\(^3\) The Leopold matrix is a qualitative environmental impact assessment method pioneered in 1971 (Leopold et al, 1971)
Table 4.1: Modified Leopold Matrix to evaluate Step 1 and 2 activities against the environmental and social aspects assessed in the Phase 2 EIA

<table>
<thead>
<tr>
<th>Aspects associated with Step 1 and 2 operational activities</th>
<th>Surface water &amp; groundwater</th>
<th>Air quality</th>
<th>Noise &amp; vibration</th>
<th>Ecology &amp; biodiversity</th>
<th>Socio-economic</th>
<th>Archaeology &amp; cultural heritage</th>
<th>Landscape &amp; visual</th>
<th>Traffic &amp; transport</th>
<th>Non-mining waste management</th>
<th>Greenhouse gas emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The upgrade and addition of new ore processing facilities next to the existing process plant to the east of the pit (Steps 1 and 2)</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X*</td>
</tr>
<tr>
<td>The potential relocation of TSF3 and change in construction method (Step 1)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Potential construction of the new power plant to the east of the pit (Step 2)</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X*</td>
</tr>
<tr>
<td>New water supply pipeline from the borefield (Step 2)</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

X = potential change in impact assessment
- = no change in impact expected
* Reduction in predicted levels of greenhouse gases is discussed under the air quality impact sub-section below
4.1 Surface water and groundwater

Phase 2 of the Expansion Project involves a number of activities with the potential to impact upon surface water and groundwater resources in the vicinity of the Mine. This section summarises the mine site surface water and groundwater baseline studies and identifies how the potential impacts identified in the Phase 2 EIA may be influenced by the change in activities. It recognises that many mitigation measures are already included in the design for the protection of water and to minimise the impact on the water environment. The re-evaluation of impact significance focuses on the TSF3 facility as this is potentially in a new location compared with the original location evaluated in the Phase 2 EIA.

As stated in Section 2, the implication of the continued use of the borefield beyond its currently permitted 2020 date is currently being investigated and will be reported separately so is not evaluated in this addendum.

4.1.1 Available baseline data

The Phase 2 EIA describes the baseline as summarised below:

- Climate: the baseline relies upon data from a meteorological station located 265 km east of the site. Annual precipitation is approximately 90 mm and evaporation 3,925 mm. Extreme, and random, rainfall events in excess of 100 mm in a 24-hour period can occur.
- Geology: the geology is summarised based on exploration and resource drilling information.
- Acid rock drainage: over 90% of samples were found to be non-acid forming with the remainder being of relatively low acid-generating potential. The arid climate reduces the risk of any acid rock drainage that is generated from having an impact.
- Surface water: The high rate of evaporation and low rainfall means there are no permanent natural watercourses in the vicinity of the Mine; however storms can produce ephemeral floods in wadis and across open ground.
- Hydrogeology: Groundwater levels were recorded at 13 monitoring well locations in 2011 on an ongoing basis. Groundwater was recorded at depths of generally between 35 m and 40 m below ground level across the mine site. Hydrogeological investigations as part of pit slope engineering studies have provided data on the hydraulic characteristics of the bedrock. Primary permeability is low and any flow is via fractures. Higher permeabilities are present in weathered fractured rock. Groundwater is brackish to saline across the mine site.

4.1.2 Impact discussion

The Phase 2 EIA identifies the following potential impacts to surface water and groundwater:

- Change in runoff within the Mine as a result of land clearance, removal of vegetation and construction of facilities;
- Change in runoff within the ephemeral wadi catchment downstream as a result of land

---

Note there are currently 18 “MBH” series boreholes within the Tasiast mine licence area as shown on Figure 3-1.
clearance, removal of vegetation and stormwater diversion around the Mine site;

- Loss of runoff which enters the Mine site and is not released into the wider wadi catchment area including rain falling on or flowing into the pit;
- Change in stormwater quality as a result of stormwater contamination by oils/lubricants and other chemicals;
- Change in stormwater quality as a result of water used for dust control being released into the wider wadi catchment;
- Seepage of contaminants to the water table from construction activities;
- Seepage of contaminants to the water table from construction activities, wet facilities during operations or from dry processes following rainfall; and
- Lowering of groundwater levels as the open pit is progressively excavated deeper.

These impacts remain the same for the optimization Expansion Project (Steps 1 and 2).

In the Phase 2 EIA the specific measures in place to protect and conserve water at the TSF3 facility consisted of geosynthetic liners with seepage captured in seepage ponds. The originally proposed upstream construction method only enabled liner to be placed on the base and three sides of the initial TSF raise. The proposed new downstream construction method is more robust and allows liner to be placed on the base and all four sides of each raise as the TSF is built up because the walls are built outward rather than inward. Figure 4-1 shows these methods with tailings deposited to the right of the dam wall. This amended construction method reduces the risk of seepage and this is considered a positive change.

No specific risks associated with the underlying geology, groundwater or surface water drainages are identified for the TSF3 facility in either locality so the impact evaluation is not expected to differ between the two proposed TSF3 sites. Both surface water and groundwater conditions are similar based on the Phase 2 EIA mine site baseline. This means groundwater is not a limiting factor in the choice of TSF3 location.

In terms of the changes to the process plant and the potential relocation of the Phase 2 power plant, these are being built in areas with existing stormwater management facilities in place. No additional impacts are expected to arise as a result of these changes. The decision not to develop a new processing and possibly the power plant area to the west of the pit means the stormwater in this area would not be affected by these activities.
New Construction Approach - Downstream

Old Construction Approach - Upstream

Old and new construction methods for TSF3
4.1.3 Management measures

General management of TSF3 and site stormwater is captured by the site-wide Stormwater Management Plan, which includes:

- Prevention of clean runoff from external areas entering plant site facilities through diversion of external drainage back to nature via interceptor ditches;
- The safe conveyance of stormwater through ditches, swales, culverts and, where necessary, stormwater management ponds to eliminate flooding risk; and
- Containment of runoff from areas with potential contamination in stormwater retention ponds.

There is also a Water Use, Discharge and Conservation Management Plan, a Cyanide Management Plan and a Tailings Dam Operations, Maintenance and Surveillance (OMS) Plan. The OMS plan will be updated for the new facility but no additional plans are considered necessary to address the proposed changes.

4.1.4 Re-evaluation of impact significance

Overall, the sensitivity of surface water across the mine site in the Phase 2 EIA is considered to be moderate and that of groundwater is low. The impacts are assessed in the Phase 2 EIA as adverse, long term and of low significance (Table 4.2). This is not predicted to change for Steps 1 and 2 of the optimised Expansion Project.

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Impacts</th>
<th>Mitigation Measure</th>
<th>Project Phase</th>
<th>Nature</th>
<th>Duration</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine site</td>
<td>Change in surface water runoff and quality</td>
<td>Stormwater management, monitoring and emergency response</td>
<td>C O D</td>
<td>Adverse</td>
<td>Long term</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Change in groundwater quantity and quality</td>
<td>Monitoring boreholes on-site to be routinely checked for water levels and water quality</td>
<td>C O D</td>
<td>Adverse</td>
<td>Long term</td>
<td>Low</td>
</tr>
</tbody>
</table>

1Following implementation of proposed Mitigation Measures
2Project Phase: C = Construction, O = Operation, D = Closure
3Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and are based on the ratings provided in Section 5.2 of the Phase 2 EIA.

4.2 Air quality

Current sources of emissions from the Mine site include oxides of nitrogen, sulfur dioxide, carbon monoxide and carbon dioxide from emissions of fixed and mobile equipment and vehicles. Particulate matter (PM) is generated by windblow, road entrainment, blasting and the emissions sources from the Mine site. The TSF starter cell, CIL and ADR plants and existing dump leach facilities represent potential sources of hydrogen cyanide (HCN) gas. There are stringent controls at these facilities to protect the health and safety of workers and the wider environment.

The Phase 2 EIA evaluated air quality impacts by means of an air quality model at a number of receptor locations shown in Figure 3-2, namely:

- R1 - Existing Accommodation Camp
- R2 - Enlarged Camp Northern Edge
- R3 - Enlarged Camp Southern Edge
- R4 - Welcome Centre
- R5 - Office
- B1 - Boundary (South West)
- B2 - Boundary (West)
- B3 - Boundary (North West)
- B4 - Boundary (North)

The Phase 2 EIA states “Receptors R1 to R3 represent locations within the site boundary at which the environmental assessment values would apply. At receptors R4 and R5, occupational workplace exposure standards would apply. Receptors B1 to B4 and Receptor R4 provide locations of the maximum contributions to constituent concentrations at the Mine site boundary. At any sensitive receptor located beyond the Mine site boundary, the impacts will be less than at the site boundary receptors as concentrations of constituents become more diluted with increasing distance from the source of the emission.”

In practice the actual receptors of any air quality impacts can be summarised as:
- TMLSA staff and contractors residing at the accommodation camps on site (R1 – R3);
- Guelb Dawass (approximately 2.5 km from the northern Mine site boundary) with B4 being the closest modelled receptor site; and
- Imkebdene (approximately 11 km from the south western Mine site boundary) with B1 being the closest modelled receptor site.

This section considers the potential relocation of infrastructure within the Mine site boundary and the reduced emission rates associated with lower production levels. As the Phase 2 EIA considered two types of power generation, this section now confirms the proposed power plant capacity and type before reviewing the air quality impacts discussed in the Phase 2 EIA.

4.2.1 Available baseline data

Available air quality data comprises:
- Nitrogen dioxide (NO\textsubscript{2}), sulfur dioxide (SO\textsubscript{2}) and ozone (O\textsubscript{3}) ambient air quality data (between two and five samples at five sites) collected during the Phase 2 EIA by means of passive diffusion tubes (the sample locations are shown in Figure 3-2); and
- One set of emission monitoring data for three of the HFO generators at site (Pacific Environment Limited, 2015) with no data available for the light fuel oil (LFO) generators.

To date, there is no site specific monitoring record for Particulate Matter (PM) although new air quality monitoring stations will be capable of recording PM\textsubscript{10}. The Phase 2 EIA considers ambient air quality concentrations of both coarse dust and inhaled particles less than 10 µm (PM\textsubscript{10}) are likely to be high as a result of the desert setting, particularly during windy conditions.

A summary of the key data is given in Table 4.3 and is compared to the European Union (EU) air quality limit values used to evaluate impact significance in the Phase 2 EIA.
Table 4.3: Summary of Tasiast air quality data from Phase 2 EIA

<table>
<thead>
<tr>
<th></th>
<th>NO₂</th>
<th>SO₂</th>
<th>O₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean background value µg/Nm³</td>
<td>4</td>
<td>31</td>
<td>110</td>
</tr>
<tr>
<td>EU air quality limit (24 hour)</td>
<td>200</td>
<td>125</td>
<td>na</td>
</tr>
<tr>
<td>EU air quality limit (1 year)</td>
<td>40</td>
<td>na</td>
<td>na</td>
</tr>
</tbody>
</table>

na = not applicable

The Mine experiences winds from the north west and north east for most of the year (URS Scott Wilson, 2011c). Analysis of wind direction from the Tasiast Mine power plant weather station from July 2013 to July 2015[1] shows the prevailing wind direction is from the north east (Figure 4-2). An analysis of wind speeds show an annual average wind speed of 13.6 km/h, with maximums ranging from 33.8 km/h in June to 46.7 km/h in September.

![Figure 4-2: Wind direction for Tasiast Mine power plant weather station from July 2013 to July 2015](image)

4.2.2 Impact discussion

Air quality impacts are considered holistically by the Phase 2 EIA air quality model with the different sources of emissions being input to the model to predict the overall impact at different receptor locations. The list below describes how impacts to air quality arising from the proposed Step 1 and Step 2 activities of the optimization Expansion Project could materialise and the potential implications of this on the Phase 2 EIA air quality model results.

**TSF3**
Air quality impacts from the TSF can arise from dust blow of dry tailings, road entrainment from vehicles near the TSF and emissions from the fixed and mobile equipment used to operate the facility. If TSF3 is moved to the east of the pit the overall contribution of air quality pollutants from the TSF3 Cells 1 and 2 is unlikely to change from that used as input to the Phase 2 EIA air quality model. However, it is slightly closer but still downwind of the accommodation camp. The overall distance from off-site receptors, namely the two communities closest to the mine, does not change significantly. Therefore the potential relocation of TSF3 is not expected to change impact significance to these receptors.

**CIL& Gold Room**
The equipment proposed to be used at the upgraded and expanded process plant to the east

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[1] Data from June 2012 to July 2013 was not used in this analysis as the wind vane was not functional during this period.
of the pit is similar and in some cases (SAG mill and Ball mill) identical to that envisaged by the Phase 2 EIA air quality model. Therefore the emissions will still relate to dust from the crusher and HCN emissions from the Gold Room. The types of emissions modelled are not expected to differ.

As the full rate of production proposed in the Phase 2 EIA is not going to be achieved during Steps 1 and 2, the quantity of emissions from the processing facilities is likely to be less than originally modelled. This potentially means the magnitude of effect on the modelled receptors could be less than originally predicted. However, the upgraded and new processing equipment is now proposed to be located adjacent to the existing CIL process plant and is thus significantly closer to the accommodation camp receptors compared to a new plant to the west of the pit. It is still downwind of the camp with only occasional blows from the plant towards the camp. With the combination of lower emission levels reducing impacts and shorter distance to the accommodation camp potentially increasing impacts, the overall significance on this receptor is expected to be the same or less than originally predicted.

In the case of the off-site receptors (local communities), the relocation of the process plant is unlikely to have influenced the model results and, as the emission levels are expected to be lower, the impact significance on these receptors is likely to decrease.

New power plant

The evaluation of changes to impact significance resulting from the potential relocation of the Phase 2 power plant is similar to that of the process plant. The power requirements of Steps 1 and 2 are less than originally proposed for Phase 2 of the Expansion Project and the Phase 1b power station is to be retained to operationally provide power. This means the emissions from the new Phase 2 plant, sized at 50-60 MWe, are going to be significantly less than originally predicted for the Phase 2 power plant sized at 120 MWe. So even though the power plant may be closer to the accommodation camp, it is expected the overall impact will remain the same or less than originally predicted.

Greenhouse gases

The reduction in emissions from the process plant and power plant associated with the optimisation of Phase 2 of the Expansion Project, along with lower activity levels within the mine, means the quantity of greenhouse gases released will be less than originally predicted in the Phase 2 EIA. Thus the impacts associated with greenhouse gas releases, such as climate change, would be less than originally predicted and this is a positive change.

4.2.3 Management measures

The following air quality management measures were committed to in the Phase 2 EIA and it is not expected these will change:

- Dust suppression on haul roads by water or chemical binding agents;
- Speed control on roads;
- Covers for dump pocket and conveyors at crusher/stockpile;
- Cyanide gas monitors; and
- Power plant abatement equipment appropriate to the type of equipment proposed.

The proposed bag house at the crusher will be replaced with Foaming Dust Suppression.

4.2.4 Re-evaluation of impact significance

The Phase 2 EIA (Section 7.7.2) states: “The careful siting of the proposed elements of Phase
2 and the implementation of standard control measures, where applicable, will assist in reducing any effects during the operation of the phase so that any impacts at sensitive receptors (including the accommodation camp) are low to negligible."

The activities proposed to occur as part of Steps 1 and 2 of the optimised Expansion Project are not expected to change this conclusion and the assessment in the Phase 2 EIA (Table 4.4) remains valid.

Table 4.4: Summary of potential residual impacts - air quality

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Impacts</th>
<th>Mitigation Measure</th>
<th>Project Phase¹</th>
<th>Nature</th>
<th>Duration</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine site</td>
<td>Construction Dust</td>
<td>Best Practicable Means</td>
<td>C</td>
<td>Adverse</td>
<td>Short Term</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td>Power Plant Emissions</td>
<td>Best Practicable Means</td>
<td>C</td>
<td>Adverse</td>
<td>Short Term</td>
<td>Negligible</td>
</tr>
<tr>
<td>Off-site Roads</td>
<td>Construction Traffic Emissions</td>
<td>Scheduling, use of hard surfaced roads</td>
<td>C</td>
<td>Adverse</td>
<td>Short Term</td>
<td>Negligible</td>
</tr>
<tr>
<td>Mine site</td>
<td>Dust from Mine operations</td>
<td>Control Techniques and Site Management Practices</td>
<td>O</td>
<td>Adverse</td>
<td>Medium Term</td>
<td>Low/Negligible</td>
</tr>
<tr>
<td></td>
<td>Waste Management Plant Emissions</td>
<td>Control Techniques and Site Management Practices</td>
<td>O</td>
<td>Adverse</td>
<td>Medium Term</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td>Power Plant Emissions</td>
<td>Control Techniques and Site Management Practices</td>
<td>O</td>
<td>Adverse</td>
<td>Medium Term</td>
<td>Moderate/Low</td>
</tr>
<tr>
<td>Off-site Roads</td>
<td>Operational Traffic Emissions</td>
<td>Scheduling, use of hard surfaced roads</td>
<td>O</td>
<td>Adverse</td>
<td>Medium Term</td>
<td>Negligible</td>
</tr>
<tr>
<td>Mine site</td>
<td>HCN gas emissions</td>
<td>Control Techniques and Site Management Practices</td>
<td>O</td>
<td>Adverse</td>
<td>Medium Term</td>
<td>Low/Negligible</td>
</tr>
<tr>
<td></td>
<td>Windblown Dust for TSFs</td>
<td>Best Practicable Means</td>
<td>D</td>
<td>Adverse</td>
<td>Long Term</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td>HCN gas emissions from TSFs</td>
<td>Best Practicable Means</td>
<td>D</td>
<td>Adverse</td>
<td>Long Term</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

¹Following implementation of proposed Mitigation Measures
²Project Phase: C = Construction, O = Operation, D = Closure
³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided Section 5.2 of the Phase 2 EIA.

4.3 Noise and vibration

Existing noise across the Mine site is dominated by noise emanating from the ongoing excavation and processing activities, including the associated vehicle movement. Generally, excavation and processing operations result in relatively continuous noise across the Mine site, with intermittent noise events at particular receptors due to truck pass-bys or specific blasting events.

The Phase 2 EIA estimated noise levels associated with the existing and proposed expansion operations using sound power level data for mobile plant and fixed plant sourced from data provided for similar mining operations and from British Standard 5228. Operational noise levels were calculated using the methodology provided in ISO 9613-2: 1996 ‘Attenuation of Sound During Propagation Outdoors’. ISO 9613-2 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. These were then modelled using SoundPlan, a
commercial software package.

For the Phase 2 EIA, two different operational scenarios were modelled, using the year 2016 when the tonnage of mined material was predicted to peak and 2022 when on-site vehicle movement was expected to peak. This gives conservative estimates of possible noise levels at identified receptors with significance assessed against the World Health Organisation's Guidelines for Community Noise (WHO, 1999). Receptors evaluated included:

- The workers located at the Mine site itself, including those involved in mining and processing, as well as infrastructure and administrative personnel;
- At the accommodation camp; and
- The three communities located within 30 km of the Mine site.

Due to the large distances between sources of construction vibration and sensitive receptors, no prediction of vibration levels were carried out as part of the Phase 2 EIA.

### 4.3.1 Available baseline data

Site observations made by URS in February 2011 indicated the noise levels at the accommodation camp resulting from mining operations (excavation, processing, power generation and airstrip) are negligible. Limited, short duration vibration effects resulting from blasting can be experienced at the accommodation camp, depending on blast location and blast size. As would be expected, noise levels at office accommodation in the existing process area are dominated by noise from the process buildings and external plant.

### 4.3.2 Impact discussion

The modelling undertaken for the Phase 2 EIA indicated the night time limit for residential receptors of 45 dB L_{Aeq, 1 hour} would be exceeded at the existing accommodation camp for both the existing scenario (no P2 expansion) and the future expansion scenarios (2016 and 2022). The increase at the accommodation camp was predicted to be greater than the 3 dB(A), which is considered by the WHO to be disturbing. However, the Phase 2 EIA motivates that the accommodation blocks will be air conditioned (to provide acceptable internal conditions and keep out windblown sand), negating the need for open windows. The façades of the existing and proposed accommodation (including windows) should provide a noise reduction (outside to inside) of approximately 30 dB(A). The Phase 2 EIA therefore concludes that with the expansion the external noise levels will result in internal noise levels to the accommodation camps of less than 30 dB L_{Aeq} and will be acceptable.

Moving the expansion of the processing activities, and potentially moving the power plant, adjacent to the existing processing plant means these noise sources will be closer to the accommodation camp. The increase in noise levels associated with these activities to the east of the pit is not expected to increase the noise levels inside the accommodation facilities more than the acceptable limit of 45 dB L_{Aeq}.

The predicted noise levels associated with mining fleet and transport along the RN4 highway and Mine access road is expected to decrease compared to what was predicted in the Phase 2 EIA due to the lower production rates. So the impacts predicted for these activities remain the same or less than originally stated. Impacts from the pump stations at the borefield and along the pipeline are expected to remain the same.

### 4.3.3 Management measures

The Phase 2 EIA indicated no specific measures for noise or vibration mitigation were required.
to ensure negligible effects at office and accommodation buildings. However, it provided techniques and good site management practices to minimise operational noise and vibration levels to the workplace and workforce in general. No changes to these measures are considered necessary.

4.3.4 Re-evaluation of impact significance

The Phase 2 EIA indicates impact significance as low to negligible for construction, operation and closure (Table 4.5). The proposed changes to the project description associated with Steps 1 and 2 of the optimised Expansion Project are not predicted to change this conclusion and thus the significance remains as low to negligible.

Table 4.5: Summary of potential residual impacts\(^1\) - noise and vibration

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Impacts</th>
<th>Mitigation Measure</th>
<th>Project Phase(^2)</th>
<th>Nature(^3)</th>
<th>Duration(^3)</th>
<th>Significance(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine site</td>
<td>Construction Noise</td>
<td>Best Practicable Means</td>
<td>C</td>
<td>Adverse</td>
<td>Short Term</td>
<td>Low/Negligible</td>
</tr>
<tr>
<td></td>
<td>Construction Vibration</td>
<td>Best Practicable Means</td>
<td>C</td>
<td>Adverse</td>
<td>Short Term</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td>Operational Noise</td>
<td>Control Techniques and Site Management Practices</td>
<td>O</td>
<td>Adverse</td>
<td>Medium Term</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td>Operational Vibration</td>
<td>Control Techniques and Site Management Practices</td>
<td>O</td>
<td>Adverse</td>
<td>Medium Term</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td>Noise</td>
<td>Best Practicable Means</td>
<td>D</td>
<td>Adverse</td>
<td>Short Term</td>
<td>Negligible</td>
</tr>
<tr>
<td></td>
<td>Vibration</td>
<td>Best Practicable Means</td>
<td>D</td>
<td>Adverse</td>
<td>Short Term</td>
<td>Negligible</td>
</tr>
<tr>
<td>Off-site Roads</td>
<td>Construction Traffic Noise</td>
<td>Scheduling</td>
<td>C</td>
<td>Adverse</td>
<td>Short Term</td>
<td>Low/Negligible</td>
</tr>
<tr>
<td></td>
<td>Operational Traffic Noise</td>
<td>Scheduling</td>
<td>O</td>
<td>Adverse</td>
<td>Medium Term</td>
<td>Low/Negligible</td>
</tr>
</tbody>
</table>

\(^1\)Following implementation of proposed Mitigation Measures  
\(^2\)Project Phase: C = Construction, O = Operation, D = Closure  
\(^3\)Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided Section 5.2 of the Phase 2 EIA.

4.4 Ecology and biodiversity

Habitats and the associated flora and fauna are likely to be disturbed by Steps 1 and 2 of the optimised Expansion Project. To evaluate the significance of potential impacts, the Phase 2 EIA included a desk top review and primary data collected by means of field surveys.

4.4.1 Available baseline data

The extensive biological surveys undertaken as part of the Phase 2 EIA (Figure 3-3) built on work undertaken previously in 2004 and 2009 for the original EIA and the EIA for New Developments (Table 1.1). These studies indicate the Mine is located within the Saharan-Sindian bioclimatic zone (biome), which occupies up to three-quarters of Mauritania and is of low floristic diversity.

The habitats present within the Mine site are typical of a desert location and of much of the middle, north and north east of Mauritania. The predominant physical habitat comprises a flat
area of land formed mainly of gravelly regs\(^5\) and localised superficial sand deposits with one main dune area (dune field). Locally there are small rock and boulder extrusions as well as lower lying wadis\(^6\). Vegetation cover is sparse, intermittent and it is not uniformly distributed. Vegetation is clustered in and around the beds of minor depressions and wadis as well as areas of sandy deposits.

It is understood that none of the plant species identified are rare or threatened and are not designated as protected by local, national or international standards. However, the trees *Acacia tortilis radiana*, *Maerua crassifolia* and *Capparis decidua* are protected by national forestry legislation. This legal protection is not an indication of rarity or biodiversity value but is intended to protect vegetation as a natural resource of regional socio-economic importance.

None of the resident bird species recorded on-site during the baseline surveys are of international conservation concern or are included as threatened in the IUCN Red List. One observation of an Egyptian vulture was recorded during the baseline studies, which is included on the IUCN Red List. None of the other faunal records made during the baseline surveys includes any species listed as threatened within IUCN Red List.

The Mine site is located in an area that is remote from all of the nationally protected biodiversity conservation sites. There are no forests associated with the Mine. The closest protected site is the Parc National du Banc d’Arguin (PNBA), which is located 65 km to the west of the Mine site and is designated as a RAMSAR Site and UNESCO World Heritage Site.

Based on definitions provided by the International Finance Corporation (IFC) Performance Standard 6, the Mine site contains no legally protected areas or critical habitats. Land adversely affected by existing Mine activity is definable as modified habitat and areas less affected and remote from the current Mine workings, including land that will be affected by the Expansion Project, are defined as natural habitat. The desert habitats present within the Mine site are capable of supporting only a limited number of species. In addition the natural habitats present are common and widespread and the associated species would be expected to occur wherever suitable habitat conditions are present.

### 4.4.2 Impact discussion

The Phase 2 EIA identifies the following aspects associated with the construction and operation of Phase 2 of the Tasiast Expansion Project, which could impact on the ecology and biodiversity of the Mine site.

- Clearance of vegetation and loss of habitat;
- Loss of protected trees;
- Soil erosion and dust impacts on vegetation;
- Noise and dust disturbance to wildlife;
- Changes to surface water drainage patterns.
- Involvement of wildlife in accidents with vehicles along RN4 highway and Mine access road, or bird strike to structures such as transmission lines; and

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\(^5\) Regs are desert landform defined as broad plains covered with sand and gravel. Regs are the dominant landform in most of the Sahara.

\(^6\) Gullies or stream beds that are predominantly dry but that collect water during rainfall events.
• Risk of wildlife death as a result of cyanide levels in tailings and solution circuit ponds.

The types of impacts experienced could include:

• **Habitat loss**: with the significance of this related to the area lost, the proportion of the total habitat area and the ecology and biodiversity value of that habitat;

• **Habitat fragmentation**: disturbance of new areas of habitat for mining infrastructure can sever habitats, leaving areas too small to support viable populations, and create physical barriers to the movement of animals and plant propagules between areas cut off by the Mine;

• **Indirect effects**: these impacts may affect habitats outside the boundary of the site and may arise from disturbance (visual, noise or vibration), dust deposition, pollution incidents and changes in site hydrology; and

• **Cumulative impacts**: these are considered in two ways; firstly, the cumulative effect of the Mine on the collective resource of particular habitats or species in the study area, or part of it; secondly, the cumulative impact of the Mine in conjunction with other development projects expected to occur near the Project over a similar time period.

The activities now proposed to take place during Steps 1 and 2 of the optimised Expansion Project will not alter these types of potential impacts. However the location of where the impacts could occur will now differ as outlined below.

• The area where the additional processing circuits and the potential location of the Phase 2 power plant are to be located is an area that is already disturbed from an ecological and habitat perspective so the impact on habitat loss and fragmentation is likely to be less than the disturbance if this infrastructure had been built to the west of the pit as proposed in the Phase 2 EIA. This is a positive change.

• Both the TSF3 location options are in areas designated for disturbance in the Phase 2 EIA (Figure 2-3). Habitat areas to the south and south east of the Mine site reportedly have lower plant diversity than areas to the north, so neither option is expected to significantly impact on floral diversity. Potential harm associated with cyanide in the tailings pond remains an issue, with no change to the impacts described in the Phase 2 EIA envisaged. No differences in habitat type or species composition exist between the two sites, so ecology is not considered a limiting factor when finalising TSF3’s location;

• The construction of a new pipeline is not expected to affect any habitat because it will take place immediately adjacent to the existing pipelines and the lack of sensitive habitat within this zone.

• Indirect impacts associated with dust, noise and vibrations will remain at approximately the same level or may be of lower significance than predicted in the Phase 2 EIA as they are now more concentrated in the vicinity of the existing CIL processing plant.

• Cumulative impacts to regional wildlife are predicted to remain the same and will be dependent on the extent of development of potential new mining operations to the north and south of the Mine in TMLSA exploration areas. The cumulative impacts would need to be evaluated in any EIAs undertaken for these new operations.

### 4.4.3 Management measures

The Phase 2 EIA commits to the development of a Biodiversity Management Plan and
Monitoring Protocol. A number of management measures are proposed for inclusion in this plan. As the overall impacts associated with the Step 1 and 2 implementation of the optimised Expansion Project will result in similar or possibly less disturbance than originally envisaged, no changes to these commitments are envisaged.

4.4.4 Re-evaluation of impact significance

None of the habitats and vegetation communities that will be impacted are threatened or of limited extent (locally, nationally or internationally), or are considered critical habitat (as defined in IFC Performance Standard 6). None of the vegetation communities recorded are of high biodiversity value in their own right. Given the above considerations, the predicted impacts on biodiversity remain assessed as of low significance.

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Impacts</th>
<th>Mitigation Measure</th>
<th>Project Phase</th>
<th>Nature</th>
<th>Duration</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine site</td>
<td>Clearance of vegetation and loss of habitat</td>
<td>Implementation of mitigation program to be agreed with appropriate ministries</td>
<td>C O</td>
<td>Adverse</td>
<td>Medium term</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Disturbance and displacement of wildlife</td>
<td>Vehicle movements will be in accordance with Mine guidelines and speed limits</td>
<td>C O D</td>
<td>Adverse</td>
<td>Short to medium term (depending on the sensitivity of individual fauna)</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Wildlife (bird) mortality as a result of cyanide poisoning</td>
<td>Treatment of tailings to Kinross-adopted ICMI standards to remove cyanide. Monitoring to verify lack of harm to wildlife and usage of TSF and dump leach facility by birds</td>
<td>O</td>
<td>Adverse</td>
<td>Short to Medium term</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Invasive / alien species</td>
<td>Survey for presence and destroy / remove as appropriate</td>
<td>C O D</td>
<td>Adverse</td>
<td>Medium term</td>
<td>Low</td>
</tr>
</tbody>
</table>

1Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure
2Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Section 5.2 of the Phase 2 EIA.

4.5 Archaeology and cultural heritage

A number of archaeological studies have been undertaken at and in the vicinity of the Mine (as summarised in Table 12-1 of the Phase 2 EIA). The Phase 2 EIA impact assessment drew on the inventories of archaeological sites, monuments and findspots, knowledge of historic landscapes and the wider archaeological and cultural heritage context established in the course of these studies. TMLSA has accurately located these sites and maintains a chance finds
procedures to manage any new sites that may be identified during the course of operations.

4.5.1 Available baseline data

The archaeological and cultural sites identified in the Phase 2 EIA and as part of the site’s Change Finds Procedure are shown on Figure 3-4 and consist of the following types of sites:

- Neolithic sites comprising clusters of occupation sites located on ogolian dunes and situated mainly towards the eastern and south eastern edges of the Mine site. The cultural value of all the Neolithic occupation sites is assessed as high, as they are upstanding monuments with potential to contribute to research and form part of a coherent and complex multi-period historic landscape.

- Protohistoric tombs comprise a single tomb or cairn of rocks raised over one or several inhumations. These may be crescent shaped and occur in clusters. The cultural value of such tombs is assessed as medium (single/simple tombs) or high (elaborate or antenna tombs, paired tombs and tomb fields with enhanced value). These are considered upstanding monuments with potential to contribute to research and form coherent historic landscapes.

- Historic sites comprising Muslim tomb/s. The cultural value of such tombs is assessed as high. Burials are protected under Mauritanian statute law and Sharia law, and such sites are respected by local populations.

4.5.2 Impact discussion

According to the Phase 2 EIA, potential impacts on these sites include:

- Total or partial removal of sites (e.g. tombs) and surface scatters (e.g. occupation sites) due to groundworks and levelling, construction, blasting, mining and dumping (waste rock and tailings);

- Damage caused by vehicle tracking over sensitive/vulnerable assets; and

- Piecemeal removal of portable antiquities from widespread Neolithic finds scatters or interference with tombs by staff or contractors.

Without mitigation, these potential impacts would result in a large adverse and long term effect, as archaeological remains would be irreversibly removed, their setting or context transformed, and there would be a loss of research knowledge. For this reason, appropriate mitigation (protection, relocation and/or archaeological investigation) was committed to in the Phase 2 EIA in advance of any proposed construction.

For the areas to be disturbed by Steps 1 and 2 of the optimised Expansion Project, the following is noted:

- The expansion of the pit and the development of the WRD to the south east remains as described in the Phase 2 EIA with some disturbance to all types of sites unavoidable.

- Within the Option 1 location for TSF3 Cell 1 there are a number of Neolithic sites identified and in Cell 2 there is a further Neolithic occupation site, one Muslim tomb and one protohistoric tomb. Of these the Muslim tomb is considered of the highest cultural value.

- Within the Option 2 location for TSF3 there are no known archaeological or cultural heritage sites.
• Within the existing CIL process plant area, where the new processing circuit and power plant are proposed to be located there are no known archaeological or cultural heritage sites.

• The construction of a new water supply pipeline from the borefield is not envisaged to cause any further disturbance to archaeological or cultural heritage sites since the construction will take place in the existing pipeline corridor.

4.5.3 Management measures

The Phase 2 EIA states: ‘Where the Project involves adverse impacts on physical cultural heritage, appropriate measures for avoiding, minimising, mitigating and compensating these impacts will be applied.’ Principles for managing cultural heritage and appropriate management measures are proposed for all areas affected. No changes to these measures, which are summarised below, are proposed.

• Where reasonably feasible, Project components will be designed to avoid impacts on Muslim tombs. These will be surrounded by protective fencing, with an access gate and an information panel. Where relocation may be required, TMLSA will enter into consultation with the Ministry of Petroleum Energy and Mines, Ministry of Environment and Sustainable Development, Ministry of Culture and Ministry of Islamic Affairs as appropriate.

• Where reasonably feasible, Project components will avoid known archaeological remains, such as Neolithic dune-top occupation areas and Protohistoric tombs. Where the sites are not directly impacted by Project components, they will be surrounded by long term fencing for their protection. Where the construction of the Project would result in the removal of archaeological sites, the associated impacts will be mitigated by archaeological recording: they will be subject to programmed, professional archaeological excavations well in advance of any construction works. Archaeological works, including fencing and excavation, will be undertaken by archaeological experts permitted and supervised by the Ministry of Culture.

• Stray finds (any finds discovered during construction works) will be dealt with by the Chance Finds Procedure, which forms part of the Cultural Heritage Management Plan, part of the Tasiast Environmental Management System.

4.5.4 Re-evaluation of impact significance

Overall, with mitigation, the significance of the potential impacts on cultural heritage is rated the same as predicted in the Phase 2 EIA (Table 4.7). The potential impacts are rated as being of high significance because the development would result in the complete removal of archaeological sites, the transformation of the setting or context of archaeological monuments, and the significant loss of key components in monument groups. Although the development would have an adverse impact on archaeological remains, they will be preserved by record, through a high-calibre programme of archaeological investigation and protection. It is recognised that TMLSA has the potential to make a significant contribution to national research and institutional capacity building.
Table 4.7: Summary of potential residual impacts – archaeology and cultural heritage

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Impacts</th>
<th>Mitigation Measure</th>
<th>Project Phase</th>
<th>Nature</th>
<th>Duration</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine site</td>
<td>Construction &amp; operation impacting on Neolithic dune-top occupation sites, Protohistoric and Muslim tombs.</td>
<td>Avoid by design where reasonably feasible Protect sites by long term fencing Investigate sites by research-led scientific excavation Implement Chance Finds Procedures Implement CHMP &amp; monitoring Relocate Muslim tombs where necessary</td>
<td>C O D</td>
<td>Adverse</td>
<td>Long term</td>
<td>High</td>
</tr>
<tr>
<td>Mine site</td>
<td>Ancillary works, utilities and roads impacting on Neolithic dune-top settlement sites, Protohistoric &amp; Muslim tombs.</td>
<td>Avoid by design Protect sites by long term fencing Implement CFP</td>
<td>C O</td>
<td>Adverse</td>
<td>Long term</td>
<td>Negligible to Low</td>
</tr>
<tr>
<td></td>
<td>Loss of archaeological remains</td>
<td>Workers information campaign and environmental workers training Vulnerable sites either to be fenced or to be excavated prior to or, if appropriate, alongside Mine development Implement Chance Finds Procedures. Implement Cultural Resource Management Plan &amp; monitoring Controlled routes (one track policy), signage</td>
<td>C O D</td>
<td>Adverse</td>
<td>Long term</td>
<td>Negligible to Low</td>
</tr>
</tbody>
</table>

1 Following implementation of proposed Mitigation Measures
2 Project Phase: C = Construction, O = Operation, D = Decommissioning and Closure
3 Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Section 5.2 of the Phase 2 EIA.

4.6 Landscape and visual

The Step 1 and 2 activities will be undertaken within the Mine site and within the existing pipeline corridor from the borefield. The assessment of landscape and visual impacts needs to be undertaken in the context of these existing mining operations, which has influenced landscape character through change in landform, lighting and infrastructure. The Mine is in a remote location with no formal settlements or industries in the vicinity.
4.6.1 Available baseline data

The Phase 2 EIA indicates the Mine is not located within an area of protected landscape or a landscape designated in relation to landscape value/quality. The key characteristics of the landscape, which indicate a low value and sensitivity, are:

- It is a common sand landscape of undulating topography, which occupies approximately 75% of Mauritania and it is therefore not considered to be a scarce resource, irreplaceable or valuable as a result of uniqueness;
- It forms part of the wider Sahara and sub-Saharan desert landscape;
- There is limited land use and vegetation cover, sufficient in some areas for sporadic grazing;
- Inhabitation is largely confined to scattered nomadic/semi-nomadic settlements and the accommodation for workers based at the Mine; and
- Mining activities, which are a locally significant element of the landscape but of a scale that is dwarfed by the overall landscape context.

Existing visual screening from locations in the wider landscape is derived from the sand dunes and rocky ridgelines. Views of the Mine are obtained in close proximity to the site from a small number of isolated locations.

4.6.2 Impact discussion

The impact discussion given in the Phase 2 EIA identifies the following impacts:

- Loss of some original, characteristic, landscape elements;
- Introduction of large scale landscape elements, such as the expanded open pit, TSF and WRDs, which will remain as a permanent element of the landscape;
- Increase in the scale of development on-site both in area (footprint) and height of the new infrastructures;
- Change in the nature of views and increased visibility of new buildings/extended buildings and other infrastructure; and
- Visual impacts arising from temporary use of cranes/machinery, vehicle movements etc. which add to intrusion within a view.

The aspects associated with Steps 1 and 2 of the optimised Expansion Project are expected to affect the landscape value and visual amenity of the area in the following ways:

- There will still be a significant increase in the total area disturbed by open pit and waste rock deposition with associated effects on the landscape and visibility of infrastructure;
- There will be no visual or landscape disturbance associated with the additional dump and heap leach since these are not currently scheduled to occur as part of Steps 1 and 2;
- The effect of disturbance from new buildings and other infrastructure will be slightly less than originally envisaged in the Phase 2 EIA due to the relocation of the additional processing circuits and possibly the power plant adjacent to the existing processing facilities;
- TSF3 is still required and the location to the east or the west will not significantly change
the overall impact on landscape character or visual amenity; and

- The visual disturbance associated with construction of the new pipeline between the Mine and the borefield will be temporary in nature and once done the level of disturbance will revert back to its existing level.

4.6.3 Management measures

The nature of Mine components and the location of the Mine in a remote desert location are such that the scope for mitigation of landscape or visual impacts is limited.

4.6.4 Re-evaluation of impact significance

No changes to the impact significance given in the Phase 2 EIA are predicted with the change in landscape remaining as adverse, medium to long term and of moderate to low significance, and the visual impact on local inhabitants remaining as adverse, medium to long term and of low significance (Table 4.8).

<table>
<thead>
<tr>
<th>Location</th>
<th>Nature of Impacts</th>
<th>Mitigation Measure</th>
<th>Project Phase²</th>
<th>Nature</th>
<th>Duration³</th>
<th>Significance³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine site</td>
<td>Change of landscape</td>
<td>Use of screening, such as berms, to prevent sight of facility</td>
<td>C O</td>
<td>Adverse</td>
<td>Medium term</td>
<td>Moderate/Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Removal of facilities, where possible. Passive re-vegetation</td>
<td>D</td>
<td>Adverse</td>
<td>Long term</td>
<td>Moderate/Low</td>
</tr>
<tr>
<td>Visual impact of facilities on local inhabitants</td>
<td>Use of screening, such as berms, to prevent sight of facility</td>
<td>C O</td>
<td>Adverse</td>
<td>Medium term</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Removal of facilities where possible and passive re-vegetation</td>
<td>D</td>
<td>Adverse</td>
<td>Long term</td>
<td>Low</td>
</tr>
</tbody>
</table>

¹Following implementation of proposed Mitigation Measures
²Project Phase: C = Construction, O = Operation, D = Closure
³Duration and significance refer to the predicted impact after the implementation of proposed mitigation measures and is based on the ratings provided in Section 5.2 of the Phase 2 EIA.

5 CONCLUSIONS

The optimisation of the Expansion Project is expected to result in the relocation or amendment of some infrastructure as follows:

- The upgrade of the existing processing facilities and addition of new ore processing facilities next to the existing process plant, rather than the development of a new plant to the west of the pit (Steps 1 and 2);
- The potential relocation of Cell 1 in Step 1 (and if needed, Cell 2 in Step 2) of TSF3 to either the east of the pit or to a location slightly to the south of its original location to the west of the pit;
- The potential relocation of the new Phase 2 HFO power plant from the west of the pit to a
location adjacent to the existing processing plant (Step 2); and

- The addition of a new water supply pipeline from the borefield running parallel to existing pipelines (Step 2).

TMLSA therefore considers the optimisation of Expansion Project can be implemented by TMLSA under the auspices of the Phase 2 EIA on the basis of:

- Smaller open pits: the optimized pit lies within the 60 000 t/day pit shell;
- Waste Rock Dumps: waste rock will go in to the approved dump areas;
- Smaller process plant: process plant capacity will be less than 60 000 t/day at up to 12,000 t/day (Step 1) and between 30,000 and 38,000 t/day (Step 2);
- TSF3: the two options being considered lying within areas already approved for mine residue disposal; and
- Smaller power generation facilities: the new power plant (50-60 MWe) is smaller than the approved one (120 MWe).

Based on review of the available baseline data and the previously described impacts it has been concluded that the impact significance at the Mine site will not increase and there is potential for a slight reduction in the significance of some impacts. This is due to the smaller area of disturbance reducing the impacts on biodiversity and cultural heritage, the lower production rate resulting in lower overall emissions and greenhouse gases and the change in TSF construction method reducing the risk of long term seepage from TSF3.

No changes to the recommended management measures are required and the proposed Step 1 and 2 activities will be implemented under the requirements of TMLSA’s existing environmental and social management system and associated plans and procedures.
6 REFERENCES

British Standard, 2009. BS 5228 Control of Noise on Construction and Open Sites.


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