# Appendix 28 Biodiversity Management Plan
# Environmental and Social Impact Assessment
# Yaoure Gold Project, Côte d'Ivoire

Submitted to

**Perseus Yaoure SARL**

Submitted By

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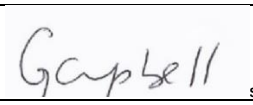
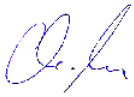
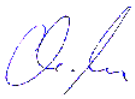
| Author | **Dr. Genevieve Campbell** |  Signature & Date | |
| Reviewer | **Dr. Christian Kunze**<br>**Chantelle De La Haye** |  Signature & Date | |
| Project Manager Approval | **Dr. Christian Kunze**<br>**Chantelle De La Haye** |  14 September 2018 | |

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## EXECUTIVE SUMMARY

This document presents the Biodiversity Management Plan (BMP) that was developed for the Yaoure Gold Project of Perseus Yaoure SARL (Perseus). It aims to propose a strategy to ensure that mitigation measures are implemented effectively, and that a proper monitoring takes place throughout the Project life to verify that mitigation measures are effective and sufficient. The Project will also adopt an adaptive management strategy, where findings from the monitoring program will be evaluated regularly, and mitigation measures adapted in accordance with results and/or change in the national and international regulations.

Perseus intends to follow the IFC Performance Standard (PS) 6, which sets the standards for best practices in biodiversity management for the private sector. Therefore, this BMP is based on the IFC PS6 guidance notes, and following the mitigation hierarchy. This BMP also includes restoration and rehabilitation measures along the Bandama River to ensure net biodiversity gain in Critical Habitat.

Twenty-four priority species were identified during baseline biodiversity surveys, and thus mitigation measures were developed to try and ensure that no diminution of priority species population in the area are caused by Project activities. These species will be used as indicator species and will be given particular attention during the monitoring process.

Finally, this document provides a detailed timeline and organising framework to ensure the proper implementation of this management plan.

## CONTENTS



## TABLES



## FIGURES

# 1.0 INTRODUCTION

## 1.1 Project Overview

The Yaoure Gold Project of Perseus Yaoure SARL (the Project) is in the Bouafle Prefecture, to the northwest of Yamoussoukro, in a transition zone between the Guineo-Congolian forest and the Sudano-Guinean savannah biomes. The habitat in the Project area has already been degraded through several years of artisanal and commercial mining operations, and as well as by the presence of a hydroelectric dam that flooded a large part of the forest in the 1970s.

The exploration phase indicated that there still remains substantial gold ore deposits at the existing mining site, and thus this Project intends to undertake exploitation activities at this site for approximately 6 years, starting with the construction phase. This project entails the construction of new accommodation facilities, new roads, mining and processing infrastructures, waste management facilities and aims to employ up to approximately 1200 people during construction and 500 people during operation. Although the site has been previously exploited, this project expansion will potentially incur additional impacts on the biodiversity present in this area.

Impacts have been identified and presented in the ESIA. This Biodiversity Management Plan (BMP) was set out specifically to provide a framework and strategy to ensure minimal impacts from Yaoure mining activities on the local biodiversity and environment.

## 1.2 Legal and Regulatory Framework

### 1.2.1 National Regulations

- Law No. 98-755 of 23 December 1998 on the Water Code: On the management, protection, and development of water resources in the country. Also regulates standards for discharge of wastewater into the environment;
- Law No. 65-425 of 20 December 1965 on the Forestry Code, replaced by the new Forestry Code Law No.2014-427 of 14 July 2014: Provide guidelines for the sustainable use of forests throughout the country;
- Law No. 96-766 of 3 October 1996 on the Environmental Code: Aim to protect all components of the environment (including the soil, fauna and flora), regulate and establish the conditions for the sustainable use of natural resources, as well as the requirements for the ESIA, and ensure rehabilitation of degraded areas;
- Law No. 65-255 of 4 August 1965 pertaining to the protection of fauna and hunting, some articles modified by law No. 94-442 of 16 August 1994;
- Decree No. 97-393 of 9 July 1997 on creation of the public administrative institution referred to as the Agence Nationale de l'Environnement (ANDE) (English: National Environment Agency); and
- Decree No. 96-894 of 8 November 1996, determining rules and procedures for studies on environmental impacts related to development projects.

### 1.2.2 International Standards and Guidelines

International standards and guidelines relevant to this Biodiversity Management Plan include the following:

- IFC Performance Standard 6 (IFC PS6) “Biodiversity Conservation and Sustainable Management of Living Natural Resources”; and
- ICMM “Good Practice Guidance for Mining and Biodiversity”, which supports Principle 7 of the ICMM’s Sustainable Development Framework to “contribute to conservation of biodiversity and integrated approaches to land use planning”.

## 1.3 Purposes and Objectives of the Biodiversity Management Plan

The BMP is designed to capture all the mitigation measures and requirements assessed in the main ESIA document. Mitigation measures for both biodiversity and ecosystem services were present in the biodiversity and ecosystem impact assessment sections the ESIA and are included here in more detail to ensure their proper implementation.

The process for developing a BMP focuses on identifying, evaluating, conserving (and where appropriate enhancing) the relevant aspects of biodiversity. More specifically, the objectives are to:

- Protect and conserve biodiversity in the Project area;
- Maintain benefits from ecosystem services in the Project area;
- Respect the mitigation hierarchy by avoiding or mitigating biodiversity loss, with the objective of maintaining the diversity of species, habitats and ecosystems and the integrity of ecological functions;
- Address any biodiversity risks that were identified through the environmental and social impact assessment (ESIA);
- Respond to regulatory requirements: Regulation and legislation that are relevant to the BMP relate to invasive species, priority species, sustainable use of resources, wildlife management, waste management, pollution prevention and water treatment;
- Propose a monitoring plan that would ensure mitigation measures are properly implemented; and
- Contribute towards the remediation of significant global, regional and local biodiversity losses caused by significant residual impacts, and to net biodiversity gain in Critical Habitat.

# 2.0 BIODIVERSITY BASELINE SURVEY SUMMARY

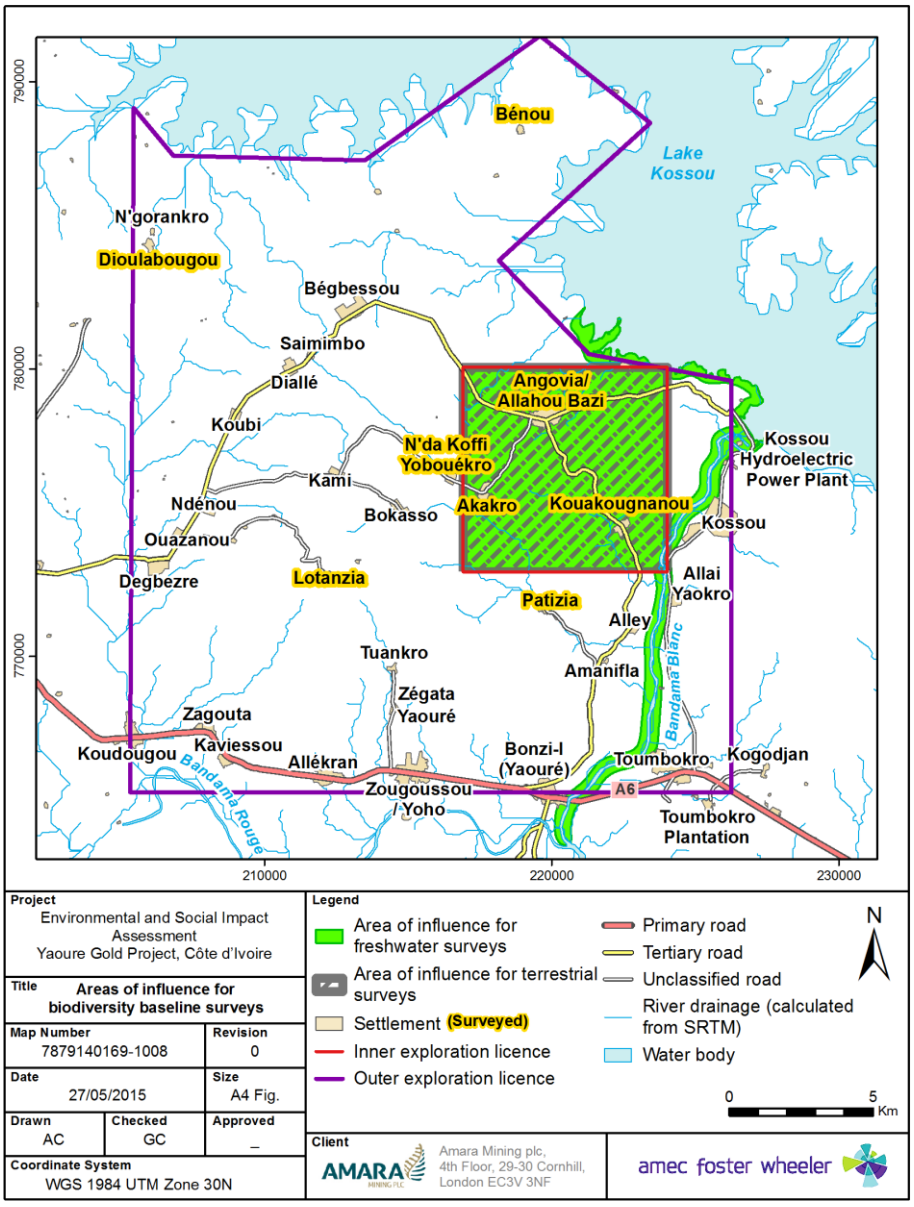
## 2.1 Area of Influence

The Project area consists of an 'Outer Exploration License' (OEL) covering approximately 440 $km^2$, including a smaller 'Inner Exploration License' (IEL) of approximately 50 $km^2$ in size. The Project area is located in a transition zone between two biomes, the Guineo-Congo forest and the Sudan-Guinea savannah biomes. However, not a significant extent of natural vegetation remains given high levels of habitat degradation in this area that have been on-going for many years.

The main hydrological features present in the Project area are the Kossou Lake, which lies at the northern end of the IEL and OEL, and the Bandama River, which flows along their eastern boundaries (Figure 2-1). A hydroelectric dam was built on the Bandama River in 1972, and now regulates the water flow on the Bandama River.

The proposed mining activities are restricted to the IEL, and thus the area of influence (AoI) defined for impacts on terrestrial biodiversity included the IEL and its vicinity (Figure 2-1). A larger AoI was selected for the freshwater surveys, as indirect impacts may affect a wider area, including the Bandama basin and its tributaries.

**Figure 2-1: Area of Influence Delimitated for Terrestrial and Freshwater Surveys**




## 2.2 Priority Biodiversity Species

Surveys were conducted between November 2014 and May 2015 on six groups: birds, reptiles and amphibians, flora, freshwater ecology (i.e. fish, microalgae and benthic macroinvertebrates), large and small mammals. These surveys revealed the presence of 24 priority species (i.e. species listed as Endangered or Vulnerable on the IUCN Red List, and endemic or restricted range species) (Table 2-1).

**Table 2-1: Priority Species Recorded in the Area of Influence during Biodiversity Baseline Surveys. The four species that triggered Critical Habitat are highlighted in red.**

| Family | Species | English name | IUCN status[1] | National Status[2] | RR[3] | EN[4] |
|---|---|---|---|---|---|---|
| BIRDS | | | | | | |
| Psittacidae | *Psittacus timneh* | Timneh parrot | VU | II | no | no |
| Pycnonotidae | *Bleda eximius* | Green-tailed bristlebill | NT | - | yes | no |
| Sylviidae | *Bathmocercus cerviniventris* | Black-headed rufous warbler | NT | - | yes | no |
| Sturnidae | *Lamprotornis cupreocauda* | Copper-tailed glossy starling | NT | - | yes | no |
| Cisticolidae | *Apalis sharpii* | Sharpe's Apalis | LC | - | yes | no |
| REPTILES AND AMPHIBIANS | | | | | | |
| Hyperoliidae | *Kassina schioetzi* | Schiøtz's running frog | LC | - | no | yes |
| Hyperoliidae | *Hyperolius* sp. | Reed frog | N/A | - | ? | ? |
| FLORA | | | | | | |
| Combretaceae | *Terminalia ivorensis* | Black Afara | VU | - | no | no |
| Leguminosae | *Afzelia africana* | Afzelia | VU | - | no | no |
| Leguminosae | *Albizia ferruginea* | Albizia | VU | - | no | no |
| Loganiaceae | *Strychnos millepunctata* | - | VU | - | yes | yes |
| Meliaceae | *Entandrophragma* sp. | - | VU | - | no | no |
| Meliaceae | *Khaya grandifoliola* | Large-leaved Mahogany | VU | - | no | no |
| Sterculiaceae | *Nesogordonia papaverifera* | - | VU | - | no | no |
| Sterculiaceae | *Pterygota macrocarpa* | - | VU | - | no | no |
| FISH | | | | | | |
| Cichlidae | *Tilapia busumana* | - | VU | - | yes | no |
| Mormyridae | *Mormyrus subundulatus* | - | EN | - | yes | no |
| Mormyridae | *Marcusenius furcidens* | - | NT | - | no | yes |
| Cichlidae | *Tilapia walteri* | - | NT | - | yes | yes |
| Mochokidae | *Synodontis bastiani* | - | LC | - | yes | yes |
| Mochokidae | *Synodontis punctifer* | - | LC | - | yes | yes |
| LARGE MAMMALS | | | | | | |
| Bovidae | *Kobus k. kob* | Buffon's kob | VU | - | no | no |
| Hippopotamidae | *Hippopotamus amphibius* | Hippopotamus | VU | - | no | no |
| Manidae | *Phataginus tricuspis* | White-bellied pangolin | VU | II | no | no |
| SMALL MAMMALS | | | | | | |
| No priority species identified | | | | | | |

1 IUCN Status: EN=Endangered; VU=Vulnerable; NT=Near Threatened; LC=Least Concern; N/A=Not Available
2 National Status: II = Partially protected species
3 RR=Restricted Range
4 EN=Endemic to Côte d'Ivoire

# 3.0 BIODIVERSITY MANAGEMENT

Following the mitigation strategy set out by the IFC, Perseus Mining plc should first seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented. Mitigation measures for both biodiversity and ecosystem services were present in the biodiversity and ecosystem impact assessment sections the ESIA and are included here in more detail to ensure their proper implementation.

Furthermore, four species triggered Critical Habitat (two fish, one amphibian and one liana species) (see Appendix 18 “Critical Habitat Assessment” of the main ESIA Report for further information). According to IFC standards, the Project should demonstrate a net gain in biodiversity for Critical Habitat, and thus further recommendations are made to attain this goal.

## 3.1 Requirements

This sub-section describes management and mitigation measures that will be implemented by Perseus to minimize identified potential impacts on biodiversity and Critical Habitat (Table 3-1), as well as for ecosystem services (Table 3-2). Where relevant, the mitigation measures are described by project phase (i.e., construction, operation, and closure), however given that most impacts may potentially occur over the entire Project life, general mitigation measures are usually presented.

Some management measures should be undertaken at the start of construction activities. These were devised to:

- Conduct rapid fauna and flora assessment of the land to be attributed as part of any resettlement program; and
- Start re-vegetation trial in degraded areas.

**Table 3-1: Proposed Mitigation Measures to Minimize Biodiversity Impacts**

| Impact | Mitigation measures |
|---|---|
| Habitat loss | Construction and operation<br>• The extent of vegetation clearance should be monitored not to exceed proposed area's surface to be cleared;<br>• Vegetation that is removed should not be burnt but left on the ground in suitable areas to decompose (preferably in soil stockpiles areas);<br>• Physically removing or scaring away animals immediately before clearance commences.<br><br>Closure<br>• Re-vegetation of bare areas using native plant species and ensuring that a mix of similar habitats as was there previously is restored if possible. |
| Habitat fragmentation | Construction and operation<br>• Restore surrounding habitats to cleared areas to compensate habitat loss where possible;<br>• Recreate connectivity between habitat patches in the vicinity to cleared areas where possible.<br><br>Closure<br>• Recreate vegetation corridor where possible. |
| Vehicle collision leading to injury or mortality | • Provide driver awareness and training;<br>• Enforce speed limits;<br>• Report any collision, document species affected and area of occurrence. |
| Hydrological impacts | • Avoidance of stream diversion where possible;<br>• Stabilize or re-vegetate slopes to prevent erosion;<br>• Monitor freshwater habitat quality. |
| Water and soil pollution | Construction and operation<br>• Specific measures such as bunded above-ground fuel and chemical storage will be implemented to prevent the pollution that could arise from cement slurry, spillage of fuels and lubricants or other contamination;<br>• Treat contaminated water to attain legal limits before any discharge into the environment;<br>• Oil and fuel spillage kits will be made available in the event of leaks (from machinery or fuel tank);<br>• Bunds will be constructed around oil and fuel areas to prevent spillages;<br>• Manage waste and recycle.<br><br>Closure<br>• Dispose of waste in such a way that there is no contamination into the environment. |
| Habitat degradation | • Adoption of the noise mitigation strategy set out in the noise section;<br>• Noisy construction work should be carried out during daylight hours to limit noise levels in the quieter night-time noise environment;<br>• Regular maintenance of equipment and vehicles in accordance with manufacturers specifications to prevent increases in noise emissions;<br>• Damping down or covering stockpiles of friable material in dry and windy conditions, use of water sprays to control dust on roads and working areas, covering of dusty materials;<br>• Use directional lighting, light shielding and hoods to mitigate light spill, and use motion sensors and timers to control lighting in areas that do not need to be permanently illuminated. |

| Impact | Mitigation measures |
|---|---|
| Induced human access and in-migration | • Conduct local environmental sensitization campaign;<br>• Develop Project staff conduct guidelines that would include a no hunting policy and the interdiction of transporting live or dead animals, plants or seeds in Project related vehicles;<br>• Install gates and inspect company vehicles for illegal wildlife products;<br>• Endeavour to develop alternative money generating activities. |
| Invasive species and pathogens | • Develop Project staff conduct guidelines that would include a no hunting policy and the interdiction of transporting live or dead animals, plants or seeds in Project related vehicles;<br>• Install gates and inspect company vehicles for illegal fauna and flora products;<br>• Provide Project staff with a hygiene and vaccination campaign;<br>• Train staff to recognise key invasive species. |
| Critical Habitat | • Conduct follow-up surveys to assess the extent of Critical Habitat;<br>• Prioritize preservation and avoidance of activities in Critical Habitat; and<br>• Implement further conservation efforts to obtain a net biodiversity gain in Critical Habitat. |

A list of priority ecosystem services (rated has having a value of high or critical) has been established for which the Project must design mitigation measures that aim to maintain or restore the value and functionality of the service for beneficiaries (Table 3-2).

Due to the cross-cutting nature of ecosystem services, mitigation of impacts is also captured in other management plans, such as in the Soil, Noise, Water and Socio-economic Management Plans.

**Table 3-2: Mitigation Measures for Priority Ecosystem Services**

| Service | Subcategory | Mitigation measure |
|---|---|---|
| **Provisioning** | | |
| Food | Hunting | • Encourage sustainable agricultural, fishing, and livestock-breeding programmes (e.g., as part of the Community Development Plan), as identified through needs-based assessments and community consultations that aim to diversify and increase food alternatives in the Project area through best practice techniques.<br><br>• Support the design and implementation of an information and awareness programme regarding sustainable harvesting, agriculture, grazing, and conservation of natural resources in partnership with relevant organisations (e.g. as part of the Community Development Fund) |
| Food | Fishing | |
| Food | Agriculture | |
| Fuel | Firewood for cooking | • Raise awareness of alternative cooking fuel (e.g. solar oven).<br>• Use fast-growing tree species used locally as fuel-wood in re-vegetation program. |
| Freshwater | - | • Work with the project affected communities to support them in securing safe and sustainable water supplies. |

| Service | Subcategory | Mitigation measure |
|---|---|---|
| | | • Participate in the cleaning/preservation of the Bandama River. |
| Natural medicine | Medicinal plants | • Undertake appropriate interventions (e.g. nurseries), as identified in needs assessments, to replace lost resources and to harvest and replant species of local significance, particularly medicinal species. |
| Abiotic materials | Mineral resources | • Comply with the Soil Management Plan. |
| **Regulating** | | |
| Seed dispersal and pollination | - | • Ensure implementation of mitigation measures are aimed to minimize impacts on biodiversity features.<br>• Consider alternative livelihood programs that can also be beneficial for ecosystem services (e.g. bee keeping). |
| Regulation of natural hazard | Forest cover (wind stopper and dust) | • Implement vegetation rehabilitation and reforestation programs, particular in areas that have been cleared for mining activities. |
| Pest control | - | • Ensure implementation of mitigation measures are aimed to minimize impacts on biodiversity features, which should ensure no alteration of the current food chain and natural pest control regulation. |
| **Cultural** | | |
| Spiritual values | Sacred forests | • Avoidance of vegetation clearance in sacred forests.<br>• Where not possible, provide alternative or compensation for loss of cultural service in consultation with the local community. |
| Spiritual values | Cemetery | |
| **Supporting** | | |
| Nutrient cycling processes | - | • Protection of soils outside work areas from damage by prohibiting the movement of construction vehicles and equipment outside designated areas (see also Soil Management Plan).<br>• Scheduling works with high erosion potential during the dry season wherever possible.<br>• Rehabilitating all disturbed land as soon as practical after completion of works (see Closure Plan). |
| Soil formation processes | - | |
| Photosynthesis | - | |

# 4.0 BIODIVERSITY MONITORING AND EVALUATION

## 4.1 Biodiversity Monitoring

The monitoring plan for the Project was developed to ensure the proper implementation and effectiveness of mitigation measures. More specifically monitoring will aim at:

- Ensuring that the Project is compliant with Côte d'Ivoire and international standards for emissions and discharges;
- Ensuring that the magnitude of impacts and sensitivity of receptors are verified regularly in order to rapidly adapt the management plan;
- Determining if the environmental, social and community health changes that are observed to be occurring are attributable to Project activities or are the result of other activities or natural variation; and
- Adopting a continual review and improvement in Project design and execution.

The detailed biodiversity management and monitoring plan is provided in Appendix A.

### 4.1.1 Indicators, Measurement and Monitoring Extent

Indicators should be used as proxies to monitor impacts on biodiversity. Using indicators is a way to balance costs and results, and they should be selected using the SMART philosophy (specific, measurable, achievable, relevant and timely). Biodiversity indicators must also be sufficiently sensitive to provide a warning of change before irreversible damage occurs – effectively they must serve to indicate where no significant change is occurring, and also where the threshold between insignificant and significant change lies. Three types of indicators (ICMM, 2006) should be used to monitor effectiveness of mitigation measures (Table 4-1).

**Table 4-1: Type of Indicator to be Used and the Measurement to be utilized to Monitor Impacts**

| Indicator type | Measurement |
|---|---|
| Condition indicator | • Species richness and composition; and<br>• Relative abundance (i.e. encounter rate) of priority species. |
| Pressure indicator | • Extent of vegetation clearance; and<br>• Relative abundance (i.e. encounter rate) of anthropogenic threats. |
| Response indicator | • Area re-vegetated; and<br>• Difference between condition and pressure indicators. |

Monitoring should be implemented at pre-selected sampling locations within the AoI, and should also include sampling locations at a control site. Indeed, the collection of data at a control site will enable assessment of the amplitude and source of impacts (i.e. caused by mining activities or due to natural variation). The area around Benou (see Figure 2-1), located approximately 8 km North of the IEL and within the OEL, is proposed as a control site since it harbours similar vegetation types, and similar fauna. Baseline data was also collected at this site for several taxa, and thus only a few biodiversity surveys would be required.

## 4.2 Evaluation

The evaluation of the monitoring programme will be on-going and as follows:

- Daily: General monitoring updates, reporting of incidents impacting biodiversity and emergency response;
- Monthly: Compilation of monitoring progress, environmental training delivered, details on any major incidents/events, general progress of the monitoring program;
- Quarterly: Summary report on quarterly biodiversity monitoring programs, review quarterly performance and apply adaptive management if required; and
- Annual: Review annual biodiversity monitoring program, prepare annual report to include evaluation results for the year against targets and biodiversity objectives.

The baseline data collected as part of biodiversity surveys will serve to assess Project impacts and efficiency of mitigation measures, as well as biodiversity gain and loss, by comparing data to be collected during the long-term monitoring to established baseline levels.

# 5.0 TIMELINE, RESOURCE ALLOCATION AND RESPONSIBILITY

## 5.1 Timeline

Biodiversity monitoring should be implemented at the start of construction activities and continue throughout the Project life..

## 5.2 Resource allocation

Perseus Yaoure SARL will be in charge of managing and supporting biodiversity specialists throughout the whole project life in accordance with the monitoring requirement plan. Biodiversity specialists will be under the management of Perseus's Environmental Managers, whom will be made responsible, as part of their duties, to monitor Biodiversity and Ecological issues as outlined in this Plan.

Some materials were left at the Project's main office after the completion of baseline biodiversity surveys (e.g. camera traps and head torches) and can be used for the long-term monitoring.

## 5.3 Responsibility

**Table 5-1: Details of Role and Responsibilities assigned to the Project's Employees**

| **Position title**<br><br>***Details TBD by Perseus when Project is at advanced stage** | **Role and responsibilities** |
|---|---|
| Operations Manager/ Project Manager | • Ensure adequate resources are available to enable implementation of the BMP; and<br><br>• Accountable for the overall environmental performance, including the outcomes of this BMP. |
| Environmental Manager (SHEC Manager) | • Ensure the day to day implementation of this BMP, including reporting of non-compliances with the trigger values;<br><br>• Ensure that all relevant records are effectively maintained on site; and<br><br>• Ensure employees are competent and appropriately qualified through training and awareness programs. |
| Contractors / Construction personnel | • Ensure operations are undertaken in accordance with instructions;<br><br>• Ensure appropriate notification and response in the event of an environmental incident; and<br><br>• Show due care not to cause environmental harm. |
| All personnel | • Follow direction provided by the Operations and Environmental Managers;<br><br>• Show due care not to cause environmental harm; and<br><br>• Notify Supervisor/Environmental Manager of any environmental non-compliance. |

# 6.0 ADAPTIVE MANAGEMENT

Given the complexity of predicting project impacts on biodiversity and ecosystem services over the long term, Perseus is committed to comply with the IFC PS6 by adopting an adaptive management monitoring system. This is to ensure that mitigation actions are either demonstrated to be effective or adjusted in a timely manner, by regularly evaluating findings from monitoring programs and adapting management and mitigation responses as necessary.

The BMP will also need to be closely integrated with other management plans (e.g. Soil Management Plan) as actions undertaken as part of those may ultimately affect biodiversity and ecological issues.

Perseus Yaoure SARL will review monitoring results, annually during the construction and operation phase, with key partners and/or biodiversity specialists to ensure that biodiversity mitigation measures are still effective and sufficient. The BMP will also be updated if new regulations and/or changes to the legislative framework occur during the Project life.

# 7.0 REFERENCES

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# APPENDIX

## APPENDIX A: Detailed Biodiversity Monitoring Plan for Yaoure Gold Project

Table A1: Detailed monitoring plan for the construction and operation phases of the Yaoure Gold Project

| Impact | Mitigation measures | Specific action | Indicator and measurement | Response | Timeline | | |
|---|---|---|---|---|---|---|---|
| | | | | | Daily | Bi-annually | Annually |
| Habitat loss | The extent of vegetation clearance should be monitored not to exceed proposed area's surface to be cleared. | Areas to be cleared should be clearly marked to ensure no accidental clearing occurs. | The final area cleared against the previously marked area should be verified by the Environmental Manager. | Non-compliance should be reported and the cause of non-compliance be investigated. | √ | | |
| | | Monitor total extent of vegetation clearance. | Total extent of deforestation can be calculated, and then compared to the expected extent of vegetation clearance. This can be done using a classified land use map and GIS software. | In the case that the extent of deforested area is higher than expected, further investigations into the cause and source of deforestation should be conducted. | | | √ |
| | Vegetation that is removed should not be burnt but left on the ground in suitable areas to decompose (preferably in soil stockpiles areas). | Vegetation should be removed according to best practice and left on the ground in suitable areas to decompose. | Stockpile areas are observed after vegetation clearance. | Non-compliance should be reported. | √ | | |
| | Physically removing or scaring away animals immediately before clearance commences. | Develop fauna scaring system and relocation procedures. | Record taxa and number of individuals displaced or relocated, as well as fleeing direction. | Report any injuries to animals or sensitive issues (i.e. major nesting site). | √ | | |
| Habitat fragmentation | Restore surrounding habitats found in the vicinity to cleared areas to compensate habitat loss.<br><br>Recreate connectivity between habitat patches in the vicinity to cleared areas where possible. | A vegetation trial should be conducted in areas that were previously exploited. Trials could also be conducted along the Bandama River at the illegal Chinese exploitation sites, which would help to attain gain in biodiversity. | The growth rate of tree species and wildlife use of the different areas re-vegetated during the trial should be compared to understand which factors can lead to successful habitat rehabilitation. | Vegetation trial plots should be closely monitored to understand factors leading to a successful program and parameters or tree species should be change according to monitoring results. | | √ | |

| Impact | Mitigation measures | Specific action | Indicator and measurement | Response | Timeline | | |
|---|---|---|---|---|---|---|---|
| | | | | | Daily | Bi-annually | Annually |
| | | Identify, with biodiversity specialists, priority areas to be re-vegetated to connect sensitive habitat patches. | Monitoring sampling locations can be included in these areas to assess the effectiveness of such measure. | Close monitoring of these areas should be made, and further mitigation measures may be needed in cases, for examples, where there is an increase in hunting in these areas by the local population or where they come to harvest wood. | | √ | |
| Vehicle collision leading to injury or mortality | Provide driver awareness and training. | The personnel shall undergo biodiversity management awareness training as part of the project induction program, including reconnaissance of priority species. | The number of collisions with animals should be lower compared to the number recorded during the baseline year. | If an increase in animal collision is recorded, further investigations should be made to understand its causes and respond accordingly. | | | √ |
| | Enforce speed limits. | Install speed bumps at pre-defined locations. | There should be no or significantly less collisions recorded close to the speed bumps. | Additional speed bumps may be required if other areas with increased animal collision are located during the construction and operation phases. | | | |
| | Report any collision, document species affected and area of occurrence. | The driver should possess a data entry log where he can record any collision with animals, its location and the species or taxa affected. | The number of collisions should not increase significantly between years. | An Increase in the number of collisions or animal injuries should be investigated. | | | |
| Hydrological impacts | Avoidance of stream diversion where possible. | Properly implement Soil and Water Management Plans.<br><br>Scheduling works with high erosion potential during the dry season wherever possible. | Environmental Manager should supervise operations to ensure compliance with the different management plans and proposed activities schedule. | Report non compliance to superior. | | √ | |
| | Stabilize or re-vegetate slopes to prevent erosion. | | | | | | |
| | Monitor freshwater habitat quality. | Undertake regular freshwater aquatic monitoring survey programme at pre-defined | Measure biodiversity indicators and compare them to baseline values. | Review results of monitoring program every quarter to ensure that any impacts on | | √ | |

| Impact | Mitigation measures | Specific action | Indicator and measurement | Response | Timeline | | |
|---|---|---|---|---|---|---|---|
| | | | | | Daily | Bi-annually | Annually |
| | | sampling locations, and in addition include control areas outside of the Project site. | | the freshwater ecosystem are recorded soon enough to implement appropriate complementary mitigation measures. | | | |
| Water and soil pollution | Specific measures such as bunded above-ground fuel and chemical storage will be implemented to prevent the pollution that could arise from cement slurry, spillage of fuels and lubricants or other contamination;<br><br>Treat contaminated water to attain legal limits before any discharge into the environment;<br><br>Oil and fuel spillage kits will be made available in the event of leaks (from machinery or fuel tank).<br><br>Bunds will be constructed around oil and fuel areas to prevent spillages.<br><br>Manage waste and recycle. | Follow the Water and Soil Management Plans closely, especially in relation to the management of potential pollution risks.<br><br>Ensure proper recycling and waste management facilities are implemented, and that employees are trained to properly use them. | Monitor and record specificity of any water treated and/or discharge in the environment. | In the event of accidental spill or environmental pollution, proceed to a review of the management plans and pollution prevention installations/measures taken. | √ | | |
| Habitat degradation | Adoption of the noise mitigation strategy set out in the noise section;<br><br>Noisy construction work should be carried out during daylight hours to limit noise levels in the quieter night-time noise environment.<br><br>Regular maintenance of equipment and vehicles in accordance with manufacturer's specifications to prevent increases in noise emissions. | Follow the Noise Management Plan.<br><br>Limit blasting to daylight hours.<br><br>Damping down or covering stockpiles of friable material in dry and windy conditions, use of water sprays to control dust on roads and working | Environmental Manager should supervise operations to ensure compliance with the different management plans and proposed activities schedule. | Report non compliance to superior. | √ | | |

| Impact | Mitigation measures | Specific action | Indicator and measurement | Response | Timeline | | |
|---|---|---|---|---|---|---|---|
| | | | | | Daily | Bi-annually | Annually |
| | Damping down or covering stockpiles of friable material in dry and windy conditions, use of water sprays to control dust on roads and working areas, covering of dusty materials.<br><br>Use directional lighting, light shielding and hoods to mitigate light spill, and use motion sensors and timers to control lighting in areas that do not need to be permanently illuminated. | areas, covering of dusty materials. | | | | | |
| Induced human access and in-migration | Develop Project staff conduct guidelines that would include a no hunting policy and the prohibition of transporting live or dead animals, plants and/or seeds in Project related vehicles.<br><br>Install gates and inspect company vehicles for illegal wildlife products. | All staff working on the project will receive environmental induction which will include common environmental issues to inform staff on the importance of biodiversity as well as highlighting habitats and species, sites of particular importance and bushmeat hunting restrictions. | Environmental induction should be given every year to ensure that the personal is following guidelines, and that they are up-to-date with regulations. | One warning may be allowed for non-compliance, but in case of repeated offense, a fine should be imposed. | | | √ |
| | Conduct local environmental sensitization campaign.<br><br>Support alternative money generating activities. | An environmental awareness campaign should be conducted in the villages included in the IEL.<br><br>Based on the needs identified by the local population during socio-economic surveys, support projects that would provide alternative revenue to the local population and workers that moved to the area. | Monitor biodiversity at selected sampling locations to ensure no significant diminution of their populations.<br><br>Monitoring of the selected alternative livehood projects should be implemented to ensure that these projects are working and that there is not an increase in other activities, such as | Review results of the biodiversity monitoring program and adapt mitigation measures accordingly.<br><br>Certain alternative livehood projects may not be successful and thus, several different types of projects should be considered to ensure some level of success. | | | √ |

| Impact | Mitigation measures | Specific action | Indicator and measurement | Response | Timeline | | |
|---|---|---|---|---|---|---|---|
| | | | | | Daily | Bi-annually | Annually |
| | | | deforestation for agriculture and increase in hunting. | | | | |
| Invasive species and pathogens | Develop Project staff conduct guidelines that would include the prohibition of transporting live or dead animals, plants and/or seeds in Project related vehicles.<br><br>Provide Project staff with a hygiene and vaccination campaign.<br><br>Train staff to recognise key invasive species. | The personnel shall undergo biodiversity management awareness training as part of the project induction program, including reconnaissance of invasive species, respecting hygiene measures and following a vaccination campaign. | Induction should be given every two years to ensure that the personal is following, and up-to-date, with the guidelines that were implemented. | Follow the company's Disciplinary Procedure for any non-compliant activities. | | | √ |
| | Install gates and inspect company vehicles for illegal fauna and flora products. | Guards positioned at the gates should be trained to inspect company vehicles for illegal fauna and flora products. | Guards should confiscate any illegal fauna or flora products found in project vehicles and report the incident to their superior. | The driver of the vehicle should be disciplined if illegal wildlife or plant products are found in his vehicle. | √ | | |
| Critical Habitat | Conduct follow-up surveys to assess the extent of Critical Habitat. | Conduct complementary morphological, acoustic and genetic analyses of *Hyperolius* sp. to determine if it is a new species.<br><br>Consider conducting complementary baseline fish surveys by adding sampling locations along the Bandama River and the Kossou Lake, as well as surveying fisherman's catch.<br><br>Conduct follow-up amphibian surveys in habitat likely to harbour threatened species | Obtain complete and representative baseline levels. | N/A | | | |

| Impact | Mitigation measures | Specific action | Indicator and measurement | Response | Timeline | | |
|---|---|---|---|---|---|---|---|
| | | | | | Daily | Bi-annually | Annually |
| | | and to clarify taxonomic status of the *Hyperolius* amphibian specimens collected during baseline surveys.<br><br>Assess Hippopotamus population status on the portion of the Kossou Lake directly to the North and West of the OEL. | | | | | |
| | Prioritize preservation and avoidance of activities in Critical Habitat. | Identify critical habitat extent and make a map indicating priority conservation areas. | Particular attention should be given to these areas and if at all possible, no activities should be conducted there.<br><br>Biodiversity monitoring should be conducted in these areas on priority species to determine if there is an increase in their population. | Avoidance of activities in pre-defined conservation areas should be monitored daily and monitoring results should be reviewed annually and further actions can be implemented if necessary. | √ | | √ |
| | Implement further conservation efforts to obtain a net biodiversity gain in Critical Habitat. | Further conservation actions should be developed with the inputs of biodiversity specialists to ensure a net gain in Critical Habitat, these could consist of rehabilitation of the Bandama river banks. | Biodiversity monitoring can also be implemented at these locations to assess biodiversity gain. | If no biodiversity gain is observed, different strategies should be proposed. | | | √ |

Table A2: Detailed monitoring plan for the closure phase of the Yaoure Gold Project

| Impact | Mitigation measures | Specific action | Indicator and measurement | Response |
|---|---|---|---|---|
| Habitat loss | Re-vegetation of bare areas using native plant species and ensuring that a mix of similar habitats as was there previously is restored if possible. | Rehabilitating all disturbed land as soon as possible after completion of mining activities (according to the Closure Plan). Results from the re-vegetation trials should guide rehabilitation.<br><br>Results of biodiversity monitoring program can be used to identify areas where habitat connectivity would benefit the fauna populations. | Monitoring of these areas should be conducted to ensure that the rehabilitation and re-vegetation programs are effective. | The rehabilitation and re-vegetation programs can be adjusted according to monitoring results. |
| Habitat fragmentation | Recreate vegetation corridor where possible. | | | |
| Water and soil pollution | Dispose of waste as such that there is no contamination into the environment. | Follow the Water Management Plan. | Freshwater aquatic monitoring should continue throughout the closure phase. | Further remediation should be discussed if poor water quality is still found at the site. |
| Induced human access and in-migration | Support alternative livelihood activities. | Based on the needs identified by the local population during socio-economic surveys, support projects that would provide alternative revenue to the local population and workers that moved to the area. | Monitoring of the selected alternative livelihood projects should be implemented to ensure that these projects are working and that there is not an increase in other activities, such as deforestation for agriculture and increase in hunting. | Certain alternative livelihood projects may not be successful and thus, several different types of projects should be considered to ensure some level of success. |