Guinea Alumina Corporation Biodiversity Management Plan

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THE BIODIVERSITY CONSULTANCY

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Executive summary

GAC aims to align with IFC Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources. This means implementing the mitigation hierarchy to achieve a net gain for Critical Habitat qualifying biodiversity features experiencing significant residual impacts and no net loss for significant impacts on Natural Habitat and a subset of species of high conservation concern which lack data to confirm Critical Habitat status. Critical Habitat qualifying features, Natural Habitat and No Net Loss species are the Projects 'priority biodiversity features'.

This Biodiversity Management Plan (BMP) complements the Project's SEIA by setting out the specific onsite control measures that GAC will undertake to avoid, minimise and, where appropriate, progressively rehabilitate impacts on priority biodiversity features and the supply priority ecosystem services. It covers actions for priority features potentially impacted directly or indirectly by the development of the southern section of GAC's mine concession and associated infrastructure in the northern section. It also includes mitigation measures for the Port component of the Project. Measures apply to all phases of the Project cycle but focus on pre-construction and operations phases (see Figure 1 for an overview of priority features, impacts and mitigation measures).

This BMP is a living document that will be updated regularly as the Project better understands the status and ecology of priority biodiversity, project impacts on biodiversity and the supply and use of ecosystem services and the effectiveness of mitigation measures.

Successful implementation of the BMP is dependent on coordination between GAC Environmental and Social teams; an Ecosystem Service Working Group will be established to facilitate collaboration and the implementation of joint work plans and a spatially referenced database will be developed and maintained based on Environmental and Social data to inform the adaptive management of mitigation measures.

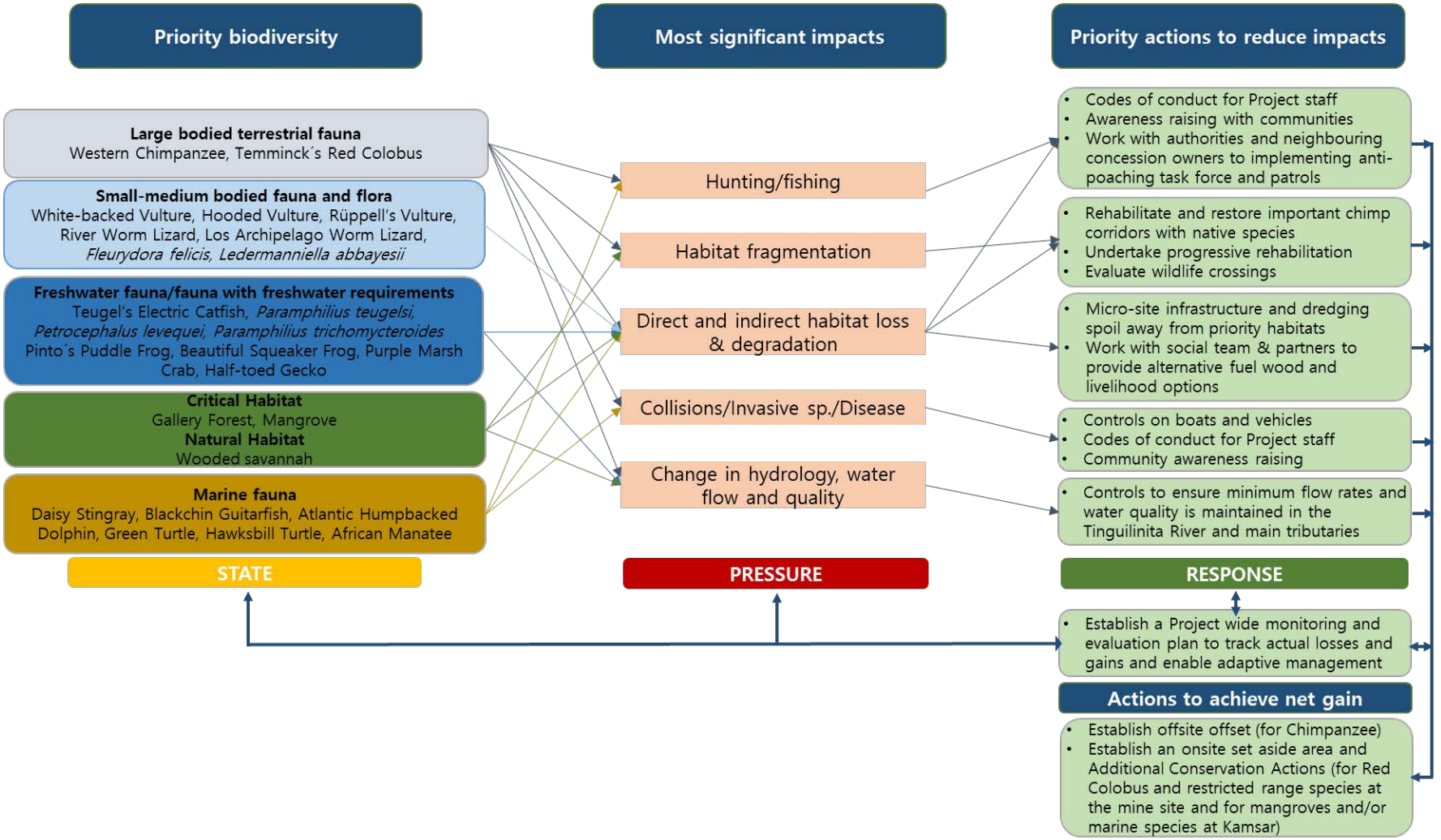

Figure 1: Overview of the Project's priority biodiversity features, impacts and mitigation measures

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List of acronyms

ADS	Agriculture Development Strategy
AC	Action Category
BMEP	Biodiversity Monitoring and Evaluation Plan
BMP	Biodiversity Management Plan
CBG	Bauxite Company of Guinea
CH	Critical Habitat
CHA	Critical Habitat Assessment
CIS	Community Investment Strategy
CM	Control Measure
CR	Critically Endangered (IUCN Redlist status)
DD	Data Deficient (IUCN Redlist status)
EHS	Environment, Health and Safety
EN	Endangered (IUCN Redlist status)
ESA	Ecosystem Service Assessment
ESR	Ecosystem Service Review
ESWG	Ecosystem Working Group
GCM	General Control Measure
GIS	Global Information System
GPS	Global Positioning System
Ha	Hectare
IESC	Independent Environmental and Social Consultancy
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature and Natural Resources
KPI	Key Performance Indicators (or response indicator)
LRP	Livelihood Restoration Plan
MP	Management Plan
MPA	Marine Protected Area
NGO	Non-Governmental Organization
NNL	No Net Loss
NTFP	Non-timber Forest Product
NOAA	National Oceanic and Atmospheric Administration
NT	Near Threatened
PIIM	Project induced In-Migration
PS6 (IFC PS6)	Performance Standard 6 (of the International Finance Corporation)

RAP	Resettlement Action Plan
SCM	Species Control Measure
SEIA	Social and Environmental Impact Assessment
SEMP	Social and Environmental Management Plan
SEP	Stakeholder Engagement Plan
SMART	Spatial Monitoring And Reporting Tool
SWQ	Salt Water Quality
ToR	Terms of Reference
VU	Vulnerable (IUCN Redlist status)
WCF	Wild Chimpanzee Foundation

1 Introduction

Guinea Alumina Corporation S.A. (GAC) is a Guinean registered company owned by Emirates Global Aluminium (EGA). GAC holds a 50-plus year mining concession for Lease 149 in the prefecture of Boké, in north-western Republic of Guinea.

GAC's bauxite export project ('the Project') includes:

- Greenfield bauxite mining activities in the southern part of the GAC concession;
- Two rail sidings to connect to the existing Sangarédi to Kamsar rail line (one within the concession and one at the port);
- A bauxite ore crushing plant, stockyards rail loading facility and associated infrastructure;
- A reservoir and pipeline to provide water for Project operations;
- Bauxite storage and export facilities at the GAC port concession in Kamsar.

The Project is expected to last between 20 and 40 years ERM, "Social and Environmental Impact Assessment (SEIA). Volume 1 Addendum for GAC´s Bauxite Export Project, Guinea.".

1.1 Biodiversity context

Biodiversity refers to the variability among living organisms from all sources (terrestrial, marine and freshwater) and the ecological environments they are part of; including the diversity found within species, between species and of ecosystems. Biodiversity forms the foundation of the ecosystem services that critically contribute to human wellbeing. For the purposes of biodiversity management the focus lies in mitigating impact risks to priority biodiversity features (habitats and species); the assumption being that the mitigation actions required for habitats will benefit all species that are dependent on those habitats as well as the ecosystem services derived from those habitats. Species specific mitigation measures are required for a subset of priority species which have greater risks of impact and consequence for the conservation status of the species.

The GAC concession area is situated in the Guinean forest-savannah mosaic ecoregion. Natural vegetation types in the concession include bowal grassland, dry forest (wooded savannah and isolated forest patches) and gallery forest (valley and headwater forest). The concession contains both Natural and Modified habitat, and includes on-site Critical Habitat. Species of global conservation concern found in the concession include Western Chimpanzee (*Pan troglodytes verus*) and several restricted-range reptiles, fish and amphibians.

Approximately 17,786 people live within the concession in 155 communities (ERM 2015, Vol 2). Many communities have limited access to social infrastructure and livelihood activities therefore rely on access to land for subsistence farming and access to other benefits provided by the natural environment (otherwise known as ecosystem services). Farming practices result in the conversion of former natural vegetation types into a mosaic of Modified Habitat consisting of farmed areas, plantations and fallow land of differing ages (see Figure 4, page 15). Ecosystem services are derived from both communally managed lands (areas of natural vegetation[1]) and from farm bush and fallow areas.

[1] I.e. wooded savannah and isolated forest patches, gallery forest (valley and headwater forest) and freshwater habitats.

This Biodiversity Management Plan (BMP) identifies onsite control measures that GAC will undertake to avoid, minimize and, where appropriate, progressively rehabilitate and offset impacts on priority biodiversity features (priority habitats and species). Due to the overlap between biodiversity and ecosystem services this plan also addresses mitigation measures for the supply of ecosystem services where they relate to management of natural vegetation. Mitigation measures to support the management of ecosystem service supply from Modified Habitat and to manage people's access to ecosystem services are part of the GAC community team social management plans.

In recognition of the links between indirect impacts that in-migration and resettlement of communities can have on biodiversity and the ability of the environment to provide ecosystem services for local communities, close coordination between the GAC Environmental and Social (E&S) teams will be required to mitigate impacts for biodiversity and ecosystem services. Measures to align social and environmental programs of work are therefore also included in the BMP.

1.1.1 Identification of priority biodiversity features and ecosystem services

An original SEIA, approved by the Government in 2008, was for a mining operation in the north of the concession but these plans are now on hold. Instead an SEIA addendum was subsequently written in 2014 to cover the planned mine and export of bauxite from the southern portion of the concession.

In 2017 the Critical Habitat Assessment (CHA) was updated by ERM (ERM 2017). In summary the CHA determined:

- The mine concession and port are Critical Habitat following IFC PS6 guidelines.
- Eight (8) species and two habitats (gallery forest and mangrove) qualify for Critical Habitat. The Project is required to achieve a net gain for habitats and species that qualify for Critical Habitat, unless it demonstrates that Project activities have not affected these features (ERM 2017).
- One habitat (wooded savannah) was identified as Natural Habitat.
- Fifteen (15) species lacked sufficient information to determine their Critical Habitat status. The 15 species that potentially qualify for Critical Habitat and wooded savannah, a Natural Habitat, require mitigation measures to achieve a No Net Loss outcome (ERM 2017). In this report these 15 species are referred to as 'No Net Loss or NNL species'.

Together all the above mentioned species and habitats are *priority biodiversity features* for the Project (see Section 2 for further detail).

Measures to avoid and minimise impacts to freshwater habitat is included within this document as this habitat as well as wooded savannah and Critical Habitats, are important for priority species and for maintaining ecosystem services. Through the Ecosystem Service Assessment (ERM 2015) and subsequent Ecosystem Service Review (TBC 2017), sixteen (16) ecosystem services were identified as a priority due to their importance for local people's livelihoods at the mine and nine (9) services at the port (see Section 2 for further detail).

1.2 GAC's commitment

GAC's Code of Business Conduct aspires to 'Zero Harm to our people, the environment and the communities in which we operate'. In terms of biodiversity and ecosystem services, GAC aims to align with IFC Performance Standard 6 (PS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources. This means implementing the mitigation hierarchy, to ultimately achieve a net gain for Critical Habitat qualifying biodiversity features experiencing significant residual impacts and no net loss for significant impacts on Natural Habitat and No Net Loss species.

As a priority the Project will aim to maintain the value and functionality of priority ecosystem services through avoiding adverse impacts to ecosystems. If impacts are unavoidable they will be minimised and mitigation measures implemented; compensation for ecosystem services will only be considered as a last resort, and will take the form of in-kind replacement through restoration of the service or through engineered solutions.

1.3 Scope and structure of the report

This Plan focuses on mitigation measures i.e. avoidance, minimization and restoration measures for priority biodiversity features and ecosystem services potentially impacted by development of the southern section of the GAC mine concession and the Port component of the Project. Measures apply to all phases of the Project cycle but focus is on pre-construction and operations. In order for the Project to fully implement the mitigation hierarchy, significant residual impacts will require offsets so as to achieve biodiversity net gain/no net loss goals. An offset pre-feasibility report has been prepared for chimpanzees (TBC 2016a), however the detailed offset actions are not part of this Management Plan but will be developed by the Project in an Offset Strategy and Implementation Plan. The list of priority features (habitats, species and ecosystem services) has been agreed with IFC based on the Project's assessments and consideration of data from the wider region.

This document follows the following structure:

Section 1: Introduction;

Section 2: Priority biodiversity features and priority ecosystem services addressed by this Plan;

Section 3: Potential impacts addressed (including reference to other Plans and documents, where relevant);

Section 4 General Control Measures (the common management actions required to achieve the objectives of this Plan);

Section 5: Monitoring and tracking implementation of General Control Measures;

Section 6: Species specific control measures (measures for priority species);

Section 7: Implementation (assurance and reporting sub-sections).

1.4 Objectives

The overarching objective of the BMP is to reduce impacts on priority biodiversity features and the supply of priority ecosystem services by setting out the specific onsite control measures that GAC will undertake to avoid, minimize and, where appropriate, progressively rehabilitate and offset impacts on priority biodiversity features.

The key aims of the BMP are to:

- Mitigate potential direct and indirect impacts on priority fauna, flora and habitats within the GAC concession resulting from planned mining and associated infrastructure development in the southern section of the license area (plus reservoir in north);
- Mitigate potential direct and indirect impacts on priority fauna and habitats resulting from development of the Port component;
- Identify indicators for monitoring the implementation of the identified mitigation measures;
- Assess the potential scale of significant residual impacts on priority biodiversity features to provide input into the design and development of an offset strategy to achieve net gain/no net loss goals

This BMP is a living document that will be updated regularly, as the Project better understands the status and ecology of priority biodiversity, project impacts on biodiversity and the effectiveness of mitigation measures.

1.5 How this document relates to other Management Plans

This Plan forms part of a suite of Management Plans (MPs) for the Mine and Port areas. An overview of links between this Plan and other biodiversity related documentation is presented in Figure 2.

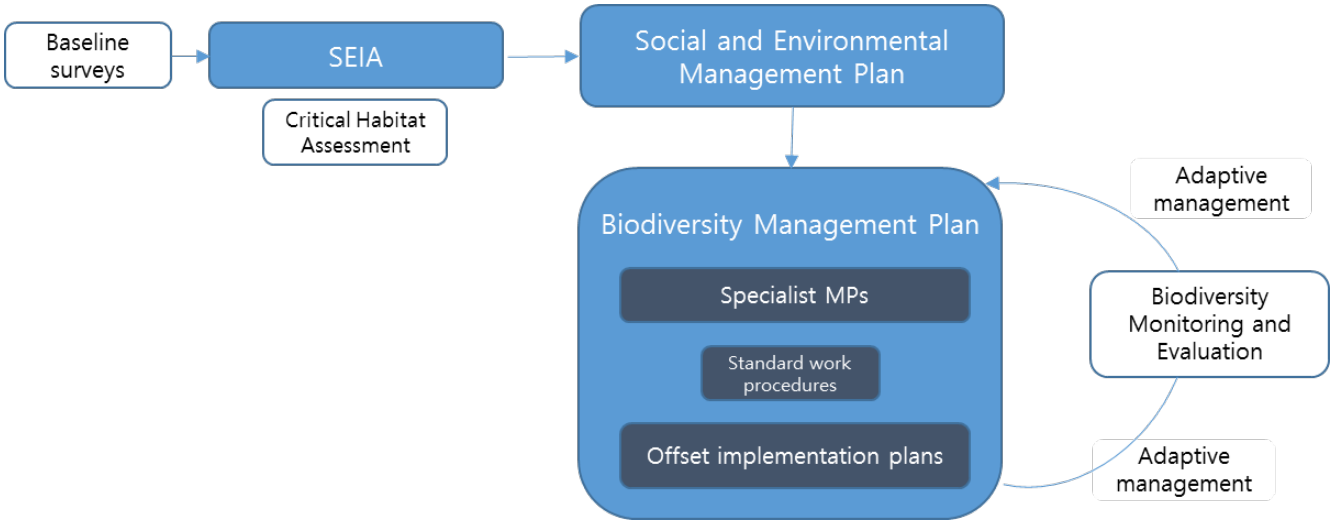

Figure 2: Overview of biodiversity documentation

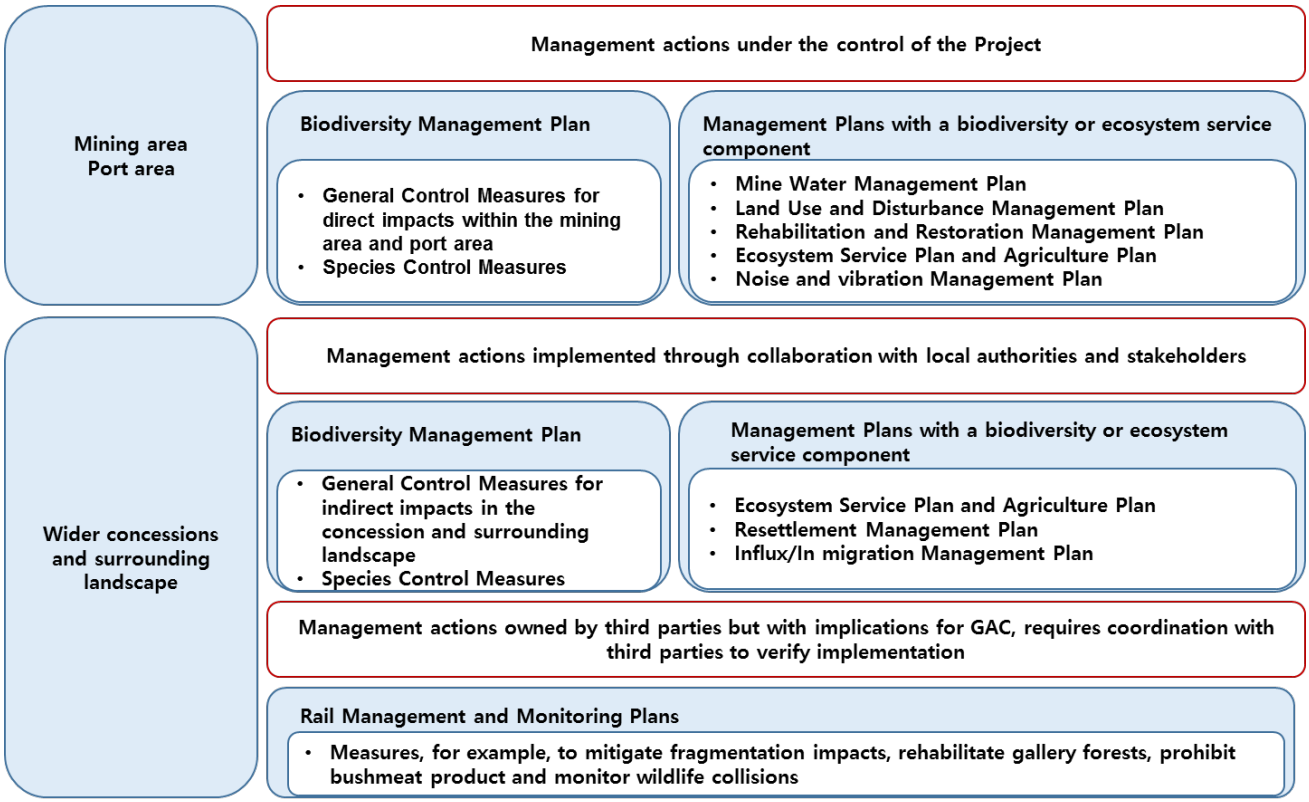

Figure 3: Overview of Management Plans containing actions related to priority biodiversity

1.6 Staffing

GAC will appoint appropriate staff and managers, as well as defining clear tasks in order to ensure effective implementation of this Plan. GAC will:

1. Appoint staff and establish line support;
2. Define clear tasks and work plans for each staff member;
3. Develop and maintain a database to monitor the implementation of control measures;
4. Integrate biodiversity measures into other relevant management plans;
5. Engage biodiversity specialists, as required, to undertake species specific surveys or discreet scopes of work;
6. Establish an Ecosystem Service Working Group or Committee to ensure an interdisciplinary approach and coordinated efforts between biodiversity and social teams in the implementation of the BMP and social management plans (see GCM10).

1.6.1 Roles and responsibilities

The principal roles and responsibilities for the implementation of this plan are outlined below.

Role	Accountability
General Manager: Operations	• Overall management responsibility to ensure GAC Operations are compliant with IFC PS6 and that the BMP is effectively implemented.
Mine Manager	• Ensure the requirements of the BMP are fully integrated into the Mine Plan
HSSEC Manager	• Overall responsibility for the implementation of this Management Plan, including ensuring that adequate resources are provided for implementation

Role	Accountability
	• Work with relevant GAC managers to ensure GAC subcontractors for construction and operations abide by the Control Measures of the BMP
Environmental Superintendent	• Ensure the Plan is available to all GAC employees and contractors • Provide leadership and strategic advice on biodiversity matters to departmental managers and within the biodiversity team • Develop and communicate on a regular basis to relevant department managers targets related to biodiversity requirements • Liaise with and coordinate activities for biodiversity conservation with relevant government, non-government and community stakeholders • Ensure appropriate checks and balances are in place to verify that GAC subcontractors are abiding by the relevant Control Measures of the BMP • Engage contractors to obtain specialist advice and support to achieve the objectives of this Plan
Environmental Specialist: Biodiversity and Compliance	• Implement the day to day management of the programs necessary to meet the requirements of this Plan • Work with contracted specialists to complete the actions required by the BMP • Monitor and report on compliance with GAC's biodiversity commitments and legal obligations • Provide training and guidance to GAC staff and contractors on the requirements of this management plan
Environmental Specialist: Monitoring and Compliance	• Provide necessary implementation and monitoring support to meet the requirements of this Plan
Environmental Technicians	• Provide necessary implementation and monitoring field support to meet the requirements of this Plan
Community Manager	• Ensure social management plans address the biodiversity requirements outlined in this plan • Work with the Environmental staff to implement and monitor actions to maintain the availability of, and access to, priority ecosystem services through the Ecosystem Service Working Group
GAC GIS	• Maintain the GIS systems necessary to support the implementation of this plan
All employees and contractors	• Comply with the requirements of this management plan

1.7 Legal and other requirements

Legal and other requirements are defined within the Project´s SEIA, Volume 1. Requirements applicable to this BMP are listed in Appendix 1. Priority biodiversity and ecosystem services

2 Priority biodiversity features

The priority features for the Project were identified through the Critical Habitat Assessment (ERM 2017), (see Table 1 and Table 2, page 16). The priority habitat in the Mine concession is gallery forest; this habitat type qualified as Critical Habitat (ERM 2017) and supports a number of priority species (see Figure 4 and Table 2, page 15). Natural habitats are also important for some priority species, these are identified in Table 3. Modified Habitat (agricultural lands with areas of plantation, farmed land, and fallow lands of varying ages) is used by chimpanzees to move between higher priority habitat areas and, to a lesser extent than other habitats, for feeding and sleeping. Three internationally recognised areas of conservation priority were also identified as Critical Habitat, 1 at the mine site and two in the port area (Table 5).

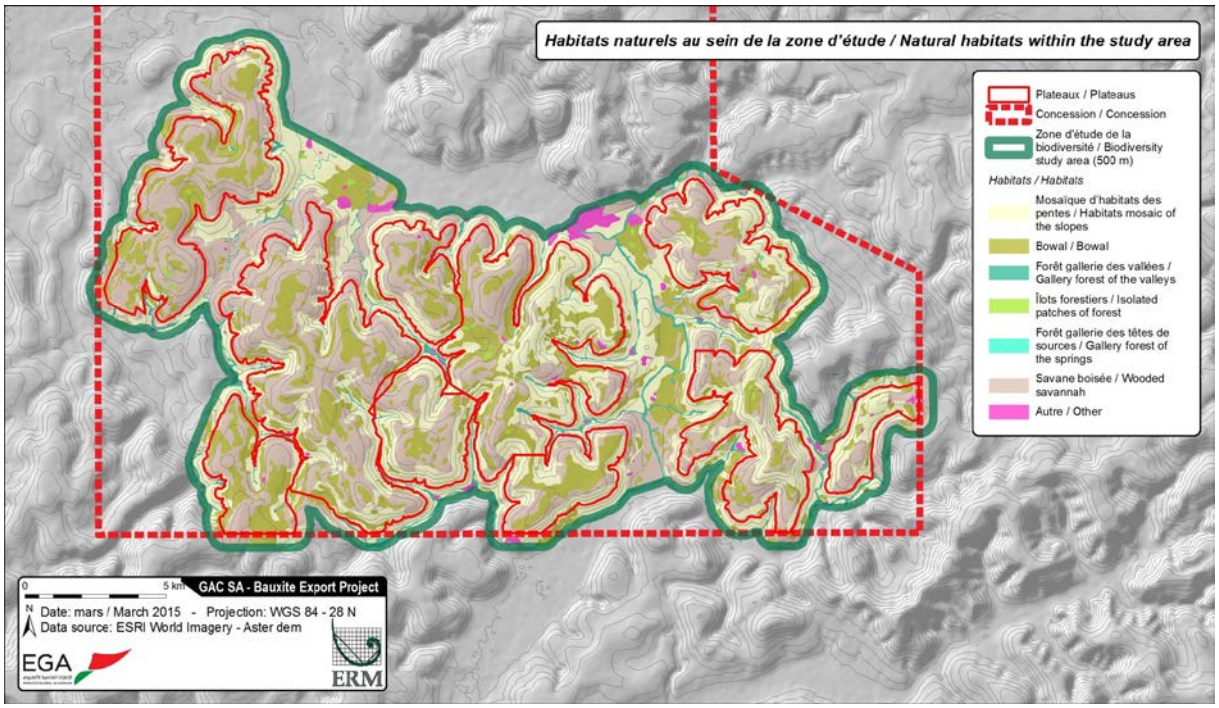

Figure 4: Priority habitat (Gallery forest), natural vegetation (Wooded savannah and Bowal) and Modified Habitat (the mosaic of the hill slopes) within southern area of the Mine concession

2.1 Prioritization of biodiversity features

Within the set of priority features[2] there are variations in terms of ecological requirements, the level and scale of threats and the level of scientific understanding. The Project´s response for mitigating impacts are tailored to these variations to maximise the efficiency of effort and the conservation outcomes. The prioritization is based on the likelihood and consequence of potential Project impacts and assigns each feature to an Action Category (see Figure 5, Figure 6, page 18 and page 19 and Appendix 2). An adaptive approach to mitigating impacts is appropriate for the context of the Project as knowledge of the distribution and sensitivity of priority features as well as the understanding of the effectiveness of mitigation measures and the significance of residual impacts will change as more information is gathered.

For three species – Western Chimpanzee, Temminck's Red Colobus and Atlantic Humpbacked Dolphin – and two habitats – gallery forest and mangroves – residual impacts are expected to be significant, and the project will work towards delivering a net gain.

For three species – Rüppell's Vulture, Daisy Stingray and Blackchin Guitarfish – residual impacts after mitigation are unlikely to be significant and so as long as monitoring verifies that impacts to the species habitat are not significant, no further action is required above the mitigation measures described in this BMP.

For the remaining priority species, threat-focused or habitat-focused mitigation measures are expected to reduce project impacts. However, insufficient information on the presence and distribution of these priority species within the mining area and wider concession means a confident

[2] See Section 1.1.1 for details on the identification of priority features

assessment of residual impact significance is not currently possible. Given the wide confidence limits on the significance of possible impacts for these features, contingency planning for delivering no net loss and net gain objectives for these species is appropriate and the strategy should be re-assessed once further information is available on the scale and extent of Project impacts.

Table 1: Priority species (Critical Habitat qualifying species and No Net Loss species, ERM 2017)

Species common name	Species scientific name	Critical Habitat qualifying species or No Net Loss species[3]
Mine		
Herptofauna		
Pinto's Puddle Frog	*Phrynobatrachus pintoi*	Critical Habitat
Beautiful Squeaker Frog	*Arthroleptis formosus*	Critical Habitat
Half-toed Gecko	*Hemidactylus kundaensis*	Critical Habitat
Cassine River Worm Lizard	*Cynisca cf oligopholis*	Critical Habitat
Los Archipelago Worm Lizard	*Cynisca leonine*	Critical Habitat
Primates		
Temminck's Red Colobus	*Piliocolobus temminckii*	Critical Habitat
Western Chimpanzee	*Pan troglodytes verus*	Critical Habitat
Invertebrate (freshwater)		
Purple Marsh Crab	*Afrithelphusa monodosa*	No Net Loss
Fish (freshwater)		
Teugel´s Electric Catfish	*Malapterurus teugelsi*	No Net Loss
	Paramphilius teugelsi	No Net Loss
	Petrocephalus levequei	No Net Loss
	Paramphilius trichomycteroides	No Net Loss
Birds		
White-backed Vulture	*Gyps africanus*	No Net Loss
Hooded Vulture	*Necrosyrtes monachus*	No Net Loss
Rüppell's Vulture	*Gyps rueppellii*	No Net Loss
Plants		
	Fleurydora felicis	No Net Loss
	Ledermanniella abbayesii	No Net Loss
Port		
Fish (Marine)		
Daisy Stingray	*Fontitrygon margarita*	No Net Loss
Blackchin Guitarfish	*Glaucostegus cemiculus*	No Net Loss
Reptiles		
Green Turtle	*Chelonia mydas*	No Net Loss
Hawksbill Turtle	*Eretmochelys imbricata*	No Net Loss
Mammals		
Atlantic Humpbacked Dolphin	*Sousa teuszii*	Critical Habitat
African Manatee	*Trichechus senegalensis*	No Net Loss
Birds		
White-backed Vulture	*Gyps africanus*	No Net Loss
Hooded Vulture	*Necrosyrtes monachus*	No Net Loss
Rüppell's Vulture	*Gyps rueppellii*	No Net Loss

[3] Critical Habitat qualifying species and species requiring no net loss mitigation measures were determined by the Projects Critical Habitat Assessment. A net gain outcome is required for species that qualify for Critical Habitat, unless the Project demonstrates it will not affect the species. A no net loss outcome is required for species that potentially qualify for Critical Habitat (ERM 2017).

Table 2: Habitats that qualify as Critical Habitat and the priority species associated with them

Habitat type	Priority species
Mine	
Gallery forest (including headwater areas)	Chimpanzee, Red Colobus, White-backed Vulture, Hooded Vulture, Half-toed Gecko, Beautiful Squeaker Frog, Pinto's Puddle Frog, Purple Marsh Crab, Los Archipelago Worm Lizard, Cassine River Worm Lizard, *Felurydora felicis, Ledermaniella abbayesii*
Port	
Mangrove	*Trichechus senegalensis*

Table 3: Natural habitats present at the Mine and Port and the priority species associated with them

Habitat type	Priority species
Mine	
Wooded savannah[4]	Chimpanzees, Red Colobus?[5], White-backed Vulture, Hooded Vulture, Half-toed Gecko?, Beautiful Squeaker Frog
Forest patches	Chimpanzees, Red Colobus?, Pinto's Puddle Frog, Beautiful Squeaker Frog
Bowal	N/A
Freshwater (rivers and tributaries)	Pinto's Puddle Frog, Beautiful Squeaker Frog, Teugel´s Electric Catfish and the fish species *Paramphilius teugelsi, Petrocephalus levequei, Paramphilius trichomycteroides* and *Ledermaniella abbayesii*
Port	
Rio Nuñez estuary	Atlantic Humpback Dolphin, African Manatee Blackchin Guitar Fish, Daisy Stingray
Beaches	Green turtle, Hawksbill Turtle
Forest (including freshwater streams)	African Manatee
Shrubland / savannah	White-backed Vulture, Hooded Vulture

Table 4: Modified Habitat present at the Mine

Habitat type	Priority species
Mine	
Mosaic of the hill slopes	Chimpanzees

Table 5: Internationally recognised conservation areas (mine and port)

Mine	Port
Boulleré (Key Biodiversity Area)	Rio Kapatchez (Important Bird Area) Kamsar (Key Biodiversity Area)

[4] Only wooded savannah is identified as a Natural Habitat with a No Net Loss requirement (ERM 2017).

[5] ? signifies an assumed habitat association based on published information about the species

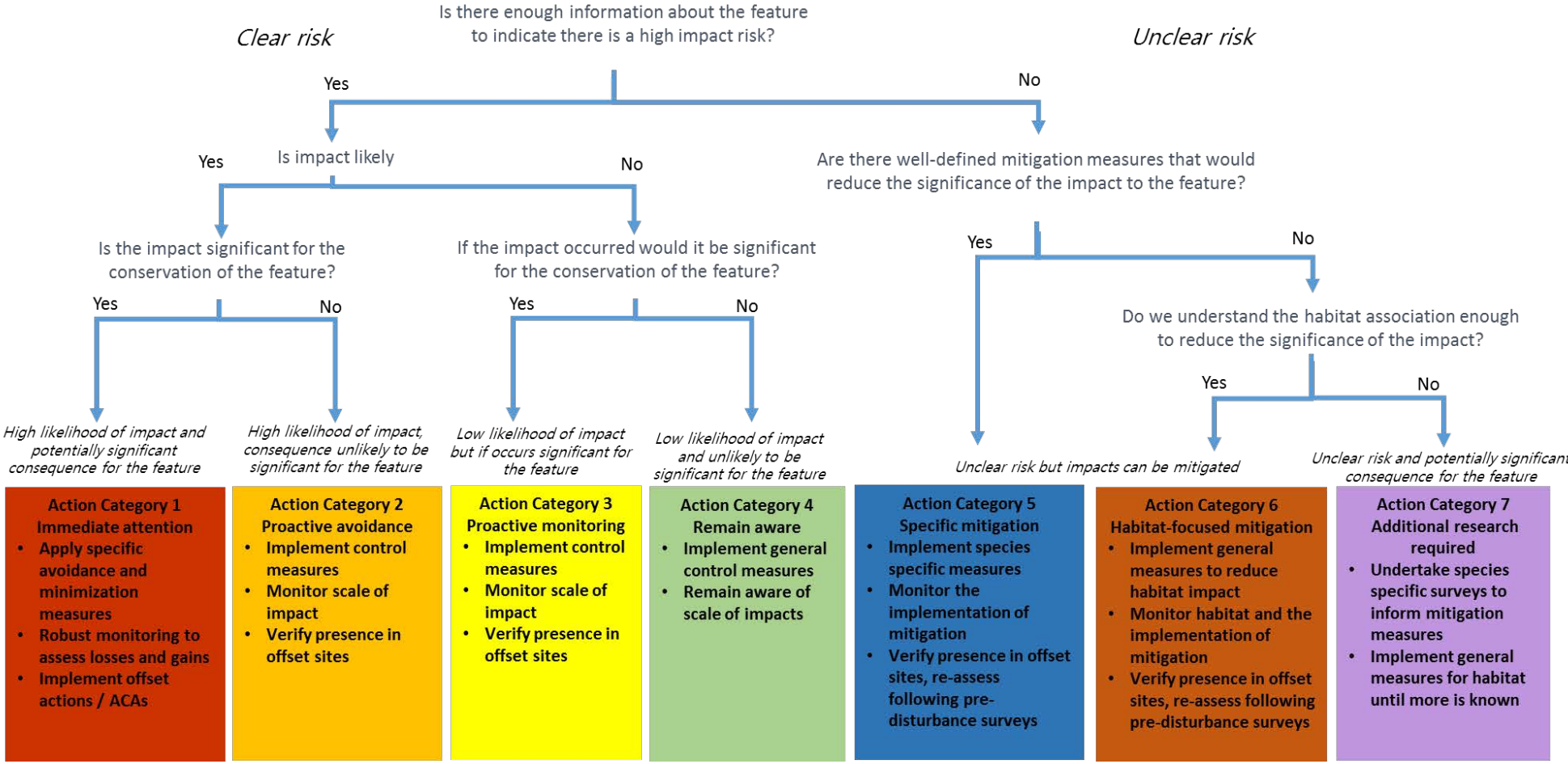

Figure 5: Prioritization process

	Risk and approach well understood				Precautionary approach to be updated based on further information		
	1. Immediate attention	**2. Proactive avoidance**	**3. Proactive monitoring**	**4. Remain aware**	**5. Specific mitigation**	**6. Habitat-focused mitigation**	**7. Further research required**
Features	Western Chimpanzee, Temminck's Red Colobus, Atlantic Humpbacked Dolphin, Gallery Forest, Mangrove	Wooded savannah, Freshwater (rivers and streams)	None	Rüppell's Vulture, Daisy Stingray, Blackchin Guitarfish	Pinto's Puddle Frog, Beautiful Squeaker Frog, White-backed Vulture, Hooded Vulture Green Turtle, Hawksbill Turtle, African Manatee,	Half-toed Gecko, Purple Marsh Crab, River Worm Lizard, Los Archipelago Worm Lizard, Teugel's Electric Catfish, *Paramphilius teugelsi, Petrocephalus levequei, Paramphilius trichomycteroides, Fleurydora felicis, Ledermanniella abbayesii*	None
Definition	*High risk that the feature will be impacted as a result of the Project and the consequence of the risk is considered to be significant for the species. The Project will prioritize actions to avoid and minimize impacts, further research will help focus mitigation measures*	*High risk that the feature will be impacted but the consequence of the risk is unlikely to be significant.*	*Low likelihood that the species will be impacted but if impact occurs the consequence of impact would be significant for the species.*	*Low likelihood that the species will be impacted and the consequence of the risk is unlikely to be significant for the species.*	*The species distribution is unknown but well defined specific mitigation measures are identified for the species and will be implemented by the Project. Further research is unlikely to alter the choice or intensity of mitigation measures*	*The species distribution is unknown, but it's habitat association is clear and measures to reduce habitat impacts will also benefit the species. The Project will implement measures to reduce impacts to the species habitat, if appropriate species specific measures will be undertaken*	*Insufficient information available to assess the likelihood and consequence of impact. Surveys required to assess presence of species in the Mine area, understand habitat requirements and develop mitigation measures*
Action	Ensure species specific mitigation measures are undertaken and conduct additional research to increase the effectiveness of measures	Implement control measures	Implement control measures	Implement general control measures	Ensure species specific mitigation measures implemented. Re-assess if encountered during pre-disturbance surveys	Ensure control measures for the species' habitat are implemented. Re-assess if encountered during pre-disturbance surveys	Undertake additional research to inform the development of species specific mitigation measures. Ensure general control measures implemented
Net gain/No Net Loss	Compensatory actions will be necessary to achieve a net gain	Necessary only if impacts are confirmed significant, verify presence in offset site	Necessary only if impacts occur, verify presence in offset site	Necessary only if impacts are confirmed significant	Required where mitigation measures are not effective, verify presence in offset site	Not required unless impacts confirmed significant, verify presence in offset site	Review once status and potential impacts clarified
Monitoring	Species specific monitoring required where habitat is not an appropriate monitoring proxy, highest level of assurance required	Monitor the scale of the impact	Use habitat as a proxy to monitor scale of impact, (if not appropriate, consider species monitoring)	Use habitat as a proxy to monitor the scale of impact	Clarify the scale of impact on species through monitoring implementation control measures	Clarify scale of impact on habitat through monitoring implementation of control measures	Clarify the scale of impact on habitat (or species) through pre-construction surveys and species monitoring if required

Figure 6: Action Category descriptions and results of the prioritization process. (This assessment assumes the mitigation measures described in this BMP are implemented effectively)

2.2 Priority ecosystem services

Ecosystem services for the mine and port areas were identified and prioritised through the Ecosystem Service Assessment (ERM 2015) and subsequent Ecosystem Service Review (TBC 2017). Priority ecosystem services are defined as those with a high or essential importance for beneficiaries and a low to moderate potential for replaceability. The exception to this is bushmeat; this was given a lower value for beneficiaries but due to the importance of chimpanzees from a biodiversity perspective and the potential change in hunting practices associated with in-migration, bushmeat is also considered a priority ecosystem service.

Priority ecosystem services and the habitat type accessed to obtain the ecosystem service are shown in Table 6 for the mine area and in Table 7 (page 21) for the port area.

Table 6: Priority ecosystem services at the mine and the habitat associated with the supply of the service

Ecosystem service	Description	Habitat associated with the supply of the ecosystem service
Provisioning services		
Bushmeat	Provision of game for household consumption or sale. Primarily rodents and bovids, plus other medium and large vertebrates apart from primates and suids. Latter two are occasionally hunted for non-Muslims.	Critical Habitat: Gallery forest Natural habitat: Wooded savannah and forest patches, bowal Modified habitat: Fallow land These are communal areas or areas of open access
Non-Timber Forest Products (NTFPs) including Wild plants fruit and honey and natural medicine	Traditional medicines and uses of plants for other local uses	Critical Habitat: Gallery forest Natural habitat: Wooded savannah and forest patches, bowal Modified habitat: Fallow land These are communal areas or areas of open access
Cultivated crops	Soils with adequate fertility to grow crops	Critical Habitat: Gallery forest Natural habitat: Wooded savannah and forest patches, bowal Modified habitat: Fallow land These are communal areas or areas of open access
Livestock farming (including transhumance)	Pasture for cattle and small ruminants; browsing and foraging areas for smaller livestock (chickens, rarely pigs, etc.)	Natural habitat: Wooded savannah and forest patches, bowal These are communal areas or areas of open access
Wild caught fish	Fish from local river and creeks	Natural habitat: Freshwater rivers and streams
Freshwater	Provision of adequately clean water for consumption, washing, livestock, crops, industrial uses (GAC), and others	Natural habitat: Freshwater rivers and streams
Timber and wood products	Planks, poles, branches (for fences), other wood products for household use and for sale	Critical Habitat: Gallery forest Natural habitat: Wooded savannah and forest patches Modified habitat: Possibly from fallow land These are communal areas or areas of open access
Biomass fuel	Nearly all local fuel consumption is based on biomass, including a high portion in urban areas	Critical Habitat: Gallery forest Natural habitat: Wooded savannah and forest patches Modified habitat: Possibly from fallow land These are communal areas or areas of open access
Cultural services		
Sites with spiritual values	Natural places of spiritual or religious value; cultural heritage sites like cemeteries or historically important sites	These are usually specific sites and may coincide with headwater spring habitats, streams and forest areas. Can be near villages (cemeteries)
Traditional practices	Cultural practices that can occur only in natural surroundings	Not known
Regulating services		
Air quality	Vegetation captures and removes dust and other pollutants from air, and serves as a barrier. Particularly important near inhabited areas.	All vegetated habitats
Surface and ground water regulation	Local habitats are significant areas of infiltration of rain, and their integrity is significant in providing regulated run-off and recharge of creeks and streams	Critical Habitat: Gallery forest Natural habitat: Wooded savannah, freshwater rivers and streams Modified habitat: Fallow land

Water purification and absorption	Natural vegetation, the soil horizon and bedrock purify water as it enters the water table and/or streams. Vegetation and soil macro- and micro-organisms are fundamental to decomposing organic wastes and pollutants, and assimilating/detoxifying compounds.	Habitats near Project activities and inhabited areas (mainly disturbed areas)
Natural hazard regulation	Seasonal flooding maintains lowland soil fertility and water resources, but can be devastating if large-scale. Fires are natural hazards which are hindered by intact ecosystems.	All habitats in Project's area of influence
Disease regulation	Natural habitat tends to regulate species so vectors of diseases do not increase dramatically, and they can be avoided if they do increase	Mainly in disturbed areas like agricultural zones, pasture, villages and industrial areas
Supporting services		
Habitat provision	Natural habitat maintains species and associations, and protects the capacity of ecological communities to recover from disturbance	All natural habitats in Project's area of influence (all forest types, aquatic habitat, bowel, bush)

Table 7: Priority ecosystem services at the port and the habitat associated with the supply of the service

Ecosystem service	Description	Habitat associated with the supply of the ecosystem service
Provisioning services		
Cultivated crops	Cropland for lowland rice in former mangroves is critical to village of Taigbé	Modified Habitat: Former or disturbed mangroves
Wild food - Fish and shellfish	Provision of wild-caught fish and shellfish for domestic consumption and sale	Natural habitat: Coastal waters and mudflats
Freshwater	Local communities and the Project depend on freshwater for consumption, washing, other domestic uses, crops and industrial uses (GAC)	Natural habitat: Freshwater rivers e.g. Dougoufissa Creek
Salt production	Women evaporate seawater to obtain salt	Natural habitat: Disturbed coastal flats
Timber and wood products	Planks and poles from mangroves for household use and for sale	Critical Habitat: Mangroves
Biomass fuel	Wood from mangroves for fuelwood and for smoking fish	Critical Habitat: Mangroves
Regulating services		
Shoreline protection	Coastal structure and ecology protects coast from erosion and protects local communities and Project's facilities	Critical Habitat: Mangroves Natural habitat: Coastline around Kamsar and outlying villages
Water purification and waste absorption	Natural vegetation, the soil horizon and bedrock purify water as it enters the water table and/or streams. Vegetation and soil macro- and micro-organisms are fundamental to decomposing organic wastes and pollutants, and assimilating/detoxifying compounds	Natural habitat: Coastline around Kamsar and outlying villages
Supporting services		
Habitat provision	Natural habitat maintains species and associations, and protects the capacity of ecological communities to recover from disturbance	Critical Habitat: Mangroves Natural habitat: Coastal mudflats, estuarine habitats, near-shore oceanic habitat

2.2.1 Approach to ecosystem service management

Priority ecosystem services are derived from habitats that are defined, from a biodiversity perspective as Critical, Natural or Modified Habitats. Project direct and indirect impacts to these habitats will affect the value and functionality of the ecosystem service. The Projects' mitigation measures therefore focus on avoiding impacts and sustainably managing these habitats to ensure local people can continue to derive benefits.

Ensuring the maintenance of ecosystem services requires an interdisciplinary approach between environment and social teams. Collaboration will be required in the development and implementation

of management activities to avoid and minimise potentially conflicting activities and apply an adaptive management approach to address problems.

Control Measures in this Plan define measures for applying the mitigation hierarchy to avoid and minimise direct and indirect impacts to Critical and Natural Habitats as these habitats are a priority from a biodiversity management perspective. Many measures require close collaboration or implementation from the social team and therefore Control Measures to ensure greater collaboration between environmental and social teams are part of this plan. Developing an accessible joint database to enable an adaptive management approach for natural resource management and to address emerging natural resource issues will be critical to maintaining ecosystem values and therefore is also included in this Plan.

Measures that focus on community's access to ecosystem services and sustainable management of natural resources require a social management approach and therefore will be integrated into social management plans. The key mitigation measures to be added to Management Plans under the control of the social team are found in Appendix 6 and are the output of the Ecosystem Service Review process (TBC 2017).

3 Summary of potential impacts and mitigation measures

3.1 Potential impacts

Based on the Project´s SEIA and related biodiversity information (e.g. studies and reports on chimpanzees and mangrove; WCF (2015), ERM, (2014) a biodiversity work book was developed with input from stakeholders including GAC staff, engineers, species specialists, Wild Chimpanzee Foundation (WCF), Sylvatrop, Geo Partner Service (GPS) Eaux et Forêts, sub-prefecture and prefecture. The workbook documents priority features, risks to those features, and captures potential Project impacts and mitigation measures to address moderate to critical rated potential impacts. The results of the development of the BMP workbook have been used to develop this Management Plan. Table 8 and Table 9, page 23 describe the anticipated impacts in the mine concession and port area.

Table 8: Predicted impacts and MPs where they will be addressed: Mine concession

Direct Impacts – mine concession	Description of impact	Section or Plan where impact is addressed
Habitat loss	Loss of habitat under the footprint of mine infrastructure, reservoir and mine pits	Biodiversity Management Plan (BMP)
		Land Use and Disturbance Management Plan (MP)
		Mine Closure and Reclamation MP
Habitat degradation	Fragmentation, noise, light and dust pollution, invasive species	Biodiversity Management Plan
		Noise and vibration MP
		Land Use and Disturbance MP
Hydrological impacts	Alterations to quantity and quality of hydrological flow in springs, seeps, streams, ground water and surface water as a result of the mining of the plateaus, construction and operation of the Tiouladiwol reservoir and associated construction activities	Biodiversity Management Plan
		Integrated Water MP
Individual mortality	Mortality due to vehicle collisions or hunting by Project staff	Biodiversity Management Plan
		Traffic, Vehicle Movement and Transportation Management Plan
Indirect Impacts – mine concession	**Description of impact**	**Section or Plan where impact is addressed**
Habitat loss		Biodiversity Management Plan

	Loss of habitat due to clearance for agriculture and construction as impacted communities are relocated and as a result of induced in-migration to the area	Resettlement Action Plans (RAP)
		Project-Induced In-Migration (PIIM) Plan
Habitat degradation and individual mortality	Hunting, fuel wood collection and medicinal plant collection	Biodiversity Management Plan
		Project-Induced In-Migration (PIIM) Plan

Table 9: Predicted impacts and MPs where they are addressed: Port area

Direct Impacts – Port area	Description of impact	Section or Plan where impact is addressed
Habitat loss	Loss of habitat under the footprint of port infrastructure, dredging, rail spur and roads	Biodiversity Management Plan
		Mangrove MP
		Dredging MP
Habitat degradation – terrestrial and marine	Noise, vibration, light, invasive species, sedimentation, pollution, spills	Biodiversity Management Plan
		Storm water sediment and erosion control MP
		Noise and vibration MP
		Spill prevention and response Plan and Chemical and petroleum MP
		Ballast Water MP
Individual mortality	Mortality due to boat collisions	Biodiversity Management Plan
		Traffic, Vehicle Movement and transportation MP
Indirect Impacts – Port area	**Description of impact**	**Section or Plan where impact is addressed**
Habitat degradation or individual mortality	Degradation of habitat or species loss as a result of increased accessibility and increased fishing	Biodiversity Management Plan Mangrove MP
		Project-Induced In-Migration (PIIM) Plan

3.2 Mitigation approach

The Project will apply the mitigation hierarchy to avoid, minimise and restore impacts to priority biodiversity features and ecosystem services. A suite of General Control Measures and Species Control Measures has been developed (see Sections 4 and 6). An overview of priority features, impacts and mitigation measures can be seen in Figure 7 (page 25). Key mitigation measures include;

Avoidance: The Project has placed emphasis on avoidance through the development and implementation of 'avoidance buffers' around priority habitats (see Figure 8, page 26 and Appendix 5). Avoidance buffers are embedded into mine plans to ensure the mine planning process avoids impacts to priority habitats. Any disturbance requirement will trigger a disturbance permitting process (see Appendix 4) to assess whether micro-siting of infrastructure can mitigate adverse impacts. If adverse impacts cannot be mitigated to priority species or cultural sites, the permit will be rejected. Measures to minimise and restore impacts will be part of disturbance permitting conditions and their implementation verified by the Environment team. Other key avoidance measures include staff training and awareness on biodiversity values and codes of conduct to prevent impacts.

Minimisation: Impact mitigation will continue through operations through ongoing implementation of the General and Species Control Measures, and monitoring will ensure that mitigation measures are being implemented effectively. The Project's biodiversity and social teams are developing a collaborative approach to reduce impacts to habitats that are important for species as well as ecosystem service availability. The Project will work with local communities to implement resource management practices, including anti-poaching patrols and with wider stakeholders, including government and neighbouring concessions to reduce the impacts of immigration to the area. At the

port, mitigation measures are a priority for the project to implement to reduce the scale of impacts. As part of the suite of mitigation measures GAC will aim to work with relevant port authorities and operators to address cumulative impacts in the Nunez estuary with a view to collaboratively assessing the feasibility of establishing a Marine Protected Area (MPA) offset for the Atlantic Humpbacked Dolphin.

Restoration: The Project will apply a progressive approach to technically and biologically rehabilitate disturbed areas once mining activities in that area have ceased. Rehabilitation will also include the identification and restoration of areas that serve as important chimpanzee corridors in order to maintain, and where possible improve, wildlife corridors throughout the concession.

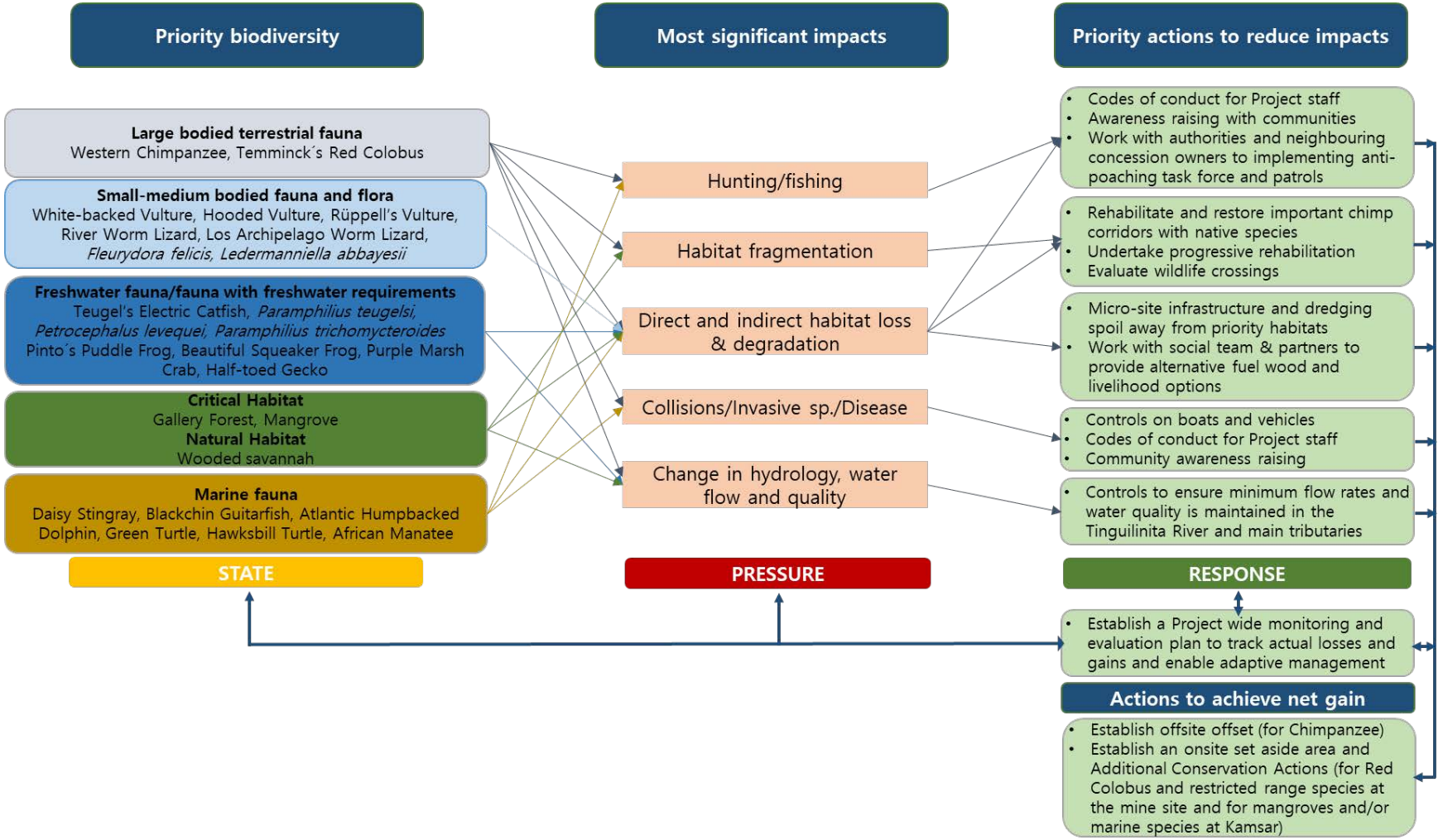

Figure 7: Overview of priority biodiversity features, significant impacts and mitigation measures to achieve Project objectives

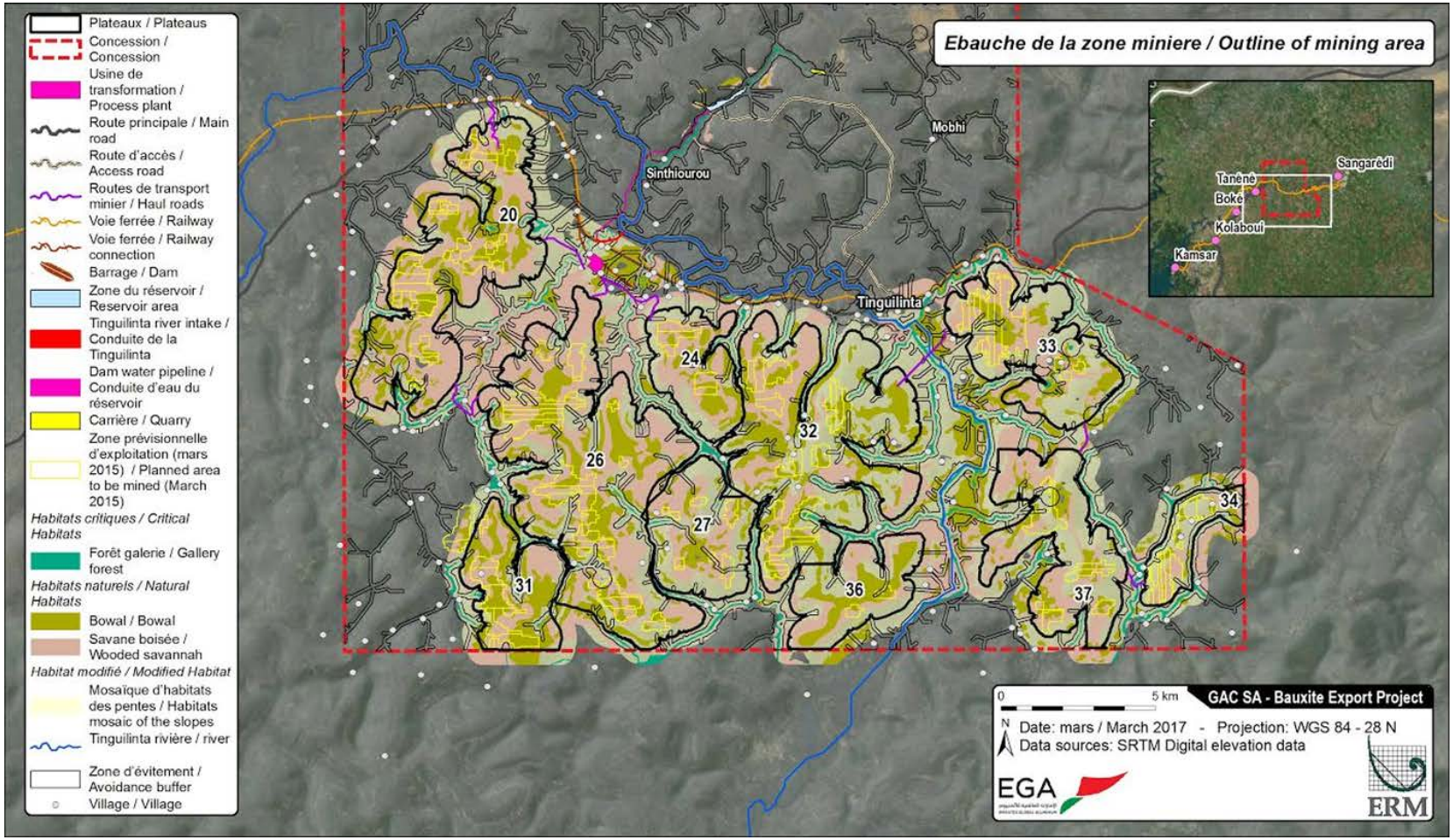

Figure 8: Overview of the Project's avoidance buffers within the mine concession

3.3 Approach to delivering Project net gain and no net loss objectives

For some priority features, significant residual impacts are likely even with mitigation. An overview of the approach to achieve a net gain or not net loss for priority features is in found in Table 10, page 28. The proposed approaches are based on currently available information and involve:

1. *Enhanced onsite management (onsite set-aside)*. Minimising impacts onsite is a PS6 requirement, and given the high background rate of loss of habitats in the GAC concession, enhanced management onsite may be able to deliver gains compared to the without Project scenario. This would require the protection of important pockets of gallery forest (throughout the concession but particularly in the north) to support restricted range species. This is an essential component of delivering a net gain for restricted range species for which there are unlikely to be feasible opportunities for offsite offsets. A feasibility assessment is necessary to assess whether enhanced onsite management can deliver a net gain for restricted range species, and whether resource sterilisation would be required.
1. *Offsite offset management*; to focus on achieving a net gain for Western Chimpanzee;
2. *Additional Conservation Actions*. For some priority biodiversity features that may experience significant residual impacts, a site-based offset approach is not appropriate/feasible. In this case additional actions (such as focused research efforts or support to existing conservation projects) are required to support the generation of biodiversity gains.

The Project also has the option to support further research to expand the understanding of priority species. If further locations and populations of restricted range species are found the priority status of the species, and hence the required level of mitigation could be downgraded. However, the project aims to deliver no net loss of Natural Habitat and it may be more efficient to continue mitigation based on current prioritisation.

Table 10: Overview of the approach to delivering Project net gain and no net loss objective for priority biodiversity features

Key: Priority measure to implement for the feature; Important measure to implement; More significant; Less significant; Required to achieve a net gain; Important mechanism to implement for restricted range species in particular

Priority feature	Net gain (NG) or no net loss (NNL) objective	Mitigation hierarchy		Significant residual impact?	Gain mechanism		Additional Conservation Actions
		Avoidance / Minimization	Restoration/ Rehabilitation		Enhanced onsite management (Onsite set aside)	Offsite offset	
Mine							
Herptofauna							
Pinto's Puddle Frog	NG	✓		?	✓	X	X
Beautiful Squeaker Frog	NG	✓		?	✓	X	X
Half-toed Gecko	NG	✓		?	✓	X	X
Cassine River Worm Lizard	NG	✓		X	X	X	X
Los Archipelago Worm Lizard	NG	✓		X	X	X	X
Primates							
Temminck's Red Colobus	NG	✓	✓	✓	?	X	✓
Western Chimpanzee	NG	✓	✓	✓	✓	✓	?
Invertebrate (freshwater)							
Purple Marsh Crab	NNL	✓		?	✓	X	X
Fish (freshwater)							
Teugel´s Electric Catfish	NNL	✓		?	✓	X	X
Paramphilius teugelsi	NNL	✓		?	✓	X	X
Petrocephalus levequei	NNL	✓		?	✓	X	X
Paramphilius trichomycteroides	NNL	✓		?	✓	X	X
Birds							
White-backed Vulture	NNL	✓		Unlikely	X	✓	X
Hooded Vulture	NNL	✓		Unlikely	X	✓	X
Rüppell's Vulture	NNL	✓		X	X	X	X
Flora							
Fleurydora felicis	NNL	✓		X	✓	X	X
Ledermanniella abbayesii	NNL	✓		X	✓	X	X
Habitat							
Gallery forest	NG	✓	✓	✓	✓	✓	X
Wooded savannah	NNL	✓	✓	✓	✓	✓	X
Port							
Marine							

Daisy Stingray	NNL	✓		X	X	X	X
Blackchin Guitarfish	NNL	✓		X	X	X	X
Green Turtle	NNL	✓		?	X	X	?
Hawksbill Turtle	NNL	✓		X	X	X	X
African manatee	NNL	✓		X	X	X	X
Atlantic Humpbacked Dolphin	NG	✓		?	X	X	✓
Habitat							
Mangroves	NG	✓	✓	✓	X	X	✓

4 General Control Measures

Control Measures (CM) are the mitigation and management actions required to achieve the objective of the BMP. The tables in this section capture the General Control Measures (GCM) to mitigate impacts for habitats and species. Much of the focus of these measures is minimizing impacts to habitats as mitigating impacts to habitats will also benefit the species that are dependent on them. GCMs are included for direct impacts that are under the control of the Project and for indirect impacts which will require collaboration with other stakeholders to enable implementation. Species Control Measures (SCM) for priority species, where they are required are captured in Section 6. An overview of all GCMs and SCMs is provided in Table 11 and Table 12 (page 31) with hyperlinks to the relevant section.

A Control Measure to develop offsets for priority species and habitats with residual impacts is included as a GCM. However, the GCM will be implemented via an Offset Strategy and/or Offset Implementation Plan(s) which will provide the detailed actions and roles and responsibilities to achieve no net loss and net gain objectives.

Table 11: Overview of all GCMs and SCMs for the Mine

Priority feature	Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required	
All priority features	Direct habitat loss and degradation, individual mortality	AVOID	GCM1	Avoidance through staff awareness Ensure that staff and contractors abide by Project code of conduct to prevent biodiversity impacts.
Gallery forest, wooded savannah	Direct habitat loss	AVOID	GCM2	Avoidance through design Ensure that priority habitat is avoided wherever feasible, and where avoidance is not possible minimize loss/degradation of suitable habitat due to mine construction and operating footprint.
Gallery forest	Direct habitat fragmentation	MINIMIZE	GCM3	Minimization through design Optimize Mine Plan to avoid fragmentation of priority habitats, and where avoidance is not possible minimize fragmentation through wildlife friendly design
Gallery forest, wooded savannah	Direct and indirect habitat loss	MINIMIZE	GCM4	Minimisation through management of potential community relocation impacts Ensure that priority habitats are avoided wherever feasible, and where avoidance is not possible minimize loss/degradation of suitable habitat due to relocation of communities in the Mine licence area
All priority features	Indirect habitat degradation and	MINIMIZE	GCM5	Minimization through community awareness raising

Priority feature	Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required	
	individual mortality			Work with communities within the concession to promote sustainable resource use and awareness of biodiversity and ecosystem service values
All priority features	Direct habitat degradation and individual mortality	MINIMIZE	GCM6	Minimization through integration of biodiversity requirements into other project management plans Work with GAC staff outside of the biodiversity team e.g. the water team and the mining team to ensure measures to maintain hydrology and water quality in streams and rivers are implemented and to ensure noise, dust and vibration levels are minimized
Gallery forest	Direct and indirect habitat loss and degradation	REHABILITATION	GCM7	Rehabilitation and restoration through trials and implementation of techniques to rehabilitate priority habitat Develop a Rehabilitation and Restoration Management Plan based on effective techniques
All priority features	All impacts	MINIMIZE	GCM8	Minimization through monitoring and adaptive management Develop a Monitoring and Evaluation Program to monitor the nature and scale of impacts (and offset gains) and ensure thresholds are included to trigger adaptive management actions
All priority features	All impacts	OFFSET	GCM9	Offset significant residual impacts to priority features Undertake the next steps required to implement and offsite offset (TBC 2017) and undertake pre-feasibility studies to assess potential gains via an onsite offset
All priority features	All impacts	ALL STAGES	GCM10	Improve implementation of mitigation measures through inter-departmental coordination Establish an Ecosystem Service Working Group to ensure cross-cutting mitigation actions of the BMP are implemented and a spatially referenced social and environmental database is established and maintained to inform mitigation activities
Gallery forest	Indirect habitat loss	MINIMIZE	GCM11	Minimisation through engagement with key stakeholder groups Ensure that priority habitats are avoided wherever feasible, and where avoidance is not possible minimize loss/degradation of suitable habitat due to in-migration
All priority features	Indirect habitat degradation and individual mortality	MINIMIZE	GCM12	Minimization through support to local authorities Work with local authorities and Eaux et Forêts to avoid habitat degradation and individual mortality
All priority features	Cumulative impacts	ALL STAGES	GCM13	Minimization through collaboration with other companies in the bauxite region Work with adjacent companies (COBAD, CBG, etc.) to address indirect and cumulative impacts consistently
All priority features	All impacts	ALL STAGES	GCM14	Engage with stakeholders to support BMP implementation Support GCM and SCM successful implementation by informing and consulting stakeholders at all stages of the mitigation of biodiversity impacts
Chimpanzees	All impacts to chimpanzees	ALL STAGES	SCM1	Optimise mitigation through employment of specialist staff Select employee to oversee implementation of best practices by the Project for chimpanzees
Chimpanzees	Direct habitat loss, fragmentation, individual mortality	AVOID/ MINIMIZE	SCM2	Research to optimize avoidance and minimization measures Conduct more intensive surveys to collect information on chimpanzee communities
Chimpanzees	Direct individual mortality	MINIMIZE	SCM3	Minimization through staff awareness Ensure that staff and contractors abide by Project code of conduct to minimize impacts to chimpanzees
Red Colobus	Direct habitat loss	AVOID/ MINIMIZE	SCM4	Avoidance through design Minimize habitat loss by optimising infrastructure locations and selecting an area to set-aside as an onsite offset

Priority feature	Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required	
Red Colobus	Additional Conservation Action	OFFSET	SCM5	Undertaken additional conservation actions to support colobus conservation Support research to understand the distribution and threats to the colobus and the development of a species action plan for the region
Pinto's Puddle Frog and Beautiful Squeaker Frog	Direct habitat loss	AVOID/ MINIMIZE	SCM6	Avoidance and minimization through design When Project criteria require, ensure that pre-disturbance surveys target the species to avoid and minimize impacts
Pinto's Puddle Frog and Beautiful Squeaker Frog	Indirect individual mortality	AVOID/ MINIMIZE	SCM7	Avoidance and minimization through implementation of protocols Ensure all imported equipment is "clean as new" and monitor for the presence of chytrid fungus in Guinea
Vultures	Direct habitat loss	AVOID/ MINIMIZE	SCM8	Avoidance and minimization through design When Project criteria require, ensure that pre-disturbance surveys target potential vulture nesting areas to avoid and minimize impacts
Vultures	Indirect habitat degradation and individual mortality	MINIMIZE	SCM9	Minimization through community awareness raising Work with communities within the concession to promote sustainable resource use and awareness of biodiversity values
Half-toed gecko	Direct habitat loss	AVOID/ MINIMIZE	SCM10	Avoidance and minimization through design When Project criteria require, ensure that pre-disturbance surveys target the gecko to avoid and minimize impacts
Half-toed Gecko	Direct individual mortality	AVOID/ MINIMIZE	SCM11	Avoidance through implementation of translocation protocols When required, ensure that translocation is implemented following translocation protocols to avoid and minimize impacts to the Half-toed Gecko
Purple Marsh Crab	Direct habitat loss and degradation	AVOID/ MINIMIZE	SCM12	Avoidance and minimization through design When Project criteria require, ensure that pre-disturbance surveys target the Purple Marsh Crab to avoid and minimize impacts
Freshwater fish species (Four species)	Direct habitat loss and degradation	AVOID/ MINIMIZE	SCM13	Avoidance and minimization through design When Project criteria require, ensure that pre-disturbance surveys target priority freshwater fish species to avoid and minimize impacts

Table 12: Overview of all GCMs and SCMs for the Port

Feature	Impact	Stage of Mitigation Hierarchy	Control Measure	
All priority features	Direct habitat loss and individual mortality	AVOID	GCM15	Avoidance through staff awareness Ensure that staff and contractors abide by Project code of conduct to prevent biodiversity impacts.
All priority features	Direct habitat loss and individual mortality	AVOID/ MINIMIZE/ REHABILITATION	GCM16	Minimize impacts through infrastructure optimization Optimise infrastructure design and location to minimize impacts to priority habitat and species
All priority features	Direct habitat degradation and individual mortality	AVOID/ MINIMIZE	GCM17	Minimize impacts to water quality generated by port construction and operations Comply with best practices to minimize impacts to water quality
All priority features	Direct habitat degradation and individual mortality	MINIMIZE	GCM18	Minimize noise and dust generated by port construction and operations Conduct targeted surveys in order to develop noise and vibration minimization measures for priority marine species
All priority features	Indirect individual mortality	MINIMIZE	GCM19	Minimize impacts to priority species related to induced access Ensure access to Port area is monitored to control fishing activities
All priority features	All impacts	MINIMIZE	GCM20	Minimization through monitoring and adaptive management Develop and implement a Monitoring and Evaluation Program to monitor the nature and scale of impacts (and offset gains) and ensure thresholds are included to trigger adaptive management actions

Mangrove	Direct and indirect habitat loss	REHABILITATION	GCM21	Rehabilitation and restoration through trials and implementation of techniques to rehabilitate mangroves Develop and implement a Rehabilitation and Restoration Management Plan based on effective techniques
All priority features	Indirect habitat loss and individual mortality	MINIMIZE	GCM22	Minimization of impacts to priority species related to in-migration Identify and manage potential threats to biodiversity resulting from in-migration activities
All priority features	All impacts	ALL STAGES	GCM23	Engage with stakeholders to support BMP implementation Support GCM and SCM successful implementation by informing and consulting stakeholders at all stages of the mitigation of biodiversity impacts
Atlantic Humpbacked Dolphin	Collisions	AVOID	SCM14	Avoid direct project impacts to dolphin Ensure that best practices measures are implemented to avoid vessel strikes
Atlantic Humpbacked Dolphin	Direct and indirect individual mortality	AVOID/ MINIMIZE	SCM15	Avoid and minimize project impacts through research and monitoring Avoid and minimize impacts to habitats of high importance to dolphins
Atlantic Humpbacked Dolphin	Indirect individual mortality	MINIMIZE	SCM16	Minimize project impacts related to in-migration Minimize project impacts through working with port authorities and communities to raise awareness and identification of alternatives
Turtle species and African Manatee	Individual mortality	AVOID	SCM17	Avoid direct project impacts to turtles and the African Manatee Ensure that best practices measures are implemented to avoid vessel strikes
Turtle species	Species loss	MINIMIZE	SCM18	Minimize project impacts related to in-migration Minimize project impacts through community awareness raising, research and monitoring

Table 13: GCMs in the Mine concession under Project control

(Note: Frequency refers to whether the GCM is a one-off action or required over the Project lifetime following Project requirements. Task timing refers to when the Control Measures need to be undertaken in relation to operations; 'Prior to construction' refers to prior to significant earthworks being undertaken beyond the area of plateau 20 that is currently under development (March 2017).

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Start	Finish			
Habitat loss and degradation, individual mortality	AVOID	GCM1	AVOIDANCE THROUGH STAFF AWARENESS Ensure that staff and contractors abide by Project code of conduct to prevent biodiversity impacts					
			1. Develop Biodiversity codes of conduct for employees, their families and contractors to outline the rules, procedures and prohibitions relevant to the mitigation of impacts on biodiversity (to include for example, limiting access of personnel to undisturbed habitats to minimize habitat degradation and interaction with wildlife, restriction of personnel movements to designated roads and paths, prohibition of hunting and purchase of bushmeat, prohibition of the collection timber and non-timber forest products, prohibition of transporting of bushmeat or NTFPs in Project vehicles, prohibition of fishing in rivers and the Tiouladiwol reservoir, sanitation and hygiene measures, waste disposal, smoking prohibitions (to avoid fire), minimizing water usage etc. (additional chimpanzee guidance provided in SCM2) 2. Implement appropriate penalties for staff and contractors who disregard the codes of conduct 3. Develop an induction program to train new staff upon their arrival in the code of conduct, the identification of priority features, the importance of biodiversity in maintaining ecosystem services and as species of conservation concern, and to communicate the penalties for non-compliance 4. Develop specific training for roles that may impact priority features e.g. training of vehicle operators to adhere to speed restrictions and avoid collisions with wildlife, training of security guards to check for bushmeat or other prohibited products on personnel and vehicles leaving/entering site, training for the social team on the synergies and potential conflicts of community and biodiversity work, 5. Undertake periodic refresher training for personnel in key roles where Project impacts are likely; 6. Operationalize procedures to ensure codes of conduct are enforced e.g. verify that security teams undertake routine inspections of vehicles and staff bags entering and leaving site to check for prohibited products	ASAP	End of operations	Induction records of new staff and contractors	GAC - Environment	Continuously
Habitat loss	AVOID	GCM2	AVOIDANCE THROUGH DESIGN Ensure that priority habitat is avoided wherever feasible, and where avoidance is not possible minimize loss/degradation of suitable habitat due to mine construction and operating footprint.					

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Start	Finish			
			A. Inclusion of avoidance buffers into Mine Plans and update information to maintain avoidance efforts: 1. Develop a GIS layer of avoidance buffers; avoidance buffers are defined as 'no-go areas' in the ESIA ERM, "Social and Environmental Impact Assessment (SEIA). Volume 1 Addendum for GAC´s Bauxite Export Project, Guinea." as; a 50 m buffer from any waters, a 100 m buffer from high ecological value sites[6] and from the Tinguilinita River, 250 m buffer from wells, a 300 m buffer around headwaters feeding into gallery forests[7] (see Figure 8). 2. Record the GPS locations of priority species within the Projects database to avoid impacts to areas known to contain priority species; when the pre-disturbance permitting process triggers a pre-disturbance survey for priority species (see Appendix 4), the location of priority species encountered should be added to the Projects spatially referenced database (see GCM10). Measures to avoid impacts to areas known to contain priority species through the micro-sighting of infrastructure must be part of land disturbance permit process. If adverse impacts to priority species cannot be mitigated, the land disturbance permit should be rejected (see Appendix 4). 3. Apply avoidance and minimization measures to wooded savannah and forest patches, where possible, (as these habitats are important habitats for chimpanzees and provide ecosystem services benefits to communities). If direct impacts occur to this habitat, the size of area impacted should be recorded for future rehabilitation purposes (see appendix 4). 4. If feasibility studies into enhanced management of a set aside area for an onsite offset are positive (GCM9), include a set aside area into Mine Plans as an avoidance buffer. 5. Communicate the location and importance of maintaining avoidance buffers where infrastructure should not be built and mining should not be undertaken to relevant GAC managers to ensure that Mine Plans and construction activities avoid these areas. 6. Verify that future updates to Mine plans include the avoidance buffer on paper and when a land disturbance permit process is triggered assess if the micro-sighting of infrastructure can avoid significant adverse impacts via a pre-disturbance survey (see Appendix 4). The pre-disturbance survey process will provide clear instructions for minimizing impacts, including micro-sighting of infrastructure or translocation of species as well as rehabilitation requirements.	Ongoing	Prior to construction	GIS layers, land disturbance procedure and permits, infrastructure maps	GAC – Environment[8] GAC – Mining[9]	Continuously

[6] A site that supports protected or large populations of flora and fauna

[7] A 500m buffer from the periphery of plateaus defined in the SEMP is not required for avoiding impacts to high priority biodiversity features

[8] GAC environment; responsible for developing buffers, communicating buffers to other departments, undertaking pre-disturbance surveys and ensuring information gained from survey work is input into the projects spatial database

[9] GAC mining - responsible for ensuring mine plans apply the buffers and for triggering a land disturbance permit process following the Environment departments process and for working with the Environment team to complete the required permit actions

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Start	Finish			
			7. Ensure appropriate minimisation and rehabilitation actions are part of permit conditions and verify that they are being implemented. Record residual impacts to priority species, gallery forests, wooded savannah and freshwater habitats for appropriate rehabilitation and offset actions					
			B. Develop a land disturbance permitting procedure to detail the land disturbance permitting process described in Appendix 4 and include: 1. Procedures to operationalize avoidance, minimization and rehabilitation measures as infrastructure construction and mining activities progress. For example stage 1 of the procedure 'pre-disturbance planning', would detail how ~6 months to 1 year prior to a planned disturbance event (i.e. one that is in the Mine plan or prior to the construction of the dam) the biodiversity team should evaluate the type of pre-disturbance survey that is required (see Appendix 4). For some species surveys are required in both the wet and the dry season and therefore enough time allowed for the surveys to be undertaken and the relevant avoidance and minimization measures to be applied. During stage 2, 'pre-disturbance assessment', the required pre-disturbance surveys are undertaken to assess for the presence of priority species and results are applied to either reject the permit, if adverse impacts cannot be mitigated, or permit conditions are developed to minimize impacts. Permit conditions may include for example requirements for progressive clearance (to give wildlife time to flee), through the translocation of priority species if pre-clearing surveys identify their presence (e.g. see SCM11). During stage 3 'disturbance' stage, the Environment team should verify the land disturbance permit conditions are being respected, if they are not, disturbance should be halted until permit conditions are applied. Residual impacts to priority habitats and species and to wooded savannah should be recorded for rehabilitation and offset purposes. Stage 4, 'rehabilitation', should draw on the results of rehabilitation trials (see rehabilitation GCM7) and monitoring of rehabilitation progress should be undertaken to ensure rehabilitation targets are achieved. 2. Wildlife corridor restoration; based on the sequential timing of mining of plateaus, wildlife corridor restoration activities should be undertaken ahead of clearance activities (see SCM2) as per the WCF Chimpanzee Management Plan (2015).	ASAP	End of operations	GIS layers, land disturbance procedure and permits, infrastructure maps	GAC - Environment	Continuously
Habitat fragmentation	MINIMIZE	GCM3	MINIMIZATION THROUGH DESIGN Optimize Mine Plan to avoid fragmentation of priority habitats, and where avoidance is not possible minimize fragmentation through wildlife friendly design					
			Optimize the design of new roads and infrastructure: 1. Avoid construction of unnecessary roads and use existing roads where ever feasible. 2. Evaluate the 'wildlife friendly' haul road alternatives proposed by WCF Ibid. to assess where they can be used by the Project instead of current designs. 3. Where wildlife friendly road design is not technically or logistically feasible, identify mitigation approaches to minimize road impacts e.g. measures to minimize the width of the road, measures to ensure that stream flow is not interrupted and the hydrology of the stream or river is not altered, placement of barriers to prevent induced access, install appropriate culverts or	Prior to construction	End of decommissioning	Overlay of GIS layers, infrastructure maps with important wildlife corridors, location of	GAC - Mining GAC - Environment	

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Start	Finish			
			underpasses for wildlife use, plant native, fast growing species along roads to minimize dust, noise and air pollution. 4. Identify gallery forest corridors that can be restored to provide priority species with alternative dispersal corridors (see SCM2), undertake restoration activities and monitor the outcome through the Mine Monitoring and Evaluation plan (see GCM8). 5. During operations, prevent induced access on Project operated roads by using barriers and gates to control access if the road passes through areas containing high priority features.			wildlife friendly road design		
Habitat loss due to relocation of communities	MINIMIZE	GCM4	MINIMIZATION THROUGH MANAGEMENT OF POTENTIAL COMMUNITY RELOCATION IMPACTS Ensure that priority habitats are avoided wherever feasible, and where avoidance is not possible minimize loss/degradation of suitable habitat due to relocation of communities in the Mine licence area					
			1. Identify potential negative impacts on priority species, habitats and ecosystem service availability from relocation of impacted communities as outlined in the Resettlement Action Plan e.g. if impacted communities are re-located to live in communities near to important areas for chimpanzees there is likely to be conflict between humans and wildlife for resources 2. Work with communities team and community stakeholders to develop actions to minimize habitat and biodiversity loss e.g. creation of community protected areas or bylaws for land and resource use (e.g. if mis en defens10 is effective consider using the same approach elsewhere), support of alternative livelihood programmes. 3. Identify indicators that track the identified negative impacts to biodiversity (identified in step 1) e.g. the area and condition of gallery forest or the area of occupied chimpanzee habitat, include the indicators in the Monitoring and Evaluation Plan collect monitoring data following the requirements of the Plan.	Prior to construction	End of decommissioning	Agricultural Development Plan, Monitoring and Evaluation Plan	GAC ES working group[11] GAC - Environment	
Habitat degradation and individual mortality	MINIMIZE	GCM5	MINIMIZATION THROUGH COMMUNITY AWARENESS RAISING Work with communities within the concession to promote sustainable resource use and awareness of biodiversity and ecosystem service values					
			1. Develop an interactive educational program, in collaboration with social specialists to maximize effectiveness, aimed at; a. raising community awareness of biodiversity (including priority features for the Project) and ecosystem service values, b. supporting community members to identify ways in which they can help maintain resources and ecosystem service	Prior to construction	End of operations	Educational materials, records of community	GAC - Environment GAC -	Continuously

[10] Refers to management of land by local communities through land planning whereby a proportion of land is set aside to be protected/rehabilitated, and other areas are dedicated to sustainable agricultural practices.

[11] The ES working group (Environment and social staff) are responsible for assessing potential conflicts between resettlement activities and priority biodiversity and ecosystem services and developing actions to minimise conflicts. The appropriate social team will be responsible for implementing actions involving communities and the environment team for biodiversity monitoring.

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Start	Finish			
			benefits and minimize conflicts with priority species (especially chimpanzees). Such awareness raising may be given through roadshows involving theatre, films and via school programs or however social specialists consider is most effective; 2. Support the GAC communities team and/or external contractors if appropriate, to implement the awareness raising and community identified activities to minimize human-wildlife conflicts, especially with chimpanzees[12]. As different communities may have different perceptions of chimpanzees, activities may need to be tailor-made for each community. 3. The monitoring and evaluation plan should include indicators to monitor changes in community perceptions towards priority species and sustainable resource use			team activities	Community Relations	
Habitat degradation and individual mortality	MINIMIZE	GCM6	MINIMIZATION THROUGH INTEGRATION OF BIODIVERSITY REQUIREMENTS INTO OTHER PROJECT MANAGEMENT PLANS Work with GAC staff outside of the biodiversity team e.g. the water team and the mining team to ensure measures to maintain hydrology and water quality in streams and rivers are implemented and to ensure noise, dust and vibration levels are minimized					
			A: Water regulation: All headwater streams and rivers are included within the avoidance buffer of the Project (see Figure 8 and appendix 5); if mining activities or operations will disturb freshwater habitat within an avoidance buffer, the land disturbance permitting process should be triggered to; 1. Record the minimum flow rates and thresholds in the river and/or stream prior to disturbance (mapping of water resource use by communities including average amounts required per household should be part of the calculation for the flow rate). The maintenance of the minimum flow rate should be a condition of the disturbance permit. Minimum flow rates must be maintained during the disturbance event to maintain biodiversity values and community requirements. 2. Verify that the minimum flow rates established in the permit conditions are being maintained throughout the year. 3. Verify that the Integrated Water Management Plan includes a. minimum flow rates and thresholds for the Tinguilinita River and main tributaries (based on field monitoring undertaken at an appropriate frequency to detect seasonal fluctuations)b. ground water levels and thresholds in multiple locations in the southern concession, c. community perceptions of access to, availability of, and quality of water freshwater (baseline monitoring data to meet the requirements of the monitoring plan should be gathered prior to construction) and ensure	Prior to construction	End of decommissioning	Water monitoring results in priority streams and rivers	GAC – Environment GAC – Community Relations	Continuously

[12] whilst the implementation of community work is unlikely to be undertaken by the biodiversity team it is important for the biodiversity team to be involved in the development of materials and activities to ensure that messages are aligned and impacts to biodiversity from GAC community activities are minimized. If external contractors are used it will be important for them to liaise with the GAC communities team, again to ensure that messages and activities are aligned

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Start	Finish			
			suitable indicators to detect changes in the condition of gallery forests and priority species as a result of changes in water flow and availability are included into biodiversity monitoring plans For the Tiouladiwol tributary and dam construction: 1. Establish the minimum natural flow rate and thresholds for the dry and wet seasons for the tributary prior to construction. These minimum wet and dry season flows should be maintained throughout the lifetime of the dam to maintain biodiversity values and community requirements downstream of the dam. 2. Assess whether impacts to gallery forest in the Tiouladiwol river can be minimised by reducing the water height of the reservoir; 2.1. Trial the use of alternatives to water to suppress dust along Project roads. 2.2 If effective, re-assess the amount of water required for Project operations and if feasible reduce the height of the dam and the required level of water in the dam. 3. Ensure clearance of vegetation from within the reservoir area before impoundment through community collection and Project clearance (see appendix 4) 4. Work with local communities to establish reservoir and land use management measures that enable sustainable fishing of native species but prevent the introduction of invasive species. 5. Revegetate banks of the reservoir with locally appropriate species to minimise erosion and sedimentation of the reservoir 6. Throughout the operational life of the dam, monitor 1. Water flow downstream of the reservoir to ensure minimum flow rates are maintained 2. Water quality within the reservoir, 3. The area of hill slope rehabilitated around the reservoir				
			B: Noise, dust and vibration: 1. Comply with IFC EHS best practice guidelines in minimizing noise disturbance, and plan for blasting to be conducted at the same time each day (or preferably surface miner approaches or similar are adopted to avoid the use of blasting) 2. Review the Mine plans to identify areas appropriate for the construction of buffer vegetation to shield priority species (in particular chimpanzees) from visual, dust and sound disturbances in their core habitat 3. If appropriate areas are identified investigate the feasibility of constructing a vegetation shield (considering potential conflict with controlling for fire, timescales for implementation and likely effectiveness, whether suitable species are available and their growth rate in the time available Ibid. 4. If feasible use the results of GCM7 to begin planting in identified areas sufficiently in advance of exploitation for the shield to be effective	Prior to construction	End of operations	Noise monitoring and vibration results	GAC - Environment GAC - Mining[13]	Continuously

[13] The GAC environment team are responsible for overseeing environmental monitoring and making appropriate recommendations to operations for minimising impacts whilst the mining department are responsible for ensuring that the required actions are implemented

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Start	Finish			
			5. Implement dust abatement practices to minimize dust generation from transport activities (e.g. vehicle and ore handling generated irrigation of material). Trial the use of alternative dust suppression spays to water to reduce the water requirement of the Project. 6. Monitor Project related noise, dust and vibration levels with distance from infrastructure 7. Include indicators in the Project wide monitoring and evaluation plan for monitoring Chimpanzee responses to mining activities					
Habitat loss and degradation	REHABILITATION	GCM7	REHABILITATION AND RESTORATION THROUGH TRIALS AND IMPLEMENTATION OF TECHNIQUES TO REHABILITATE PRIORITY HABITAT Develop a Rehabilitation and Restoration Management Plan based on effective techniques					
			General 1. Identify fast growing, easy to propagate native species that are preferred by priority fauna for nesting or as a food source, particularly chimpanzees 2. Develop protocols to propagate each species and requirements for planting out e.g. are they best grown from seed or from a cutting, what are the optimal soil and watering requirements. 3. Review the success rate of nursery established by WCF and make improvements as appropriate. 4. Undertake trials to rehabilitate areas of disturbed land and restore degraded areas identified as important wildlife corridors for chimpanzees and priority species (see SCM2) include for example investigation into the optimum spacing between plants, whether each species has any specific ecological requirements e.g. soil type and amount, proximity to water etc., what time of year should planting out be undertaken, how many times should saplings be watered after planting etc. to maximise the likelihood of survival. 5. Develop appropriate indicators for monitoring the success of rehabilitation and restoration e.g. Initial success could be based on the % of individuals of each species that were planted out and survived to year two. Over time the diameter of the base of the species and its height could be tracked, and indicators of rehabilitation completion could be based on evidence of flowering or fruiting of the tree (and indicators of whether the area is used by priority species). 6. Develop a rehabilitation and restoration Management Plan and Mine closure rehabilitation Plan with appropriate monitoring framework drawing on the results of rehabilitation trials	Ongoing	Prior to construction	Results of trial rehabilitation Area rehabilitated	GAC - Environment GAC - Mining	Continuously
			Roads 1. Undertake progressive rehabilitation of roads and areas no longer required by the Project and where there is no agreement for community use, following the rehabilitation and restoration Management Plan	Ongoing	Post decommissioning	Rehabilitation monitoring results	GAC - Mining GAC - Environment	Continuously

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Start	Finish			
			2. Monitor the success of rehabilitation based on pre-identified rehabilitation indicators[14]					
All impacts	MINIMIZE	GCM8	MINIMIZATION THROUGH MONITORING AND ADAPTIVE MANAGEMENT Develop a Monitoring and Evaluation Program to monitor the nature and scale of impacts (and offset gains) and ensure thresholds are included to trigger adaptive management actions					
			1. Bring together monitoring measures identified in this plan and other Project documentation into a Monitoring and Evaluation Management Plan for the Mine component. The plan should serve to identify the nature and scale of actual impacts (as opposed to predicted impacts in the ESIA/BMP), to track whether overall the Project will achieve a net gain for priority biodiversity features and to identify thresholds to enable the project to evaluate whether adjustments to the approach are required in order to keep the Project on track to reaching biodiversity net gain objectives. 2. Collect any outstanding baseline monitoring data based on the Monitoring and Evaluation Plan prior to construction, (in particular a concession wide, ground-truthed habitat map to record a baseline of Critical, Natural and Modified Habitat for future comparisons) 3. Re-assess the scale of potential residual impacts and as required embed the results into offset design 4. Establish a Biodiversity Advisory Committee or panel of specialists to undertake a comprehensive third party review and evaluation of the Monitoring Plan as well as provide technical support to the Project as required.	ASAP	Prior to construction	Monitoring and Evaluation Plan	GAC - Environment	Ongoing
All impacts	OFFSET	GCM9	OFFSET SIGNIFICANT RESIDUAL IMPACTS TO PRIORITY FEATURES Undertake pre-feasibility studies to assess potential gains via an onsite set-aside (and offsite offsets)					
			Onsite set aside area for conservation management: 1. Identify an area within the concession containing Chimpanzee, Red Colobus and high priority restricted range species (species in Action Categories 5 and 6), in consultation with communities and other stakeholders (currently a proposal has been made for an area in the north east as an onsite set-aside (see WCF 2015 and TBC 2015); 2. Verify that the onsite set aside area contains important habitat for at least one chimpanzee community and is connected via dispersal corridors with other chimpanzee communities to ensure its viability; 3. Survey headwater streams and areas of gallery forest for the Projects restricted range priority species (as per Action Categories 5 and 6);	Prior to construction	To end of decommissioning	Delimitation of onsite offset and its integration into Mine planning	EGA/GAC Management GAC - Environment	Ongoing

[14] Technical rehabilitation may be required prior to biological rehabilitation to ensure that landforms are stabilised and have an appropriate slope and adequate amount of top soil to meet biological rehabilitation requirements; coordination between GAC teams will be required to align procedures and work plans to operationalise activities

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Start	Finish			
			4. Delimitate the area to be considered as a set aside area on the ground in coordination with the GAC mine manager, GAC communities team and communities; 5. Assess resource usage within the set aside area by the communities living around and within the area (address timber extraction, fuelwood collection, charcoal production, bushmeat hunting, agriculture production, livestock grazing) 6. Evaluate how the Project can support affordable and culturally acceptable measures to decrease the usage of resources within the set aside area and design appropriate activities in coordination with the communities 7. Monitor the outcome of the work for biodiversity (e.g. improvements in the condition of habitat and distribution of priority species) and for communities to ensure no negative social impacts are created 8. Communicate information to Mine managers, engineering and construction teams and ensure the set aside area is captured in Mine plans and land disturbance procedures 9. Work with the appropriate authorities to ensure the set aside area is integrated into land planning and effectively managed beyond the lifetime of the Project Offsite offset: 1. Work with appropriate authorities and third parties to implement the offset implementation road map (TBC 2017) based on the results of the offset feasibility study 2. Establish a governance, management and finance structure for the offset 3. Undertake monitoring at the offset site to track offset gains and progress towards offset targets					
All impacts	ALL STAGES	GCM10	IMPROVE IMPLEMENTATION OF MITIGATION MEASURES THROUGH INTER-DEPARTMENTAL COORDINATION Establish an Ecosystem Service Working Group (ESWG) to ensure cross-cutting mitigation actions of the BMP are implemented and a spatially referenced social and environmental database is established and maintained to inform mitigation activities					
			1. Identify critical staff members to be part of an ESWG (e.g. leads on RAP, In-migration, Community liaison, BMP) 2. Establish the group and develop Terms of Reference (including objectives of the group, activities, frequency of meetings, appointment of a chairperson etc.). Activities will include; 2a. Ensuring relevant control measures from the BMP are applied to community activities (particularly GCM4, 5, 6, 11, 12, 15, 20, 23, 24) as well as additional measures highlighted by the ESR review (Appendix 6) 2b. Establishment and maintenance of a spatially referenced database of information relevant to the monitoring and adaptive management of biodiversity and social impacts and mitigation measures. The database should be based on quantitative socio-economic and biophysical information to enable environmental and social managers to 1. Identify priority areas for biodiversity and ecosystem service supply and dependence, 2. Assess and prioritise appropriate Project mitigation activities, 3. Develop livelihood restoration measures targeted to appropriate	ASAP	To end of operations	Spatially referenced database and ESWG meeting notes	GAC Environment GAC RAP/ Community Relations	Continuously

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Start	Finish			
			areas, 4. Track changes in biodiversity and ecosystem service availability and therefore sustainability of resource use 2c. Coordination and forward planning of joint activities and identification of activities which may pose conflicting outcomes for environmental and social objectives 3. ESWG activities and the data base should be maintained throughout the operational life of the Project					

Table 14: GCMs requiring collaboration with local authorities and other external stakeholders

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Habitat loss due to in-migration	MINIMIZE	GCM11	MINIMISATION THROUGH ENGAGEMENT WITH KEY STAKEHOLDER GROUPS Ensure that priority habitats are avoided wherever feasible, and where avoidance is not possible minimize loss/degradation of suitable habitat due to in-migration					
			1. Include avoidance buffers, habitat maps and priority species information into Project Induced In-migration (PIIM) Plan. 2. Conduct natural resource use and threat assessments in communities within the concession to identify areas at risk from in-migration/induced access (assessments should focus on timber extraction, fuelwood collection, charcoal production, bushmeat hunting, agriculture production, livestock grazing); ensure the results are input into the Projects spatially referenced database (GCM10) 3. Assess the success of previous livelihood programmes in the region and determine appropriate actions with community and or Government stakeholders to minimize threats to habitat and species loss 4. Work with local authorities and other stakeholders to implement the PIIM and sustainably manage resources within the GAC concession 5. Work with local government and other stakeholders including mining companies to scale up activities into a regional development plan to ensure that in-migration to the area does not create negative social or biodiversity impacts	ASAP	To end of decommissioning	In-migration plan, regional development plan	GAC – Environment GAC – Community Relations	Continuously
Habitat degradation and individual mortality	MINIMIZE	GCM12	MINIMIZATION THROUGH SUPPORT TO LOCAL AUTHORITIES Work with local authorities and Eaux et Forêts to avoid habitat degradation and species loss					

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
			1. Support local law enforcement Eaux et Forêts through financial and logistical means and training to reinforce enforcement against illegal hunting and land clearance within the concession 2. Work with authorities (and consult with external expertise e.g. GALF) to develop a patrol strategy and work plans to control illegal activities within the concession, for the set-aside and along the main national road at strategic locations 3. Work with hunters associations and communities to identify potential eco-guards in high risk areas of hunting and illegal activities throughout the concession (see GCM11) 4. Review and monitor patrol logs and work plans using a systematic process based on SMART to check implementation effectiveness	ASAP	To end of decommissioning	MoU with Eaux et Forêts, Patrol logs, incidents of illegal activities	GAC - Management GAC - Environment GAC - Government Relations GAC - Community Relations	Continuously
Cumulative impacts	AVOID/MINIMIZE/REHABILITATION	GCM13	MINIMIZATION THROUGH COLLABORATION WITH OTHER COMPANIES IN THE BAUXITE REGION Work with adjacent companies (COBAD, CBG, etc.) to address indirect and cumulative impacts					
			1. Establish a cumulative impact mitigation committee with neighbouring concessions and develop and implement a strategic plan to minimize cumulative impacts 2. Share biodiversity and social information to improve common knowledge and understanding of species distribution, requirements, in-migration figures and corresponding social pressures on biodiversity and resources, etc., and improve impact assessment and mitigation 3. Consult companies working in adjacent concession when planning new infrastructures development to optimize design and enable a joint mitigation of cumulative impacts 4. Coordinate impact mitigation and conservation actions in the Boullere area (on site offset) which overlaps with the CBG concession	ASAP	To end of decommissioning	Minutes of meetings with neighbouring companies	GAC - Management GAC - Environment	Continuously
All impacts	ALL STAGES	GCM14	ENGAGE WITH STAKEHOLDERS TO SUPPORT BMP IMPLEMENTATION Support successful implementation of GCM and SCM by informing and consulting stakeholders at all stages of the mitigation of biodiversity impacts					
			1. Map key stakeholders for the implementation of the BMP and assess their interests, capacity and power to influence its success 2. Develop a Stakeholder Engagement Plan (SEP) that will define who to inform and consult, how and when during the mitigation design, implementation and evaluation 3. Implement SEP and review and update regularly to check relevance 4. Transparently share publicly the outcomes of the consultation process and the decisions made by the company to ensure information of stakeholders	ASAP	To end of decommissioning	SEP is developed and implemented	GAC - Environment GAC - Community Relations	Continuously

Table 15: GCMs in the Port under the control of the Project

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Habitat loss and individual mortality	AVOID	GCM15	AVOIDANCE THROUGH STAFF AWARENESS Ensure that staff and contractors abide by Project code of conduct to prevent biodiversity impacts.					
			As per Mine GCM1				GAC - Environment	
Habitat loss	AVOID/MINIMIZE /REHABILITATION	GCM16	MINIMIZE IMPACTS THROUGH INFRASTRUCTURE OPTIMIZATION Optimise infrastructure design and location to minimize impacts to priority habitat and species					
			Ensure design of any new/additional Port infrastructure is optimised to: 1. Avoid further land reclamation on top of mangroves (e.g. through use of existing roads) 2. Avoid construction activities that alter hydrological flows and ensuring hydrological flows are maintained through use of bridges and culverts 3. Decommission of roads and rehabilitation of mangroves after closure	Prior to construction	Post decommissioning	Monitoring reports and updated habitat maps; Biodiversity Management Plan	GAC - Infrastructure GAC - Environment Port Operator	Continuously
Habitat degradation and individual mortality	AVOID/MINIMIZE	GCM17	MINIMIZATION OF IMPACTS TO WATER QUALITY GENERATED BY PORT CONSTRUCTION AND OPERATIONS Comply with best practices to minimize impacts to water quality					
			A: Dredging 1. Minimize dredging impacts through timing and duration of dredging events, restricting dredging during times of high land-based sediment runoff 2. Identify suitable site for dredge sludge disposal, away from sensitive species and mangrove habitats, and downstream from estuary in areas of low current exposure 3. Assess opportunities for recycling dredge sludge on land to avoid marine impacts 4. Control that oil and pollutants are separated and removed from water prior to discharge 5. Monitor sewage effluent quality to ensure it stays within the IFC guidelines on Wastewater and Ambient Water Quality (2007)[15] 6. Implement through Saltwater Quality (SWQ) Monitoring and Habitat Preservation Plan and Dredging Management Plan	Prior to construction	End of operations	Water quality monitoring (Monitoring and Evaluation)	GAC - Environment	Quarterly

[15] Available at: IFC guidelines on wastewater and Ambient Water Quality

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
			B: Desalinization plant 1. Model flow and temperature brine effluent discharge from desalinisation plant (through wastewater treatment facility) 2. Determine potential impacts from elevated sea temperatures and salinity to sensitive habitats, particularly mangroves 3. Use results to inform appropriate good practice mitigation measures if needed, including identification of a suitable discharge point (away from sensitive, shallow-water habitats) and shutdown during periods of elevated ambient water temperature 4. Check that effluent quality complies with IFC guidelines on Wastewater and Ambient Water Quality (2007) 5. Integrate and monitor potential impacts through the Saltwater Quality (SWQ) Monitoring Plan and undertake adaptive management where needed	Prior to construction	End of operations	Modelling and impact assessment report, monitoring and evaluation	GAC - Engineering GAC - Environment	Quarterly
			C: Spills 1. Develop and implement appropriate mangrove spill response plan using best practice response measures (e.g. NOAA's Oil Spills in Mangroves Planning & Response Considerations, 2014)[16] 2. Incorporate measures in the Emergency Preparedness, Prevention and Response Plan 3. Train people for emergency response 4. Make readily available emergency response material	Prior to construction	End of operations	Project staff training and induction logbook, Emergency drill logbook	GAC - Environment	Ongoing
Habitat degradation and individual mortality	MINIMIZE	GCM18	MINIMIZATION OF NOISE AND DUST GENERATED BY PORT CONSTRUCTION AND OPERATIONS Conduct targeted surveys in order to develop noise and vibration minimization measures for priority marine species					
			1. Minimize underwater noise to as low are reasonably practicable (including appropriate equipment selection and maintenance, soft start/ ramp up procedures) 2. Assess overlap between cetacean/manatee vocalisations to determine critical frequencies/engine types to target (see species control measures for Atlantic Humpback Dolphin) 3. Integrate findings and recommended procedures into Project Noise and Vibration Management Plan 4. Implement dust abatement practices to minimize dust generation from transport activities (e.g. vehicle and ore handling generated irrigation of material) 5. Monitor Project related noise and dust impacts	Prior to construction	End of operations	Records of noise levels and cetacean vocalizations	GAC - Port Operator GAC - Environment	Continuously

[16] Available at http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/oil-spills-mangroves.html

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Individual mortality	MINIMIZE	GCM19	MINIMIZATION OF IMPACTS TO PRIORITY SPECIES RELATED TO INDUCED ACCESS Ensure access to Port area is monitored to control fishing activities					
			1. Restrict access to Port area to prevent communities from using it for fishing activities 2. Restrict fishing access to and around loading conveyor and berthing facility 3. Provide awareness raising to ensure community is aware of restrictions to fishing within/around Port area 4. Integrate access restrictions policies into the PIIM plan	Prior to construction	End of operations	Project security logbook; Training and community awareness logbook	GAC - Security	Continuously
All impacts	MINIMIZE	GCM20	MINIMIZATION THROUGH MONITORING AND ADAPTIVE MANAGEMENT Develop a Monitoring and Evaluation Program to monitor the nature and scale of impacts (and offset gains) and ensure thresholds are included to trigger adaptive management actions					
			1. Employ a mangrove specialist to undertake field surveys to determine the quality of mangrove habitat in the area, close to and away from Port facilities (including parameters such as canopy cover, density, tree height and signs of disturbance/degradation), up to around 5km from Port facilities 2. Use survey information to determine potential impacts from degradation (e.g. pollution and sedimentation) and indirect causes (e.g. increased fuelwood harvesting) 3. Develop an updated mangrove habitat map, incorporating information on mangrove status (tree density, canopy cover etc.) 4. Quantify residual, disturbance and indirect impacts where significant, beyond the direct project footprint 5. Determine additional gains that may be required to achieve net gains for mangroves and the completion criteria for demonstrating a gain to be linked to monitoring indicators 6. Assess suitable offset sites and undertake additional mediative and/or averted loss offsets to meet net gain requirements 7. Undertake continual baseline monitoring of impacts and effectiveness of mitigation measures and integrate into Port Monitoring and Evaluation Plan 8. Integrate mangrove habitat sites into future project planning and development procedures	ASAP	To end of decommissioning	Monitoring reports and updated habitat map; Biodiversity Management Plan	GAC - Environment	Continuously
Habitat loss	REHABILITATION	GCM21	REHABILITATION AND RESTORATION THROUGH TRIALS AND IMPLEMENTATION OF TECHNIQUES TO REHABILITATE MANGROVES Develop and implement a Rehabilitation and Restoration Management Plan based on effective techniques					
			1. Assess success of mangrove rehabilitation activities conducted at Taidy and Taigbe 2. If activities were successful, then implement similar mangrove restoration activities to offset further impacts to mangrove caused by project activities where possible. *If* activities were not successful, then work with mangrove restoration experts (e.g. identified through the IUCN Mangrove Specialist Group) to help develop an appropriate mangrove restoration program	Prior to construction	To end of decommissioning	Mangrove rehabilitation and restoration Management Plan;	GAC - Environment	Continuously

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
			3. Educate, train and directly involve local communities in the restoration program to ensure they are empowered and can benefit from the services provided from mangroves 4. Identify obstacles and modifications of the original mangrove habitat that currently prevent establishment and succession 5. Understand and engineer original hydrological patterns of area to facilitate natural regeneration 6. Design a restoration program to restore appropriate hydrology and address conditions preventing natural colonisation of mangrove propagules and plant establishment 7. Undertake propagule planting following successful completion of previous steps and if natural recruitment is not sufficient to provide the quantity of successfully established seedlings, the soil stabilisation or rate of growth necessary for the project 8. Periodically check that the rehabilitation site is protected from exploitation or damage 9. Develop appropriate indicators for monitoring the success of rehabilitation and restoration including completion criteria (e.g. initial success could be based on the % propagule survival. Over time, mangrove biomass and height could be tracked, and indicators of rehabilitation completion could be based on evidence of flowering of the tree) 10. Develop and implement a Mangrove rehabilitation and restoration management plan to monitor restoration success against the completion criteria (the restoration proves can take anywhere from 5-15 years) 11. Undertake adaptive management where required			Biodiversity Management Plan		

Table 16: GCMs for the Port requiring collaboration with local authorities and other external stakeholders

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Habitat loss and individual mortality	MINIMIZE	GCM22	MINIMIZATION OF IMPACTS TO PRIORITY SPECIES RELATED TO IN-MIGRATION Identify and manage potential threats to biodiversity resulting from in-migration activities					
			1. Assess areas that are at the most risk of being negatively impacted by in-migration activities according to the PIIM Plan; 2. Identify threats to biodiversity (e.g. increase in fishing activities, destruction of mangrove for agriculture, to produce salt and to smoke fish) and model impacts on priority habitat; 3. Work with local authorities to define a land use management plan focussed on the indirect area of influence of the Project; 4. Assess success of previous livelihood restoration and rehabilitation programs at the port; 5. Integrate measures to minimize pressure or enhance habitat quality of priority species into the livelihood restoration and rehabilitation programs; 6. Define partnership with local authorities and relevant NGOs to implement activities and monitor success	ASAP	To end of decommissioning	PIIM Plan, BMEP	GAC-Environment GAC - Community Relations	Yearly
All impacts	ALL STAGES	GCM23	ENGAGE WITH STAKEHOLDERS TO SUPPORT BMP IMPLEMENTATION Support implementation of GCM and SCM by informing and consulting stakeholders at all stages of the mitigation of biodiversity impacts					
			As per Mine GCM14	ASAP	To end of decommissioning	SEP is developed and implemented	GAC - Community Relations GAC - Environment	Continuously

5 Monitoring, Evaluation and Adaptive Management

5.1 Overview of the Monitoring and Evaluation framework

Monitoring and Evaluation enables the Project to determine the scale of actual impacts and adaptively manage mitigation and offset actions to achieve an overall net gain or no net loss. This BMP sets out the framework the Project will use and the overall approach for Monitoring and Evaluation but details will be captured in a separate Monitoring and Evaluation Plan (BMEP).

The Project will adopt a commonly used framework for monitoring the effectiveness of biodiversity management known as the "*Pressure-State-Response*" framework. This framework identifies indicators or measures to track three aspects of biodiversity management:

1. The threats to biodiversity (monitored by the pressure indicators);
2. The Project mitigation measures to minimize those pressures (monitored by the response indicators or Key Performance Indicators);
3. The overall status of the priority biodiversity feature (monitored by the status indicators).

Applying the same indicators and methods to monitor pressures and the status of biodiversity at the site where impacts occur (losses) and the site where offsets occur (gains) will enable the Project to demonstrate that an equivalent gain has occurred and the Project has achieved an overall net gain for priority features. An overview of the framework and the relationship between the different types of indicator that will be used for monitoring is found in Figure 9. For key indicators, the Project will establish monitoring thresholds, if thresholds are crossed trigger an adaptive management review and response as appropriate. The BMEP is considered to be a live document; the indicators and thresholds selected will be regularly reviewed with input from specialist stakeholders and adapted, where required, based on monitoring results. It will include provision for monitoring rehabilitation post-mine closure.

This BMP identifies only the response indicators or Key Performance Indicators (KPIs) which are based on the Project´s GCMs and where appropriate SCMs. As described, the KPIs track the progress of implementation of key mitigation actions rather than the outcomes of mitigation measures (the pressure) or the status of priority features.

Section 5.2 identifies the KPIs for the GCMs and Section 5.3 outlines the approach the Project will apply for monitoring the status of the priority habitats; gallery forest and mangrove in sites of both losses and gains. The species-specific sections, identify KPIs for SCMs and outline the approach for monitoring the status of species where it is required.

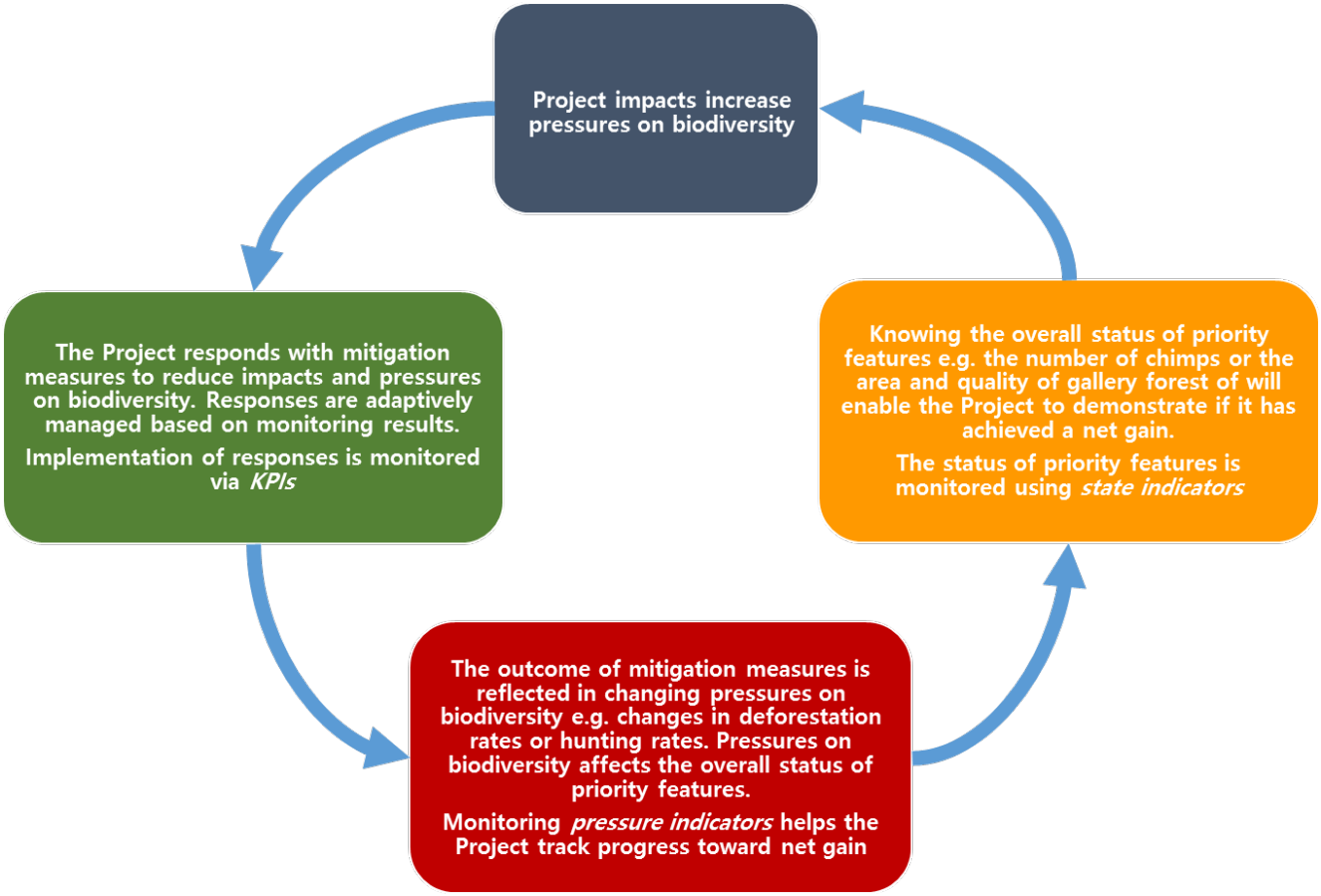

Figure 9: The Monitoring and Evaluation framework

5.2 Key Performance Indicators

The KPIs selected by the Project for monitoring the implementation of GMs are found in Table 17. At a minimum KPIs should be checked on an annual basis e.g. GIS monitoring KPIs such as KPI3 and KPI6 where changes are less likely to be detected over a short period of time, for others quarterly monitoring is more appropriate e.g. monitoring of disciplinary breaches (KPI1).

Table 17: Key Performance Indicators for Mine GCMs

General Control Measure		Key Performance Indicator		Target	Means of verification
GCM1	AVOIDANCE THROUGH STAFF AWARENESS Ensure that staff and contractors abide by Project code of conduct to prevent biodiversity impacts	KPI 1	% of new staff and contractors receiving biodiversity training	100%	Records of new staff induction
		KPI 2	Number of incidents of staff breaching code of conduct	Zero	Staff disciplinary records
GCM2	AVOIDANCE THROUGH DESIGN Ensure that priority habitat is avoided wherever feasible, and where avoidance is not possible minimize loss/degradation of suitable habitat due to construction and operating footprint	KPI 3	Ha of avoidance buffer areas cleared	Zero	Confirm: Avoidance buffer GIS layer applied to all project plans Results of pre-disturbance assessments to validate findings Review of all ground disturbance permits Comparison with habitat map
		KPI 4	Ha of priority habitat impacted beyond project footprint requirements	Zero	Results of pre-disturbance assessments to validate findings Review of all ground disturbance permits
GCM3	MINIMIZATION THROUGH DESIGN Optimize Mine Plan to avoid fragmentation of priority habitats, and where avoidance is not possible minimize fragmentation through wildlife friendly design	KPI 5	Number of fragmentation incidents (i.e. number of times a road or infrastructure dissects forest habitat)	Zero	Habitat maps and Mine disturbance layer
GCM4	MINIMISATION THROUGH APPROPRIATE ENGAGEMENT WITH COMMUNITIES TEAM AND COMMUNITY STAKEHOLDERS Ensure that priority habitats are avoided wherever feasible, and where avoidance is not possible minimize loss/degradation of suitable habitat due to relocation of communities in the Mine licence area	KPI 6	Ha of priority habitat lost due to relocation of communities	Zero	Habitat maps pre-relocation and post relocation of communities
GCM5	MINIMIZATION THROUGH COMMUNITY AWARENESS Work with communities within the concession to promote sustainable resource use and awareness of biodiversity values	KPI 7	% of community members in the Mine area that have participated in environmental awareness activities	100%	Records of community team activities
GCM6	MINIMIZATION THROUGH INTEGRATION OF BIODIVERSITY REQUIREMENTS INTO OTHER PROJECT MANAGEMENT PLANS Work with GAC staff outside of the biodiversity team e.g. the water team and the mining team	KPI 8	Number of incidents of water flow and quality passing their thresholds on the Tingulinita River and main tributaries	Zero	Mine Water Plan monitoring results

	to ensure measures to maintain hydrology and water quality in streams and rivers are implemented and to ensure noise and vibration levels are minimized	KPI9	Number of incidents of breeches in minimum flow downstream of the Tiouladiwol dam	Zero	Mine Water Plan monitoring results
		KPI10	Rehabilitation of wooded savannah within a 500 m buffer of the maximum reservoir height	100%	Rehabilitation results, field verification
GCM7	REHABILITATION AND RESTORATION THROUGH TRIALS AND IMPLEMENTATION OF TECHNIQUES TO REHABILITATE PRIORITY HABITAT Develop a Rehabilitation and Restoration Management Plan based on effective techniques	KPI 11	No of ha rehabilitated to meet completion criteria	To meet rehab and restoration plan	Rehabilitation results, field verification
		KPI 12	No of ha restored to meet completion criteria	To meet rehab and restoration plan	Restoration results, field verification
GCM9	OFFSET SIGNIFICANT RESIDUAL IMPACTS Undertake pre-feasibility studies to assess potential gains via an onsite offset (and offsite offsets)	KPI 13	Number of priority species confirmed present in onsite offset	All	Mine plan integrating onsite offset for chimpanzees.
		KPI 14	Number and size of chimpanzee communities present in the onsite offset	1+ community	Feasibility study of onsite offset
		KPI15	Established offset	One+	Offset Implementation Plans and on the ground activities to achieve net gain for priority features with significant residual impact
		KPI16	Number of times offset management effectiveness falls below average rating	Zero	Management effectiveness tracking reports
GCM10	IMPROVE IMPLEMENTATION OF MITIGATION MEASURES THROUGH INTER-DEPARTMENTAL COORDINATION Establish an Ecosystem Service Working Group (ESWG) to ensure cross-cutting mitigation actions of the BMP are implemented and a spatially referenced social and environmental database is established and maintained to inform mitigation activities	KPI17	% of ESWG activities implemented	100%	ESWG workplan and meeting notes
		KPI18	% of GIS Social and Environmental information layers periodically updated	100%	Spatially referenced Environmental and Social database
GCM11	MINIMISATION THROUGH ENGAGEMENT WITH KEY STAKEHOLDER GROUPS Ensure that priority habitats are avoided wherever feasible, and where avoidance is not possible minimize loss/degradation of suitable habitat due to in-migration	KPI 19	Land disturbance plan for the Southern area of the concession	One	Stakeholder agreed land disturbance plan

GCM12	MINIMIZATION THROUGH SUPPORT TO LOCAL AUTHORITIES Work with local authorities and Eaux et Forêts to avoid habitat degradation and species loss	KPI 20	% of patrol teams applying SMART approach	100%	MoU with Eaux et Forêts, Patrol logs, incidents of illegal activities
GCM14	ENGAGE WITH STAKEHOLDERS TO SUPPORT BMP IMPLEMENTATION Support successful implementation of GCM and SCM by informing and consulting stakeholders at all stages of the mitigation of biodiversity impacts	KPI 21	% of Stakeholder Engagement activities implemented	100%	SEP

Table 18: Key Performance Indicators for the Port

General Control Measure		Key Performance Indicator		Target	Means of verification
GMC15	AVOIDANCE THROUGH STAFF AWARENESS Ensure that staff and contractors abide by Project code of conduct to prevent biodiversity impacts.	KPI 22	% of new staff receiving induction training	100%	• Records of new staff induction
GCM19	MINIMIZATION OF IMPACTS TO PRIORITY SPECIES RELATED TO INDUCED ACCESS Ensure access to Port area is monitored to control fishing activities	KPI 23	% of community members made aware of restrictions	100%	• Project security logbook; Training and community awareness logbook.
		KPI 24	# of fishing intrusions into restricted Port area	Zero	
GCM21	REHABILITATION AND RESTORATION THROUGH TRIALS AND IMPLEMENTATION OF TECHNIQUES TO REHABILITATE MANGROVES Develop a Rehabilitation and Restoration Management Plan based on effective techniques	KPI 25	# of ha of mangrove restored to meet completion criteria	100%	• Mangrove rehabilitation and restoration Management Plan
		KPI 26	% survival rate of mangrove propagules to meet completion criteria	100%	
		KPI 27	Track quality of mangrove habitat through annual monitoring	Maintained or increasing	

5.3 Approach to monitoring the status of priority habitats

The Project recognises the importance of monitoring habitats as habitat can be used as a proxy or surrogate for monitoring wider biodiversity values including, where appropriate, priority species.

The Project will use a widely applied approach to monitoring habitats known as 'Quality Hectares' (QH). This approach combines an estimate of the area impacted with the condition or quality of the forest in that area. The inclusion of habitat quality into the measure is important as within a given habitat-type, habitat condition, or quality, may vary from place to place due to past disturbance. These different areas may have different levels of value for biodiversity – some specialist species may be absent or present at reduced densities in a logged forest for example. This means simply using the area of habitat is not a reliable measure of the biodiversity value of a given portion of a habitat.

The Project has provisionally applied this approach to assess the scale of potential residual direct and indirect impacts to gallery forest, wooded savannah and mangrove in order to support offset planning. A description of the application of the approach is found in Appendix 3 and a summary of the results and the approach to achieve a net gain in Section 5.4.

5.4 Anticipated significant residual impacts to priority habitats and wooded savannah

Significant residual impacts are presented for priority habitats (gallery forest and mangrove) based on potential direct and indirect impacts, these estimates apply a precautionary principle and will be refined through monitoring as the Project progresses. Estimated direct residual impacts are provided for savannah woodland (and forest patches), a Natural Habitat important for chimpanzees.

5.4.1 Gallery forest

Table 19: Summary of estimated residual impacts in the southern section of the concession and net gain approach: Gallery forest

Gallery forest	
Metric used:	Quality Hectares
Estimated significant residual direct impact:	~ 15 QH
Estimated significant residual indirect impact in the southern section of the concession:	Up to 800 QH
Estimated total significant residual impact in the southern section of the concession:	Up to 815 QH (Southern area of concession only)
Plan to deliver gains:	Improved management of an offset site (4 potential sites were identified as part of a chimpanzee offset pre-feasibility study (TBC 2015), further work is required to understand if these sites are appropriate to offset impacts to gallery forest habitat
Potential gains:	Not yet estimated, a feasibility study of the preferred offset site is required to estimate potential gains
Net gain feasible?	Yes, if a site with a large enough area of gallery forest can be found to generate the necessary averted loss or restoration gains

Wooded savannah

Table 20: Estimated direct residual impacts to wooded savannah habitat

Wooded savannah	
Metric used:	Quality hectares
Estimated significant residual direct impact:	~ 1,451 QH
Estimated significant residual indirect impact	~ 6,752 QH
Estimated total significant residual impact	~ 8,203 QH
Plan to deliver gains:	Improved management of an offset site , further work is required to understand if the preferred offset site is appropriate to offset impacts to wooded savannah habitat
Potential gains:	Not yet estimated, a feasibility study of the preferred offset site is required to estimate potential gains
No net loss feasible?	Yes, if the offset site contains a wooded savannah habitat important to chimpanzees

5.4.2 Mangrove

Table 21: Summary of estimated residual impacts and net gain approach: Mangrove

Mangrove	
Metric used:	Quality hectares
Estimated significant residual direct impact:	~ 54 QH
Plan to deliver gains:	Rehabilitation / Restoration of two sites is currently underway for the Project. The scale of the current activities may have to be adjusted if further direct impacts occur.
Potential gains:	Previously losses and gains have been estimated following government requirements, using a simple area-based approach. Further work is required to factor in mangrove quality to loss and gain estimations. Consideration of whether gains are possible through identification of additional restoration sites may be required.
Net gain feasible?	Yes, if the project continues to adaptively manage its approach to mangrove restoration and scale up activities if required

6 Species Control Measures

This section identifies specific measures for priority species where they are required. Many of the measures will require species specialist knowledge to support the development of protocols or the implementation of activities; GAC will contract the relevant specialists as required. The prioritization process placed priority species into Action Categories which define the type of Project response required based on the likelihood and consequence of Project impacts. It is a provisional classification that will be revisited as more information is known about the species (see Figure 10 for the outcome and Appendix 2 for the full description of actions associated with each category).

Species in Action Categories 1 and 2 have a clear risk of impact but the consequence of impact is considered high for Category 1 and lower for Category 2:

- Species in Action Category 1 require immediate species specific measures to mitigate impacts, they have the highest likelihood and consequence of impact and therefore the highest priority species for the Project.
- Impacts to species in Action Category 2 will mainly be minimized by General Control Measures as the likelihood of impacts to these species is high but the consequence of the impact is considered to be lower. The Project does not currently have any species in this category, only habitats (see GCMs).
- Species in Action Category 3 are considered to have a low likelihood of Project impact but if an impact did occur it would be significant and therefore active monitoring of the species is required. The Project does not currently have any species in this category.
- Species in Action Category 4 have a low likelihood and consequence of impact due to the ecology of the species. Implementation of GCMs and monitoring of the habitats the species are associated with are considered appropriate approaches to track risks.

For species in Action Categories 5 to 7 the risk is unclear as there is less information known about these species. Species specific actions therefore focus on avoiding or reducing impacts where there are proven measures to minimise risk to the species or on undertaking targeted pre-disturbance surveys if the habitat associated with the species will be impacted by the Project:

- For species in Action Category 5, even though the risk is unclear there are species specific measures that can be undertaken to minimize the risk of impact which are described in this section.
- Species in Action Category 6, have a known association with a particular habitat and therefore if impacts to the habitat can be minimized so will impacts to the species
- For species in Action Category 7 there is not enough information to adequately assess the likelihood and consequence of impact and therefore urgent research is required to assess whether the species is present within the concession and establish appropriate mitigation measures. There are currently no species in this category.

The remainder of this section outlines the species specific measures following the outcome of the prioritization process.

	Risk and approach well understood				Precautionary approach to be updated based on further information		
	1. Immediate attention	**2. Proactive avoidance**	**3. Proactive monitoring**	**4. Remain aware**	**5. Specific mitigation**	**6. Habitat-focused mitigation**	**7. Further research required**
Features	Western Chimpanzee, Temminck's Red Colobus, Atlantic Humpbacked Dolphin, Gallery Forest, Mangrove	Wooded savannah, Freshwater (rivers and streams)	None	Rüppell's Vulture, Daisy Stingray, Blackchin Guitarfish	Pinto's Puddle Frog, Beautiful Squeaker Frog, White-backed Vulture, Hooded Vulture Green Turtle, Hawksbill Turtle, African Manatee,	Half-toed Gecko, Purple Marsh Crab, River Worm Lizard, Los Archipelago Worm Lizard, Teugel's Electric Catfish, *Paramphilius teugelsi, Petrocephalus levequei, Paramphilius trichomycteroides, Fleurydora felicis, Ledermanniella abbayesii*	None
Definition	*High risk that the feature will be impacted as a result of the Project and the consequence of the risk is considered to be significant for the species. The Project will prioritize actions to avoid and minimize impacts, further research will help focus mitigation measures*	*High risk that the feature will be impacted but the consequence of the risk is unlikely to be significant.*	*Low likelihood that the species will be impacted but if impact occurs the consequence of impact would be significant for the species.*	*Low likelihood that the species will be impacted and the consequence of the risk is unlikely to be significant for the species.*	*The species distribution is unknown but well defined specific mitigation measures are identified for the species and will be implemented by the Project. Further research is unlikely to alter the choice or intensity of mitigation measures*	*The species distribution is unknown, but it's habitat association is clear and measures to reduce habitat impacts will also benefit the species. The Project will implement measures to reduce impacts to the species habitat, if appropriate species specific measures will be undertaken*	*Insufficient information available to assess the likelihood and consequence of impact. Surveys required to assess presence of species in the Mine area, understand habitat requirements and develop mitigation measures*
Action	Ensure species specific mitigation measures are undertaken and conduct additional research to increase the effectiveness of measures	Implement control measures	Implement control measures	Implement general control measures	Ensure species specific mitigation measures implemented. Re-assess if encountered during pre-disturbance surveys	Ensure control measures for the species' habitat are implemented. Re-assess if encountered during pre-disturbance surveys	Undertake additional research to inform the development of species specific mitigation measures. Ensure general control measures implemented
Net gain/No Net Loss	Compensatory actions will be necessary to achieve a net gain	Necessary only if impacts are confirmed significant, verify presence in offset site	Necessary only if impacts occur, verify presence in offset site	Necessary only if impacts are confirmed significant	Required where mitigation measures are not effective, verify presence in offset site	Not required unless impacts confirmed significant, verify presence in offset site	Review once status and potential impacts clarified
Monitoring	Species specific monitoring required where habitat is not an appropriate monitoring proxy, highest level of assurance required	Monitor the scale of the impact	Use habitat as a proxy to monitor scale of impact, (if not appropriate, consider species monitoring)	Use habitat as a proxy to monitor the scale of impact	Clarify the scale of impact on species through monitoring implementation control measures	Clarify scale of impact on habitat through monitoring implementation of control measures	Clarify the scale of impact on habitat (or species) through pre-construction surveys and species monitoring if required

Figure 10: Action Category descriptions and results of the prioritization process. This assessment assumes the mitigation measures described in this BMP are implemented effectively

6.1 MINE SPECIES

6.1.1 Western Chimpanzee

6.1.1.1 Species detail

Summary species information		
Species	*Pan troglodytes verus*	
Project priority status	**Action Category 1: Immediate attention**	
Description	The Western Chimpanzee's range extends into eight countries in West Africa, with Guinea harbouring the largest proportion of this subspecies. Chimpanzees occur throughout the GAC concession and more than one chimpanzee community is likely to be present. Chimpanzees use most of the habitat types present within the Mine area, but are particularly reliant on gallery forest for feeding and nesting. Chimpanzees are a priority species for the Project and qualify for Critical Habitat following the IFC PS6 guidelines. Further surveys should focus on gathering information on the number of chimpanzee communities present, as well as their size and composition, in order to rapidly detect significant changes in their population dynamic and adapt mitigation measures accordingly.	
Existing threats	Chimpanzees are in decline mainly as a result of hunting and habitat loss. In this part of Guinea, habitat loss has traditionally been a bigger threat than hunting due to religious taboo against eating primates in the area. However, this religious taboo is weakening and hunting may become a significant threat as people from other parts of Guinea that eat primates are moving into the area. Recent bushmeat surveys conducted within the concession showed that primates constituted currently 11% of species hunted, WCF, (GAC 2015 SEIA Addendum Annex 6-4C). Furthermore, more than half of the hunters interviewed within the concession were not aware of national hunting laws and regulations, and that the chimpanzee is a nationally protected species.	
Red List Status	CR	
Restricted Range	No	
Recorded within licence area	Yes	
Habitat association	In the Mine area, most of the chimpanzee presence signs (i.e. chimpanzee nests) have been recorded in gallery forest, but chimpanzees have also been recorded in forest patches, wooded savannah, bowal and farmland.	
Potential Project impacts	Direct and indirect habitat loss, degradation and fragmentation. Increased hunting pressure.	

6.1.1.2 Specific control measures for chimpanzees

Most mitigation measures that are beneficial for chimpanzees have been captured under GCMs (e.g. noise minimization, avoidance of fragmentation, restoration of corridors). Here we provide further control measures that target chimpanzees only.

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
All impacts to chimpanzees	ALL STAGES	SCM1	OPTIMISE MITIGATION THROUGH EMPLOYMENT OF SPECIALIST STAFF Select employee to oversee implementation of best practices by the Project for chimpanzees					
			1. Designate a specific GAC employee as an 'ape champion' responsible for overseeing ape mitigation measures, following ape & mining best practice guidelines developed by the Arcus Foundation Arcus Foundation, *State of the Apes: Extractive Industries and Ape Conservation*. If existing employees do not have the necessary skills, consider employing a new staff member or seconding specialist staff from external organizations into the Project. 2. Develop awareness raising activities for chimpanzee (and colobus) for the community's team to use as part of their educational activities and incorporate the activity into GCM5.	ASAP	Ongoing	CV / TOR of staff member	GAC - Environment	Ongoing
Habitat loss, fragmentation, species loss	AVOID/ MINIMIZE	SCM2	RESEARCH TO OPTIMIZE AVOIDANCE AND MINIMIZATION MEASURES Conduct more intensive surveys to collect information on chimpanzee communities					
			1. Review existing data to develop specific research questions and an appropriate survey design. 2. Develop and implement a concession wide optimised and repeatable chimpanzee monitoring approach to understand chimpanzee abundance, distribution and social structure. The approach should enable the Project to understand the number of communities present and the estimated limits to their territories in relation to proposed mining locations, as well as their core areas (especially important for high density areas as identified by WCF (2015) at plateaus 20 & 26 in the southwest, and for plateaus 33 & 34& 37 in the southeast; the limits to their territory may extend outside of the concession boundary); 3. Use information to a. include important habitat areas for chimpanzees based on core use areas within land disturbance processes (see also GCM2B), b. Plan mining sequence in order for chimpanzees to temporarily shift their range within their territory c. optimize infrastructure including road location, guide corridor restoration activities; and 4. Communicate information to Mine managers, engineering and construction teams sufficiently in advance of operations to enable mitigation measures to be embedded into design and operations.	Prior to construction	End of operations	Close monitoring of chimpanzee communities to monitor their ranging patterns within their territory and the fluctuation in community size.	GAC - Environment	Ongoing

Species loss	MINIMIZE	SCM3	MINIMISATION THROUGH STAFF AWARENESS Ensure that staff and contractors abide by Project code of conduct to minimize impacts to chimpanzees.					
			1. Within the employee code of conduct (GCM1) specific guidance in relation to chimpanzees to prevent the spread of disease should include 1. Prohibition of defecation and spitting in the natural environment, 2. Prohibition of leaving any food waste or rubbish, 3. Respect of a distance of at least 20m when encountering a wild chimpanzees 2. Ensure specific codes of conduct, induction training and regular refresher training are developed for staff most likely to come into contact with chimpanzees (e.g. drivers). Driver codes of conduct should ensure that speed limits are respected, that any encounters with priority species or mortality of priority species are reported and their locations recorded with a GPS, and that drivers and their vehicles are subject to regular random inspections to check for bushmeat and other prohibited products.	ASAP	To end of decommissioning	Code of conduct, Induction logbook	GAC - Environment	Continuously

6.1.1.3 *Monitoring of control measures*

Control Measure		Key Performance Indicator		Target	Means of verification
SCM2	RESEARCH TO OPTIMIZE AVOIDANCE AND MINIMIZATION MEASURES Conduct more intensive surveys to collect information on chimpanzee communities	KPI28	Number and area of Project encroachments into core chimpanzee area	Zero	Overlay of Mine sequence and core chimpanzee area.
SCM3	MINIMISATION THROUGH STAFF AWARENESS Ensure that staff and contractors abide by Project code of conduct to minimize impacts to chimpanzees	KPI29	Number of staff incidents involving a breach of code of conduct related to chimpanzee	Zero	Incident reports

6.1.1.4 *Approach to monitoring losses and gains*

Currently the approach to measure losses and gains is through a chimpanzee population size estimate. Given that there are wide confidence intervals around the population size estimates combined with natural yearly stochastic variation, it would be preferable to combine these estimates with other auxiliary variables in order to refine the loss and gain assessment. For example, habitat proxy combined with information on the number of chimpanzee communities and their reproductive health would provide more accurate and precise information as a basis to assess losses and gains. This could be achieved by monitoring important chimpanzee habitats using remote sensing and by collecting information on chimpanzee demography (e.g. community size and composition) using camera trapping.

6.1.1.5 *Estimated significant residual impact*

Two different assessment of significant residual impacts were conducted separately by WCF (2015) and by TBC (2016). WCF estimated that residual impacts of 70-100% or c. 190 to 270 chimpanzees. TBC estimated residual impacts to be in the order of 30-60%, focusing on the southern portion of the GAC concession where the majority of mining activities are expected, resulting in the loss of 50 to 160 chimpanzees. These estimates are contingent upon the effectiveness of mitigation measures.

6.1.2 Temminck's Red Colobus

6.1.2.1 *Species detail*

Summary species information		
Species	*Piliocolobus temminckii*	
Project priority status	**Action Category 1: Immediate attention**	
Description	The Red Colobus is a large primate species with declining populations throughout its range mainly due to the loss of its preferred habitat (forests including gallery forest) and hunting pressures. It has been reported from different areas within the GAC concession but only recorded once.	
Existing threats	Red Colobus are in decline mainly as a result of hunting and habitat loss. In this part of Guinea, habitat loss has traditionally been a bigger threat than hunting due to religious taboo against eating primates in the area. However, bushmeat surveys conducted within the concession showed that primates constituted currently 11% of species hunted, and Red Colobus is listed as a species that is hunted in this area (Bushmeat report WCF 2015). Furthermore, more than half of the hunters interviewed within the concession were not aware of national hunting laws and regulations, and that the Red Colobus is a nationally protected species.	

Red List Status	EN (but likely to be soon upgraded to CR[17])
Restricted Range	No
Recorded within licence area	Yes
Habitat association	In the Mine area, the only record is from gallery forest but recent records throughout its range suggest colobus are also using woodland, mangrove swamps and farmland given that their preferred habitats is being lost to agriculture or becoming degraded
Potential Project impacts	Direct and indirect habitat loss, degradation and fragmentation. Increased hunting pressure.

[17] IUCN Primate Specialist Group, pers. comm

6.1.2.2 *Species specific control measures*

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Habitat loss	AVOID/ MINIMIZE	SCM4	AVOIDANCE THROUGH DESIGN Minimize habitat loss by optimising infrastructure locations and selecting an area to set-aside as an onsite offset					
			Identify 'Priority habitat areas' for the Red Colobus: 1. Conduct targeted surveys to assess the relative abundance and distribution of the species within the concession and the different types of habitat used (approach: undertake reconnaissance walks in suitable colobus habitat (guided by hunter's knowledge of areas used by red colobus and by the results of previous records between plateaus 11 and 19 and plateau 7NE), during the walk select sites to remain quiet and listen for primate vocalizations at dusk and dawn in order to detect red colobus calls). If the colobus is encountered ensure all locations are recorded and captured within the Projects database as avoidance areas. 2. During pre-disturbance surveys (see Appendix 4), include targeted surveys for colobus if the site contains gallery forest or wooded savannah habitat (see above for survey approach). If surveys encounter the species, the land disturbance permit must be rejected as this is an EN species (that will likely soon be upgraded to CR) and the locations for the species added to the Projects database and avoidance layer to avoid future impacts. 3. Take into consideration priority habitat for colobus when outlining the onsite offset 4. Monitor direct and indirect impacts to the priority habitat areas for colobus over the Project lifetime	Prior to construction	To end of decommissioning	GIS layer of Priority habitat for colobus overlaid with infrastructure footprint.	GAC - Environment	Continuously
Offset	AVOID/ MINIMIZE	SCM5	UNDERTAKE ADDITIONAL CONSERVATION ACTIONS TO SUPPORT COLOBUS CONSERVATION Support research to understand the distribution and threats to the colobus and the development of a species action plan for the region					
			Identify additional conservation actions that the Project can support for Red Colobus: 1. Engage with a species specialist to develop a scope of work for post-doctoral research to further understanding into the distribution of Red Colobus and threats to the species. An output of the work should be a regional species action plan. 2. Identify a suitable post-doc to undertake the work and fund the research program 3. Disseminate the findings and provide support towards activities identified in the action plan	Early in the construction phase	To end of decommissioning	Red Colobus regional action plan	GAC - Environment	Ongoing

6.1.2.3 *Monitoring of control measures*

Control Measure		Key Performance Indicator		Target	Means of verification
SCM4	AVOIDANCE THROUGH DESIGN Minimize habitat loss by optimising infrastructure locations	KPI30	% of Colobus priority habitat area impacted	Zero	GIS layer of Priority habitat for red colobus overlaid with infrastructure footprint.
SCM5	UNDERTAKE ADDITIONAL CONSERVATION ACTIONS TO SUPPORT COLOBUS CONSERVATION Support research to understand the distribution and threats to the colobus and the development of a species action plan for the region	KPI31	Regional species action plan for Red Colobus	One	Species action plan

6.1.2.4 *Approach to monitoring losses and gains*

In the current state of knowledge, losses cannot be quantified. Insufficient information is available to assess population size, distribution and habitat preferences.

6.1.2.5 *Estimated significant residual impact*

Further information on the Red Colobus distribution and/or ecological requirements are required in order to estimate significant residual impacts. To date, the only record for Red Colobus is from the north of the concession, but it is likely that they could also be found in the southern part of the concession, where immediate direct impacts are likely.

6.1.3 Amphibians

6.1.3.1 *Species detail*

Pinto's Puddle Frog

Summary species information		
Species	*Phrynobatrachus pintoi*	 © Hillers, 2008
Project priority status	**Action Category 5: Specific mitigation**	
Description	This species has a very restricted range (386km^2) and is only known globally from 4 sites and 1 threat location as defined by the IUCN. It has not yet been recorded in the Mine concession. It is thought to be a forest dependent species and associated primarily with gallery forest, headwater springs and forest patches within savanna, in the wet season it may use savannah habitat more frequently	
Existing threats	Main threats are from the conversion of the species natural habitat into agriculture and habitat degradation	
Red List Status	EN	
Restricted Range	Yes	
Recorded within licence area	No	
Habitat association	Gallery forest, forest patches	

Potential Project impacts	Direct and indirect habitat loss and degradation, introduction of the deadly amphibian Chytrid fungus

Beautiful Squeaker Frog

Summary species information		
Species	*Arthroleptis formosus*	 ©Chiro, 2015
Project priority status	**Action Category 5: Specific mitigation**	
Description	This species is currently known from only 4 sites within 183 km2), all within the Télimélé region but it may occur more widely. It has not yet been recorded in the Mine concession. But has been recorded in the adjacent CBG concession. It is thought to be associated with gallery forest habitat with small rivers, headwater springs as well as humid grass and tree savannahs (i.e. moist habitat) and may tolerate a degree of habitat degradation.	
Existing threats	Main threats are from the conversion of the species natural habitat into agriculture and habitat degradation	
Red List Status	DD	
Restricted Range	Yes	
Recorded within licence area	No	
Habitat association	Gallery forest	
Potential Project impacts	Direct and indirect habitat loss and degradation, introduction of the deadly amphibian chytrid fungus	

6.1.3.2 Species specific control measures

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Loss of habitat due to Project footprint	AVOID/ MINIMIZE	SCM6	AVOIDANCE AND MINIMISATION THROUGH DESIGN When Project criteria require, ensure that pre-disturbance surveys target the species to avoid and minimize impacts					
			When the land disturbance permitting process requires a pre-disturbance survey: 1. Identify staff or contract specialists with the suitable skill set and experience to undertake amphibian survey work 2. Undertake targeted pre-disturbance surveys in gallery forest habitat and gallery forest around headwaters, during the wet and dry seasons to detect the presence/absence of the 2 species and locate potential breeding sites for them. 3. IF encountered, gather data to understand their habitat and breeding requirements (micro-habitat where the species are encountered, their dependency on water and record their GPS locations). 4. IF recorded, develop land disturbance permitting conditions to avoid and minimize impacts to the species (see Appendix 4) 5. IF recorded, verify that minimum water levels are maintained through the monitoring associated with the Mine Water Management Plan (GCM6A)	Prior to construction	To end of operations	Pre-disturbance surveys, Mine water management plan includes requirements for Pinto's Puddle Frog and the Beautiful Squeaker Frog where relevant	GAC - Environment	Continuously
Species loss due to invasive species	AVOID/ MINIMIZE	SCM7	AVOIDANCE AND MINIMISATION THROUGH IMPLEMENTATION OF PROTOCOLS Ensure all imported equipment is 'clean as new' and monitor for the presence of chytrid fungus in Guinea					
			1. Develop cleaning and quarantine protocols for all vehicle, heavy equipment and staff equipment to be imported from other countries/sites 2. Communicate protocols internally and add to contractors HSEQ requirements 3. Ensure protocols are implemented successfully and that all equipment is imported "clean as new" 4. Monitor the presence and spread of the chytrid fungus as part of the broader M&E program e.g. via networking with amphibian research specialists to track any presence/spread of the fungus in/to Guinea or countries from where the Project imports equipment to alert the Project to risks and via periodic sampling of the amphibian population for the fungus 5. If chytrid is recorded present in Guinea, develop an Amphibian Management Plan to address specific actions to minimize and monitor chytrid spread, and consider starting an ex-situ conservation program for for Pinto's Puddle Frog and the Beautiful Squeaker Frog.	Prior to construction	End of decommissioning	Imported vehicle cleaning logs, records of chytrid presence/absence	GAC - Environment Port Operator	Continuously

6.1.3.3 *Monitoring of control measures*

Control Measure		Key Performance (Response) Indicator		Target	Means of verification
SCM7	AVOIDANCE AND MINIMISATION THROUGH IMPLEMENTATION OF PROTOCOLS Ensure all imported equipment is 'clean as new' and monitor for the presence of chytrid fungus in Guinea	KPI32	% of imported vehicles and equipment that are cleaned and quarantined	100%	Equipment and vehicle cleaning records
		KPI33	Presence of chytrid fungus in Guinea	Zero	Monitoring records

6.1.3.4 *Approach to monitoring losses and gains*

If pre-disturbance surveys detect the presence of either species, the areas where they are present should be monitored for impacts to habitat and to hydrology (water flow and quality). If monitoring thresholds for habitat and hydrology are passed, surveys will be required to detect if the species are still present, if the species are not found a quantification of losses will be required and elaboration of plans to achieve a net gain for these species.

6.1.3.5 *Estimated significant residual impact*

Losses and gains cannot be quantified with the current level of knowledge. Should pre-disturbance surveys detect the presence of these species in the Mine area and their association with gallery forest, a suggested proxy to quantify losses and gains on for these species would be "Area of gallery forest where species are known present".

6.1.4 Vultures[18]

6.1.4.1 *Species detail:*

White-backed Vulture

Summary species information		
Species	*Gyps africanus*	
Project priority status	**Action Category 5: Specific mitigation**	
Description	Critically Endangered species of vulture associated with wooded savannah habitats where it uses tall trees as sites for nesting. The species breeds at the start of the dry season and may breed in loose colonies of 2 to 13 birds. Nests are usually made from a platform of sticks lined with grass in the fork of a tall tree. Reported to be 'fairly common' within the Mine licence area ERM, "Social and	

[18] Note: The CHA (ERM 2017) identified that the same 3 vulture species that are priority species at the mine site are also priority species at the port. However, no species specific measures are identified for the port as port activities are unlikely to impact vultures.

	Environmental Impact Assessment (SEIA). Volume 1 Addendum for GAC´s Bauxite Export Project, Guinea.”.
Existing threats	The main threats to this species are targeted poisoning, capture for traditional medicine and bushmeat. The conversion of its preferred habitat is a threat throughout its range as is the loss of wild ungulates (i.e. the reduction in the availability of carrion).
Red List Status	CR
Restricted Range	No
Recorded within licence area	Yes
Habitat association	Wooded savannah
Potential Project impacts	Loss of habitat due to direct and indirect impacts; potential impact to nesting sites if nesting sites are found within the concession

Hooded Vulture

Summary species information		
Species	*Necrosyrtes monachus*	
Project priority status	**Action Category 5: Specific mitigation**	
Description	Critically Endangered species of vulture associated with wooded savannah and gallery forest habitats where it uses tall trees and palms as sites for nesting. It is also often found around human settlements and is reported to be common within the Mine area (SEIA Vol 1).	
Existing threats	The main threats to this species are targeted poisoning, capture for traditional medicine and bushmeat. The species may be affected by avian influenza. The conversion of its preferred habitat is a threat throughout its range as is the loss of wild ungulates and therefore the availability of carrion. As this species is often associated with refuse dumps, improvements in waste facilities may also affect the species	
Red List Status	CR	
Restricted Range	No	
Recorded within licence area	Yes	
Habitat association	Wooded savannah, gallery forest and around human settlements	
Potential Project impacts	Loss of habitat due to direct and indirect impacts, potential impact to nesting sites if nesting sites are found within the concession	

Rüppell’s Vulture

Summary species information		
Species	*Gyps rueppellii*	

Project priority status	**Action Category 4. Remain aware**
Description	Presence not yet recorded in the concession. Critically Endangered species of vulture associated with woodland, grassland and montane regions. Unlike the other vulture species, Rüppell's Vulture is unlikely to use habitats within the Mine area to nest as the species prefers to nest on cliff faces and escarpments.
Existing threats	Like the other vulture species, the main threats are conversion of preferred habitats to agriculture, poisoning and persecution and for use in black magic
Red List Status	CR
Restricted Range	No
Recorded within licence area	No
Habitat association	Woodland, grassland and montane regions
Potential Project impacts	As this species is considered unlikely to nest in the Mine licence area potential even if it is found to be present within the concession impacts are not likely to be significant

6.1.4.2 Species specific control measures

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Loss of habitat due to Project footprint and relocation of communities	AVOID/ MINIMIZE	SCM8	AVOIDANCE AND MINIMISATION THROUGH DESIGN When Project criteria require, ensure that pre-disturbance surveys target potential vulture nesting areas to avoid and minimize impacts					
			When the land disturbance permitting process requires a pre-disturbance survey, undertake a targeted survey following protocols, to assess the presence of nesting sites for vulture species: 1. Identify staff or contract specialists with the suitable skill set and experience to undertake vulture survey work 2. Undertake pre-disturbance field survey a. With communities to identify presence vultures in the area and potential location of nests b. in the field during the breeding season to locate and collect baseline data (Nov to April). IF encountered gather baseline data on the number of nests in the colony, number of adults, juveniles and fledglings, Record the GPS locations of the trees containing the nests. Create a minimum 50m buffer around the trees and enter the locations and buffers into the Projects spatially referenced database as an area where impacts must be avoided. 3. If nests are encountered the land disturbance permitting conditions must require the avoidance of areas with vulture nests. If these areas cannot be avoided the permit should be rejected. If the area can be avoided, minimization and monitoring recommendations should be made within the land disturbance permitting conditions (see Appendix 4). 4. Any disturbance impacts to vulture nests must be recorded for offset actions either via an offsite offset or via additional conservation actions; the scope and scale of activities would be further defined if nest are encountered and if disturbance occurs	Prior to construction	End of operations	Pre-clearance surveys, GPS locations of vulture nesting sites, monitoring of nests if required	GAC - Environment	Continuously
Habitat degradation and species loss	MINIMIZE	SCM9	MINIMIZATION THROUGH COMMUNITY AWARENESS RAISING Work with communities within the concession to promote sustainable resource use and awareness of biodiversity values					
			1. Develop an awareness raising activity for vultures for the community's team to use as part of their educational activities and incorporate the activity into GCM5. The activity should be short and highlight the benefits vultures have for people e.g. cleaning of carcasses to prevent disease and the threats they face throughout their range and therefore why they are a priority species for the Project. The exercise should also encourage people to leave trees with vulture nests alone and report to the Project when nesting sites are found. 2. Periodically update the information based on new information on vultures	Prior to operation	End of operation		GAC - Environment GAC - Community Relations	Continuously

6.1.4.3 *Monitoring of control measures*

If pre-disturbance surveys encounter vulture nesting sites:

Control Measure		Key Performance Indicator		Target	Means of verification
SCM8	AVOIDANCE AND MINIMISATION THROUGH DESIGN When Project criteria require, ensure that pre-disturbance surveys target potential vulture nesting areas to avoid and minimize impacts	KPI34	Number of nesting trees avoided through the land disturbance permit process	100%	Pre-disturbance survey records, disturbance GIS layer, Monitoring records

6.1.4.4 *Approach to monitoring losses and gains*

If pre-disturbance surveys detect the presence of the species, avoidance measures will be put in place via land disturbance permit conditions (see appendix 4) and monitoring of the nesting sites will be undertaken to assess whether nesting sites are impacted. If impacts occur, quantification of losses will be required and elaboration of plans to achieve a net gain for the species.

6.1.4.5 *Estimated significant residual impact*

Losses and gains cannot be quantified with the current level of knowledge but are unlikely to be significant as these species are wide-ranging. Should pre-disturbance surveys detect the presence of nesting sites in the Mine area and these sites cannot be avoided, quantification of significant residual impacts would be based on the number of nesting trees removed and an estimate of the number of fledglings impacted as a result.

6.1.5 Half-toed Gecko

6.1.5.1 *Species detail*

Summary species information		
Species	*Hemidactylus kundaensis*	 © Chiro, 2013
Project priority status	**Action Category 6: Habitat-focused mitigation**	
Description	Newly discovered species of gecko with extremely restricted range and only known globally from a few localities. The species is poorly known but gallery forests around headwater streams may be an important habitat for the species. It has been recorded within the concession.	
Existing threats	Main threats are likely to result from loss of habitat or degradation of habitat as a result of human disturbance from agricultural clearance, and from bauxite mining in the distribution range of the species.	
Red List Status	CR	
Restricted Range	Yes	
Recorded within licence area	Yes	
Habitat association	The species was initially thought to be associated with wooded savanna on hill slopes but most recent data from the species authority indicates that it restricted to hyper-humid gallery forests around the headwater springs	
Potential Project impacts	Direct and indirect loss and degradation of gallery forest habitat in headwater streams	

6.1.5.2 Species specific control measures

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Loss of habitat due to Project footprint and relocation of communities	AVOID/ MINIMIZE	SCM10	AVOIDANCE AND MINIMIZATION THROUGH DESIGN When Project criteria require, ensure that pre-disturbance surveys target the gecko to avoid and minimize impacts					
			When the land disturbance permitting process requires a pre-disturbance survey, undertake a targeted survey to assess the presence of the Half-toed Gecko: 1. Identify staff or contract specialists with the suitable skill set and experience to undertake vulture survey work 2. Undertake targeted pre-disturbance surveys to detect the presence/absence of the species. Field surveys should include questions to local communities about whether they have seen the species since it is known to inhabit disturbed areas and villages. IF encountered gather baseline data on the habitat type associated with the encounter and record the GPS locations of the encounters for entry into the Projects spatially referenced database. 3. If the species is encountered, assess if impacts can be avoided. If adverse impacts can be mitigated develop land disturbance permitting conditions relevant for mitigating impacts to the gecko (see Appendix 4), e.g. contract a gecko specialist to develop translocation protocols and translocate individuals to an appropriate location prior to disturbance (See SCM11).	Prior to construction	End of operations	Pre-disturbance surveys, priority habitat layer for the Gecko, disturbance layer	GAC - Environment	Continuously
Species loss due to Project footprint	AVOID/ MINIMIZE	SCM11	AVOIDANCE THROUGH IMPLEMENTATION OF TRANSLOCATION PROTOCOLS When required, ensure that translocation is implemented following translocation protocols to avoid and minimize impacts to the Half-toed Gecko					
			Contract the services of a reptile specialist to: 1. Identify an area to release individuals of Half-toed Gecko that might be caught prior to land clearance. The conservation area should meet the ecological requirements of the species, have the capacity to carry additional individuals. It should not be in an area potentially impacted in the future by the project or by external threats (e.g.: clearance for agriculture), the feasibility of using the proposed onsite offset area to release individuals should be investigated. 2. Develop a protocol to collect individuals of Half-toed Gecko prior to land clearance. The protocol should provide details on the suitable season and period of the day, where to look for individuals and how to catch them, how to store them, which level of effort is appropriate, how to release them, etc.). 3. Where land likely or known to harbor Half-toed Gecko cannot be avoided and will be cleared, collect all individuals prior to clearance and release them in the designated area. 4. Monitor the success or failure of the translocation through appropriate monitoring methodology	Prior to construction	End of operations	Translocation protocols, pre-disturbance surveys, translocation records	GAC - Environment	Continuously

6.1.5.3 *Monitoring of control measures*

Control Measure		Key Performance Indicator		Target	Means of verification
SCM10	AVOIDANCE AND MINIMISATION THROUGH DESIGN When required, ensure that pre-disturbance surveys target the gecko to avoid and minimize impacts	KPI35	Area of Half-toed Gecko habitat impacted	Zero	Pre-disturbance surveys

6.1.5.4 *Approach to monitoring losses and gains*

If impacts occur to areas where the Half-toed Gecko has been recorded a suggested proxy to quantify losses and gains would be "Area of habitat where species is known present". If translocation occurs, the outcome of translocation should also be monitored as part of the disturbance permit conditions (see Appendix 4). This species has a restricted range and is unlikely to be found in an offsite offset. The Project will therefore verify the presence of this species in the onsite set-aside as a precautionary measure.

6.1.5.5 *Estimated significant residual impact*

If impacts occur to areas where the Half-toed Gecko has been recorded a suggested proxy to quantify losses and gains would be "Area of gallery forest where species is known present".

6.1.6 Purple Marsh Crab

6.1.6.1 *Species detail*

Summary species information		
Species	*Afrithelphusa monodosa*	
Project priority status	**Action Category 6: Habitat-focused mitigation**	
Description	A species of freshwater crab known only from 2 locations in Guinea (1 near Boke); specialists estimate there may only be ~2,500 mature individuals. This species has not yet been recorded in the concession. The crab is thought to prefer wetland areas in savannahs and gallery forests including around headwater springs where it lives in burrows in the ground. It has also been recorded in cultivated areas where the original habitat is converted to farmland as long as there is a small amount of muddy water in its burrow. It breathes air and therefore does not need to be immersed in water.	
Existing threats	The main threat to this species is conversion of its habitat (wetland areas within savannahs and forests) into fields and the intensification of agriculture	
Red List Status	EN	
Restricted Range	Yes	
Recorded within licence area	No	
Habitat association	Wetland areas in savannahs and gallery forests including gallery forests around headwater springs (may also survive where original habitat has been converted into farmland as long as there is some	

	muddy water remaining), it is therefore more likely that the species would be found in valleys rather than on mining plateaus.
Potential Project impacts	Direct and indirect impacts that result in habitat loss and degradation of gallery forest, direct impacts to the level of quality of ground water

6.1.6.2 *Species specific control measures*

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Habitat loss and degradation	AVOID/ MINIMIZE	SCM12	AVOIDANCE AND MINIMISATION THROUGH DESIGN When Project criteria require, ensure that pre-disturbance surveys target the Purple Marsh Crab to avoid and minimize impacts					
			When the land disturbance permitting process requires a pre-disturbance survey, undertake a targeted survey to assess the presence of the Purple Marsh Crab: 1. Identify staff or contract specialists with the suitable skill set and experience to undertake vulture survey work 2. Undertake targeted pre-disturbance surveys to detect the presence/absence of the species. Field surveys should include questions to local communities about whether they have seen the species since it is known to survive in areas that have been converted from their original habitat into cultivated areas. Ideally surveys should be undertaken in both the wet and dry seasons. IF encountered gather baseline data on the number of burrows seen, the number of adults recorded, the area covered by the burrows and take GPS points of location of the burrows to be added to the Projects spatially referenced database. 3. If the species is encountered, assess if impacts can be avoided or reduced. If adverse impacts can be mitigated develop land disturbance permitting conditions relevant for mitigating impacts to the crab (see Appendix 4). For example, species specialists should be contracted to assess the feasibility of translocating the species to an appropriate site. If feasible a detailed protocol should be written by the specialist and their oversight provided during the translocation process. If impacts occur to the area inhabited by the species, record the size of area impacted that is inhabited by the species for offset purposes.	Prior to construction	End of operations	Pre-disturbance surveys, Project's spatially referenced database for locations of the Purple Marsh Crab, disturbance layer, ground water monitoring results	GAC - Environment	Continuously

6.1.6.3 *Monitoring of control measures*

Control Measure		Key Performance Indicator		Target	Means of verification
SCM12	AVOIDANCE AND MINIMISATION THROUGH DESIGN When required, ensure that pre-disturbance surveys target the crab to avoid and minimize impacts	KPI36	Area of Purple Marsh crab habitat impacted	Zero	Pre-disturbance surveys

6.1.6.4 *Approach to monitoring losses and gains*

If presence is confirmed via pre-disturbance surveys or if the Project choses to assume the species is present rather than undertake surveys, significant residual impacts would be considered to have occurred if hydrology thresholds are passed (i.e. if the ground water level where the species has been recorded drops below a threshold level over a certain period). Losses would then be assessed as "area of impacted gallery forest wetland where species is present/assumed present". This species has a restricted range and is unlikely to be found in an offsite offset. The Project will therefore verify the presence of this species in the set aside area onsite as a precautionary measure.

6.1.6.5 *Estimated significant residual impact*

The species has yet to be confirmed present in the concession. The Project will monitor the effectiveness of mitigation measures through monitoring Key Performance Indicators for the Mine Water Management Plan and gallery forest habitat. As per above, If mitigation measures have not avoided or minimized impacts and thresholds are passed, significant residual impacts will be quantified.

6.1.7 Freshwater fish

6.1.7.1 *Species detail*

Teugel's Electric Catfish

Summary species information		
Species	*Malapterurus teugelsi*	
Project priority status	**Action Category 6: Habitat-focused mitigation**	
Description	This is an Electric Catfish with a restricted range (only recorded in 1 location in the Cogon watershed). It occurs among rocks or roots within sluggish/standing waters. It is active at night, feeding mainly on fish stunned by electric shocks. The species forms pairs and breeds in excavated cavities or holes. The largest specimen observed was about 20cm. (IUCN, 2015). It has not yet been recorded in the concession.	
Existing threats	No known threats are reported in the literature but pressures that affect water quality or water flow are most likely to affect an aquatic species.	
Red List Status	NT	
Restricted Range	Yes	
Recorded within licence area	Yes (recorded in the Tiouladiwol tributary)	
Habitat association	It lives in rivers where it occurs among rocks or roots within sluggish/standing waters. It is benthopelagic (lives and feeds near the bottom as well as in midwaters or near the surface).	
Potential Project impacts	Direct impacts to hydrology and water quality in rivers downstream from mining activities and from the construction and operation of the Tiouladiwol dam and reservoir	

Paramphilius teugelsi

Summary species information		
Species	*Paramphilius teugelsi*	
Project priority status	**Action Category 6: Habitat-focused mitigation**	
Description	A demersal species of fish (bottom dwelling), preferring tributaries bordered by gallery forest	
Existing threats	Deforestation is identified as a potential threat (Lalèyè, P. 2010)	
Red List Status	VU	
Restricted Range	Known from Sierra Leone and Guinea from 4 basins and is considered Restricted Range (Lalèyè, P. 2010)	
Recorded within licence area	Yes (recorded in Sampirin Missidé tributary, and the Tiouladiwol tributary)	
Habitat association	Freshwater tributaries	
Potential Project impacts	Direct impacts to hydrology and water quality in rivers downstream from mining activities	

Petrocephalus levequei

Summary species information		
Species	*Petrocephalus levequei*	
Project priority status	**Action Category 6: Habitat-focused mitigation**	
Description	A demersal (bottom dwelling) species, found in tributaries bordered by gallery forest	
Existing threats	Threatened by deforestation, mining and over-fishing	
Red List Status	NT	
Restricted Range	Known from Guinea, Guinea-Bissau and Sierra Leone and potentially from Liberia but its global range is estimated to be under 20,000km^2 and therefore is considered to be Restricted Range	
Recorded within licence area	Yes (recorded in the Tiouladiwol tributary)	
Habitat association	Freshwater	
Potential Project impacts	Direct impacts to hydrology and water quality in rivers downstream from mining activities and from the construction and operation of the Tiouladiwol dam and reservoir	

Paramphilius trichomycteroides

Summary species information		
Species	*Paramphilius trichomycteroides*	
Project priority status	**Action Category 6: Habitat-focused mitigation**	

Description	This fish species lives in tributary streams, typically in headwaters and is demersal (i.e. bottom dwelling).
Existing threats	This species has a wide distribution (Sierra Leone, Liberia, Guinea and Ethiopia) and its population is not considered to be highly fragmented. However, the development of hydro projects in the species range and deforestation activities are affecting freshwater habitats, The species is also threatened by drought and overfishing.
Red List Status	NT
Restricted Range	No - the global range for this species is considered over 20,000km2 and therefore does not meet the IFC PS6 threshold for Restricted Range (Bousso, T. & Lalèyè, P. 2010).
Recorded within licence area	Yes (recorded in the Tiouladiwol tributary)
Habitat association	Freshwater (tributaries)
Potential Project impacts	Direct impacts to hydrology and water quality in rivers downstream from mining activities and from the construction and operation of the Tiouladiwol dam and reservoir

6.1.7.2 *Species specific control measures*

Impact	Stage of Mitigation Hierarchy	Control Measure and Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Habitat loss and degradation	AVOID/ MINIMIZE	SCM13	AVOIDANCE AND MINIMISATION THROUGH DESIGN When Project criteria require, ensure that pre-disturbance surveys target the four priority fish species to avoid and minimize impacts					
			When the land disturbance permitting process requires a pre-disturbance survey, undertake a targeted survey to assess if the freshwater habitat within the disturbance area contains the four priority fish species: 1. Identify staff or contract specialists with the suitable skill set and experience to undertake fish survey work 2. Undertake targeted pre-disturbance surveys in streams and rivers downstream of the area to be impacted during the wet and dry seasons to detect the presence/absence of the species. 3. IF the species is recorded, gather data to understand the species habitat and breeding requirements (micro-habitat where species encountered, the water depth, flow and quality i.e. the concentration of suspended matter etc. in the area it was encountered and record GPS locations of the species) 4. IF encountered, assess if impacts can be avoided or reduced. If adverse impacts can be mitigated develop land disturbance permitting conditions relevant for mitigating impacts to fish species (see Appendix 4). Record residual impacts to freshwater habitats containing priority species for offset purposes. 5. For the Tiouladiwol tributary, monitoring of the impacts of the reservoir should include periodic assessment for the continued presence of *Paramphilius teugelsi, Malapterurus teugelsi, Petrocephalus levequei* and *Paramphilius trichomycteroides* in the tributary, upstream and downstream of the reservoir	Prior to construction	End of operations	Pre-disturbance surveys, priority habitat layer for the four priority fish species, disturbance layer, water flow and quality in priority streams	GAC - Environment	Continuously

6.1.7.3 *Monitoring of control measures*

Control Measure		Key Performance Indicator		Target	Means of verification
SCM13	AVOIDANCE AND MINIMISATION THROUGH DESIGN When required, ensure that pre-disturbance surveys target the four priority fish species to avoid and minimize impacts	KPI37	Number of incidents of water flow and quality passing thresholds on rivers and streams known to contain priority species	Zero	Monitoring of flow and water quality in streams and rivers that are disturbed; thresholds for water flow and quality for aquatic species, pre-disturbance surveys

6.1.7.4 *Approach to monitoring losses and gains*

If presence is confirmed via pre-disturbance surveys or if the Project choses to assume the species are present rather than undertake surveys, significant residual impacts would be considered to have occurred if hydrology thresholds are passed (i.e. if minimum water flow and water quality thresholds are passed). Losses would then be assessed as "Length of impacted watercourse where species is present/assumed present". An offset site where the species is confirmed to be present would then be required to achieve a net gain.

6.1.7.5 *Estimated significant residual impact*

The Project will monitor the effectiveness of mitigation measures through monitoring Key Performance Indicators for the Mine Water Management Plan. As per above, If mitigation measures have not avoided or minimized impacts and thresholds are passed, significant residual impacts will be quantified.

6.1.8 Worm Lizards

6.1.8.1 *Species detail*

Cassine River Worm Lizard

Summary species information		
Species	*Cynisca cf oligopholis*	 © Chiro, 2013
Project priority status	**Action Category 6: Habitat-focused mitigation**	
Description	This is a fossorial worm lizard (i.e. lives underground in burrows). It is likely a new species to science and has only been recorded in the Sangaredi sub prefecture and Guinea-Bissau. The ecology and the distribution of the species are poorly known. It is believed to be associated to gallery forest (ERM 2015a, Chirio 2015) and has not yet been recorded in the concession	
Existing threats	Main threats are likely to result from loss of habitat or degradation of habitat as a result of human disturbance from agricultural clearance, and from bauxite mining in the distribution range.	
Red List Status	EN	
Restricted Range	Yes	
Recorded within licence area	No	
Habitat association	This species was found in gallery forest along the Cogon (EEM, 2015).	
Potential Project impacts	Direct and indirect loss of gallery forest	

Los Archipelago Worm Lizard

Summary species information	
Species	*Cynisca leonine*
Project priority status	**Action Category 6: Habitat-focused mitigation**
Description	This is a fossorial worm lizard (i.e. lives underground in burrows). The ecology and the distribution of the species are poorly known. It was known historically from Conakry and the Loos Islands but was recently found in northern Guinea. It is associated with gallery forest (GAC 2015, Chirio, 2015) and has been recorded in the concession
Existing threats	Main threats are likely to result from loss of habitat or degradation of habitat as a result of human disturbance from agricultural clearance, and from bauxite mining in the distribution range.
Red List Status	VU
Restricted Range	Yes
Recorded within licence area	Yes
Habitat association	This species is found in gallery forest
Potential Project impacts	Direct and indirect loss of gallery forest

6.1.8.2 *Species specific control measures*

Species specific control measures are not required beyond the General Measures to avoid impacts to gallery forest habitat.

6.1.8.3 *Monitoring of control measures*

Not applicable (no species specific control measures).

6.1.8.4 *Approach to monitoring losses and gains*

The Project will monitor gallery forest as a proxy for these species.

6.1.8.5 *Estimated significant residual impact*

The Project will monitor the scale of impacts to gallery forests as a proxy for these species, if significant impacts occur to gallery forests an investigation of the significance of the impact for the species will be required.

6.1.9 Flora species

Fleurydora felicis

Summary species information		
Species	*Fleurydora felicis*	 © Martin Cheek
Project priority status	**Action Category 6: Habitat-focused mitigation**	
Description	This is a species of shrub or tree in the Orchaceae family. It is endemic to Guinea with most collected specimens found near Kindia. It is associated with gallery forest along streams and rivers. It has not yet been recorded in the concession	
Existing threats	Main threats are likely to result from loss of habitat or degradation of habitat as a result of human disturbance from agricultural clearance, and from bauxite mining in the distribution range.	
Red List Status	VU	
Restricted Range	Yes	
Recorded within licence area	No	
Habitat association	Associated with gallery forest along streams and rivers	
Potential Project impacts	Direct and indirect loss of gallery forest	

Ledermanniella abbayesii

Summary species information		
Species	*Ledermanniella abbayesii*	
Project priority status	**Action Category 6: Habitat-focused mitigation**	
Description	This is an aquatic freshwater plant known only from 3 specimens found in the Kinkon waterfall, Pita (Guinea) and from the Jèbèh River, Liberia (TBC 2015). The species grows on rocks in rivers within gallery forest habitat and has not yet been recorded in the concession.	

Existing threats	Main threats are likely to result from loss of habitat or degradation of habitat as a result of human disturbance, mining and drought
Red List Status	DD
Restricted Range	Yes
Recorded within licence area	No
Habitat association	This species is associated with freshwater streams within gallery forest habitat
Potential Project impacts	Direct and indirect loss of gallery forest and changes in stream quality and flow

6.1.9.1 Species specific control measures

Species specific control measures are not required beyond the General Measures to avoid impacts to gallery forest habitat.

6.1.9.2 Monitoring of control measures

Not applicable (no species specific control measures).

6.1.9.3 Approach to monitoring losses and gains

The Project will monitor gallery forest as a proxy for these species.

6.1.9.4 Estimated significant residual impact

The Project will monitor the scale of impacts to gallery forests as a proxy for these species, if significant impacts occur to gallery forests an investigation of the significance of the impact for the species will be required.

6.2 PORT SPECIES

6.2.1 Mammals

6.2.1.1 Species detail

Atlantic Humpbacked Dolphin

Summary species information		
Species	*Sousa teuszii*	© Caroline Weir
Project priority status	**Action Category 1: Immediate action**	
Description	A slow swimming species of dolphin, typically occurring in groups of 4 to 7 individuals. It's elusive, has a distinct humped appearance when it breaks the surface, a long narrow beak and broad flippers and is up to 2.8m in length.	
Existing threats	Affected by fishing activities as it is accidentally caught in fishing nets and fishing may reduce prey availability. Boat strikes and habitat degradation are also pressures on the species.	
Red List Status	VU (but will be upgraded to EN or CR)	
Restricted Range	No	

Occurrence relative to area	Recorded within the Nunez Estuary
Habitat association	Confined to shallow waters (up to 30m depth) and close to the coastline (within 1km from shore) where it hunts for fish in groups.
Potential Project impacts	Disturbance and modification of habitat from dredging and boat movement, fragmentation of its range due to jetty, indirect impacts via increased fishing pressure

6.2.1.2 *Species specific control measures*

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Species loss	AVOID	SCM14	AVOID DIRECT PROJECT IMPACTS TO DOLPHIN Ensure that best practices measures are implemented to avoid vessel strikes					
			1. Train vessel crew to marine mammal observations and recognition 2. Designate an observer on board to remain vigilant and inform captain in case of sighting 3. Impose vessel speed limits of 10 knots or less (zero wake speed) during sighting in proximity to vessel 4. Observer to record GIS coordinates and report sightings in GIS database 5. Report any localities of sightings of dolphins to the harbor master for general broadcast, as well as any vessel strikes 6. Identify and map any areas routinely used by dolphins (e.g. Île de Taïdy) and aim to designate such hotspots as no shipping zones	Prior to construction	End of operations	Marine mammal observer logbook; Vessel routes to avoid species habitat	GAC - Environment	Continuously
Species loss	AVOID/ MINIMIZE	SCM15	AVOID AND MINIMIZE PROJECT IMPACTS THROUGH RESEARCH AND MONITORING Avoid and minimize impacts to habitats of high importance to dolphins					
			1. Coordinate and partner research efforts with other projects (e.g. CBG and Alufer), port authorities and species specialists to develop a species cumulative impact assessment and monitoring programme 2. In coordination with other projects (e.g. CBG and Alufer), port authorities and species specialists, identify and implement measures to minimize cumulative impacts. 3. Implement monitoring measures to improve understanding of species' status (i.e. through installation of acoustic stations at strategic locations close to and away from the Port), potential primary causes of decline (e.g. fisheries by-catch, directed hunts and habitat loss) and determine whether the Project is having any long-term impacts to the species through monitoring of population health, reproductive success and population structure 4. Use data to map species habitats and identify avoidance sites and potential offset sites in wider coastal area 5. In co-ordination with other projects and stakeholders, assess the feasibility of establishing a Marine Protected Area (MPA), and if viable jointly undertake the necessary steps to establish and monitor the area 6. Undertake community surveys to collect data on dolphin sightings, by-catch and consumption mapping (this work will require training of a local community liaising officer) 7. Establish a system for reporting sightings of entangled dolphins using an incentive-based approach, whereby fishermen are compensated for reporting (a similar system has been established by WCS in Congo)	ASAP	End of operations	1. Research and monitoring reports 2. Biodiversity Management Plan 3. MPA feasibility studies	GAC - Environment GAC Port Operator	Continuously

Species loss	MINIMIZE	SCM16	MINIMIZE PROJECT IMPACTS RELATED TO IN-MIGRATION Minimize project impacts through working with port authorities and communities to raise awareness and identify alternatives					
			1. Take on an experienced community engagement officer (e.g. through WCS) to help develop and implement a campaign to increase awareness about the threatened status and value of dolphins, and what communities and port authorities can do to minimize threats 2. Work with fishing communities around Port area to identify suitable alternatives to minimize by-catch, including mapping fishing effort and identifying fisheries management schemes (no go areas, time-area exclusions) and provision of alternative gears (avoiding the use of gillnets wherever possible)	ASAP	End of decommissioning	1. Research and monitoring reports 2. Biodiversity Management Plan	GAC - Environment GAC - Community Relations	Continuously

6.2.1.3 *Monitoring of control measures*

Control Measure		Key Performance Indicator		Target	Means of verification
SCM14	AVOID DIRECT PROJECT IMPACTS TO DOLPHIN Ensure that best practices measures are implemented to avoid vessel strikes	KPI38	% of vessel crew trained in marine mammal identification	100%	Induction logbook, Incident reports
		KPI39	# of incidents of vessel strikes involving dolphins	Zero	
SCM15	AVOID AND MINIMIZE PROJECT IMPACTS THROUGH RESEARCH AND MONITORING Avoid and minimize impacts to habitats of high importance to dolphins	KPI40	Map of priority sites for dolphins	1 regional map	Peer reviewed report and map of priority sites
SCM16	MINIMIZE PROJECT IMPACTS RELATED TO IN-MIGRATION Minimize project impacts through community awareness raising and identification of alternatives	KPI41	% of local community fishermen participated in awareness raising of fishing practices and dolphin bycatch.	100%	Research and monitoring reports

6.2.1.4 *Approach to monitoring losses and gains*

The recommended approach to monitoring for this species is via population estimates, however, further data needs to be collected to assess population number and distribution within the Port area.

6.2.1.5 *Estimated significant residual impact*

Long-term monitoring of dolphin population numbers is required to assess whether there is a significant impact to the species, as there are many development Project operating in the port area the Project will investigate a collaborative approach.

African Manatee

Summary species information		
Species	*Trichechus senegalensis*	
Project priority status	**Action Category 5: Specific mitigation**	
Description	Large, aquatic herbivorous mammals that live in both salt and freshwater habitats. Typically they prefer estuarine waters where little disturbance and waters are shallow and calm. They are known to live in the Rio Nunez estuary but little information	
Existing threats	Affected by habitat loss, hunting and incidental capture in fishing nets. Boat strikes and habitat degradation are also pressures on the species.	
Red List Status	VU	
Restricted Range	No	
Occurrence relative to area	Recorded within the Nunez Estuary	
Habitat association	Confined to shallow waters (up to 30m depth) and close to the coastline (within 1km from shore) where it hunts for fish in groups.	
Potential Project impacts	Disturbance and modification of habitat from dredging and boat movement, fragmentation of its range due to jetty, indirect impacts via increased fishing pressure	

6.2.1.6 Species specific control measures

The species specific control measure for the African Manatee is described in SCM17

6.2.1.7 Approach to monitoring losses and gains

The recommended approach to monitoring for this species is monitoring of pressure indicators. If vessel strikes occur further mitigation measures may be required.

6.2.1.8 Estimated significant residual impact

Long-term monitoring of impacts on the Manatee is required to assess whether there is a significant impact to the species, as there are many development Projects operating in the port area the Project will investigate a collaborative approach.

6.2.2 Marine turtles

6.2.2.1 Species detail

Green Turtle

Summary species information		
Species	*Chelonia mydas*	
Project priority status	**Action Category 5 Specific mitigation**	
Description	A migratory species, likely to occur throughout Guinean coastal waters. A globally important nesting site with 7,000-29,000 nests is known from Poilao Island in Guinea-Bissau (Catry et al., 2009). South of the Port area,, a carapace was found in a fishing camp in NW Binari Island and the species may nest on the western side of Binari Island EEM, "Supplementary Information Package (SIP) to the ESIA of the CBG Expansion Project: Third Release.".	
Existing threats	Harvesting of eggs, habitat degradation of nesting beaches e.g. though coastal developments and marine habitat from effluent and contamination	
Red List Status	EN	
Restricted Range	No	
Occurrence relative to area	Recorded south of the Nuñez estuary, on the north-west of Binari Island	
Habitat association	Marine (grazes on rocky areas and known to forage in mangroves), nests on sandy beaches	
Potential Project impacts	Boat impacts, indirect impacts from egg collection and/or, entanglement in fishing nets, (assuming that such pressures increase in line with Project-associated in-migration). Marine habitat degradation e.g. oil spills	

Hawksbill turtle

Summary species information		
Species	*Eretmochelys imbricata*	
Project priority status	**Action Category 5 Specific mitigation**	

Description	A migratory species but with limited information on its distribution in coastal West Africa. The species considered to be among the most threatened sea turtle species in the world (SWOT, East Atlantic Ocean 2012)
Existing threats	Harvesting of eggs, hunting, habitat degradation of nesting beaches e.g. though coastal developments and marine habitat from effluent and contamination
Red List Status	CR
Restricted Range	No
Occurrence relative to area	Recorded off the southwest tip of Binari island
Habitat association	Marine (grazes on rocky areas and known to forage in mangroves), nests on sandy beaches
Potential Project impacts	Boat impacts, indirect impacts from egg collection and/or, entanglement in fishing nets, (assuming that such pressures increase in line with Project-associated in-migration). Marine habitat degradation e.g. oil spills

6.2.2.2 Species specific control measures

Impact	Stage of Mitigation Hierarchy	Control Measure Actions required		Task timing		Means of verification	Responsibility	Frequency
				Duration	Finish			
Species loss	AVOID	SCM17	AVOID DIRECT PROJECT IMPACTS TO TURTLES AND THE AFRICAN MANATEE Ensure that best practices measures are implemented to avoid vessel strikes					
			1. Train vessel crew in marine turtle observations and recognition 2. Designate an observer on board to remain vigilant and inform captain in case of sighting 3. Impose vessel speed limits of 10 knots or less (zero wake speed) during sighting in proximity to vessel 4. Observer to record GIS coordinates and report sightings in GIS database 5. Report any localities of sightings of turtles and/or Manatee to the harbor master for general broadcast, as well as any vessel strikes 6. Identify and map any areas routinely used by turtles (e.g. around Binari) and Manatees and aim to designate such hotspots as no shipping zones	Prior to construction	End of operations	Marine turtle observer logbook; Vessel routes to avoid species habitat	GAC - Environment	Continuously
Species loss	MINIMIZE	SCM18	MINIMIZE PROJECT IMPACTS RELATED TO IN-MIGRATION Minimize project impacts through community awareness raising and monitoring					
			1. Coordinate research efforts with other projects (e.g. CBG and Alufer) and species specialists to identify beaches used as turtle nesting sites 2. In coordination with other projects (e.g. CBG and Alufer) and local communities identify and implement measures to protect beach nesting sites. 3. Raise local awareness of turtle conservation through an education program in communities and schools. 4. Develop and implement a turtle monitoring programme that includes community surveys to collect data on turtle sightings, by-catch, egg harvesting and nesting success (this work will require training of a local community liaising officer) 5. Establish a system for reporting sightings of entangled turtles using an incentive-based approach, whereby fishermen are compensated for reporting (a similar system has been established by WCS in Congo)	ASAP	End of decommissioning	Research and monitoring reports	GAC - Environment	Continuously

6.2.2.3 *Monitoring of control measures*

Control Measure		Key Performance Indicator		Target	Means of verification
SCM17	AVOID DIRECT PROJECT IMPACTS TO TURTLES AND MANATEES Ensure that best practices measures are implemented to avoid vessel strikes	KPI42	% of vessel crew trained in marine turtle and manatee identification	100%	Induction logbook, Incident reports
		KPI43	# of incidents of vessel strikes involving turtles and/or manatees	Zero	
SCM18	MINIMIZE PROJECT IMPACTS RELATED TO IN-MIGRATION Minimize project impacts through community awareness raising and monitoring	KPI44	Map of priority nesting sites for turtles	1 regional map	Peer reviewed report and map of priority sites
		KPI45	% of nesting beaches actively protected	100%	Monitoring reports

6.2.2.4 *Approach to monitoring losses and gains*

The recommended approach to monitoring for this species is monitoring of pressure indicators. If nesting areas or foraging areas are found that are likely to be at risk from indirect impacts monitoring of these areas will be undertaken (as per SCM18).

6.2.2.5 *Estimated significant residual impact*

Long-term monitoring of impacts on turtles is required to assess whether there is a significant impact to the species, as there are many development Projects operating in the port area the Project will investigate a collaborative approach.

6.2.3 Marine fish

6.2.3.1 *Species detail*

Daisy Stingray

Summary species information		
Species	*Fontitrygon margarita*	
Project priority status	**Action Category 4: Remain aware**	
Description	Found in shallow coastal waters, typically having up to a 60 cm disc width. Feeds on shrimps, crabs and bivalves and uses coastal lagoons and estuaries as a breeding ground. It has a low reproductive rate and is becoming uncommon in fishing catches.	
Existing threats	Overexploitation from artisanal and small-scale commercial fishing, habitat degradation and agricultural runoff	
Red List Status	EN	
Restricted Range	No	
Occurrence relative to area	Recorded in the area (e.g. by the CBG Project)	

Habitat association	Shallow-water estuarine habitats
Potential Project impacts	Indirect impacts as a result of increased fishing pressures

Blackchin Guitarfish

Summary species information		
Species	*Glaucostegus cemiculus*	
Project priority status	**Action Category 4: Remain aware**	
Description	The guitarfish is a bottom-dwelling fish feeding on crustaceans, invertebrates and other fish. It grows up to 1.8 m and inhabits marine and brackish waters up to 100 m in depth. The species is valued for its fin which can be sold for high prices.	
Existing threats	Overexploitation from artisanal and small-scale commercial fishing, habitat degradation and agricultural runoff	
Red List Status	EN	
Restricted Range	No	
Occurrence relative to area	Recorded in the area (e.g. by the CBG Project)	
Habitat association	Shallow-water, muddy habitats, often close to mangroves. Females known to move into shallow water to birth in Sept-Oct time.	
Potential Project impacts	Direct impacts from dredging and indirect impacts as a result of increased fishing pressures	

6.2.3.2 Species specific control measures

No species specific control measures are identified. Mitigation measures are captured in the general control measures (e.g. minimize impacts from dredging and over-fishing).

6.2.3.3 Monitoring of control measures

Not required.

6.2.3.4 Approach to monitoring losses and gains

The Project will monitor indirect impacts as a proxy for these species.

6.2.3.5 Estimated significant residual impact

The Project will assess the scale of impacts to these species through monitoring of changes in biodiversity of benthic habitat as a proxy for the species (see the GAC BMEP, 2017). If significant changes in biodiversity are found, then a more detailed investigation of the significance of the impact for the priority fish species will be required.

7 Implementation

This Management Plan will be reviewed on a two year period and any necessary revisions made to reflect the changing circumstances or operational needs of the Project. Review and revision of this Management Plan will be the responsibility of the General Manager of Operations who is the custodian of this Plan.

If any material changes are required, this Management Plan may be updated on an "as required" basis. Any revisions to this Plan will be made available to appropriate staff and other parties.

7.1 Assurance

A provisional audit program is defined in Table 22 below.

Table 22: Provisional Audit Program

Audit Type	Description	Responsibility	Frequency
Internal Audit	Implementation of Biodiversity Management Plan control measures	Contractor	Ongoing
Internal Audit	Implementation of the Biodiversity Management Plan control measures.	Company	Ongoing
External Audit	External Audit of Project compliance with IFC Performance Standard 6	Company (via 3rd Party (IFC, GoG)	TBD

Internal and external audit findings, as well as related actions and incidents, should be recorded in the control register.

7.2 Reporting and record keeping

Reporting by the Contractor to the Company shall be in accordance with Table 23 below. Regular audits of biodiversity management will be undertaken by the IESC; reporting to the IESC will require the provision of additional information such as input data and decision records from the Land Disturbance Permit Process to demonstrate transparency and quality assurance in mitigation measures.

Table 23: Example of Reporting and Record Keeping Program

Report	Description	Responsibility	Frequency
Site Progress Report	Details of any HSEC incidents, near misses & non-conformances relating to activities Actions outstanding and closed during the reporting period.	Contractor	Weekly
Monthly HSSEC Report	Information as applicable to Biodiversity Management: HSSEC Performance Metrics, actual & rolling statistics and incidents (month, YTD and project to date); Authorisations & regulatory reporting requirements; HSSEC achievements & assurance activities; Progress against performance indicators applicable in the reporting period	Contractor	Monthly
Site Inspection Records & Audit Plans	Site inspections & audit reports undertaken as part of monitoring and review of HSSEC standards and providing an indication of compliance / non-conformance and actions taken, and continuous improvement.	Contractors	In accordance with the Audit Schedule
Project Annual HSSEC Report	Summary of Contractor HSSEC performance on the Project, consolidating (but not limited to) the monthly HSSEC reporting requirements.	Contractor	Annual (each anniversary of the Date of Agreement)

8 References

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9 Appendices

Appendix 1 Legal requirements

Applicable Guinean legislation

- The Environment Code (Ordinance No. 045/PRG/87 and No. 022/PRG/89)
- Presidential Decree for Environmental Protection No. 199/PRG/SGG/89 and related Orders
- The Mining code Law L/95/036/CTRN including subsequent amendments and articles
- GAC basic agreement (15th October 2004) and amendments
- Code for the Protection of Wildlife and Hunting regulations Law L/97/038/AN and related policies and actions including:
- National Action Plan for the environment;
- National Forestry Action Plan;
- Mangrove Forest Management Plan;
- The Forest Code Law L/99/013/AN and articles
- The Water Code Law L/94/005/CTRN
- For the marine environment, decree No. 201/PRG/SGG/89

Applicable Guinean standards

Many Guinean Standards are in the process of development for example for air quality and noise. In the absence of National Standards, the Project will adopt International Standards that reflect best practice; details are in the SEIA, Volume 1.

Guinea is also a signatory to CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora), an international agreement between governments that aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

Corporate and International Standards

In 2012, GAC adopted the International Financial Corporation (IFC) Performance Standards and the Equator Principles III in 2013. Relevant international standards and guidelines include:

- IFC Performance Standard PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- IFC Environmental, Health and Safety Guidelines for Mining;
- IFC Environmental, Health and Safety General Guidelines

These requirements and standards, together with the relevant commitments defined within the Social and Environmental Impact Assessment (SEIA) and the obligations register will form the basis of assessment of compliance with legal and other requirements applicable to this Plan and the Project.

Appendix 2 Prioritization of features and Action Categories

The prioritization process based on Project information, literature review and expert assessment. It is a qualitative assessment which should be repeated as further information on priority features is ascertained e.g. if a priority species global conservation status is up-graded or downgraded or if a priority species is confirmed present within the Mine area, or after pre-disturbance surveys have been undertaken. The significance of impact is based on a species impact assessment undertaken as part of the development of the BMP which categorized potential impacts from no impact to critical (see Table 24).

Table 24: Impact evaluation criteria

Severity	Description
No impact	No effect.
Negligible	Minimal impact, within a normal range of variation, no lasting effect.
Minor	A small impact to a proportion of a local population/area, with little or no measurable impact to the population of a species or extent/quality of an ecosystem at the landscape scale.
Moderate	A substantial change in local abundance and/or reduction in the distribution of a species or ecosystem, but which does not threaten the long-term viability at the landscape scale.
Major	Persistent and widespread impact that may threaten the long-term viability of the species/ecosystem at a landscape scale.
Critical	Threatens the long-term viability of the species or ecosystem at a national or global scale, with little or no opportunity for recovery.

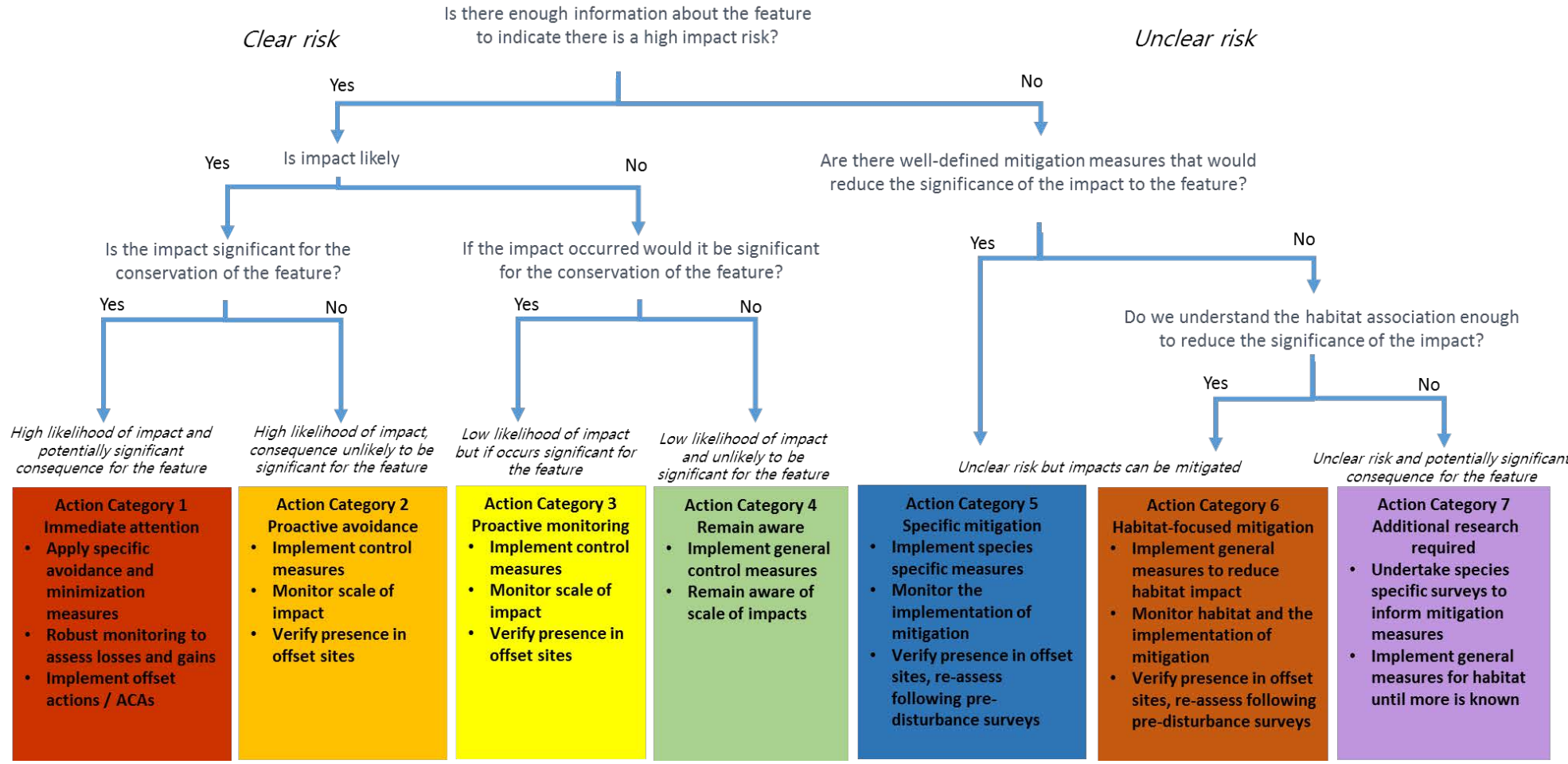


Figure 11: Prioritization process decision tree

	Risk and approach well understood				Precautionary approach to be updated based on further information		
	1. Immediate attention	**2. Proactive avoidance**	**3. Proactive monitoring**	**4. Remain aware**	**5. Specific mitigation**	**6. Habitat-focused mitigation**	**7. Further research required**
Features	Western Chimpanzee, Temminck's Red Colobus, Atlantic Humpbacked Dolphin, Gallery Forest, Mangrove	Wooded savannah, Freshwater (rivers and streams)	None	Rüppell's Vulture, Daisy Stingray, Blackchin Guitarfish	Pinto's Puddle Frog, Beautiful Squeaker Frog, White-backed Vulture, Hooded Vulture Green Turtle, Hawksbill Turtle, African Manatee,	Half-toed Gecko, Purple Marsh Crab, River Worm Lizard, Los Archipelago Worm Lizard, Teugel´s Electric Catfish, *Paramphilius teugelsi, Petrocephalus levequei, Paramphilius trichomycteroides, Fleurydora felicis, Ledermanniella abbayesii*	None
Definition	*High risk that the feature will be impacted as a result of the Project and the consequence of the risk is considered to be significant for the species. The Project will prioritize actions to avoid and minimize impacts, further research will help focus mitigation measures*	*High risk that the feature will be impacted but the consequence of the risk is unlikely to be significant.*	*Low likelihood that the species will be impacted but if impact occurs the consequence of impact would be significant for the species.*	*Low likelihood that the species will be impacted and the consequence of the risk is unlikely to be significant for the species.*	*The species distribution is unknown but well defined specific mitigation measures are identified for the species and will be implemented by the Project. Further research is unlikely to alter the choice or intensity of mitigation measures*	*The species distribution is unknown, but it's habitat association is clear and measures to reduce habitat impacts will also benefit the species. The Project will implement measures to reduce impacts to the species habitat, if appropriate species specific measures will be undertaken*	*Insufficient information available to assess the likelihood and consequence of impact. Surveys required to assess presence of species in the Mine area, understand habitat requirements and develop mitigation measures*
Action	Ensure species specific mitigation measures are undertaken and conduct additional research to increase the effectiveness of measures	Implement control measures	Implement control measures	Implement general control measures	Ensure species specific mitigation measures implemented. Re-assess if encountered during pre-disturbance surveys	Ensure control measures for the species' habitat are implemented. Re-assess if encountered during pre-disturbance surveys	Undertake additional research to inform the development of species specific mitigation measures. Ensure general control measures implemented
Net gain/No Net Loss	Compensatory actions will be necessary to achieve a net gain	Necessary only if impacts are confirmed significant, verify presence in offset site	Necessary only if impacts occur, verify presence in offset site	Necessary only if impacts are confirmed significant	Required where mitigation measures are not effective, verify presence in offset site	Not required unless impacts confirmed significant, verify presence in offset site	Review once status and potential impacts clarified
Monitoring	Species specific monitoring required where habitat is not an appropriate monitoring proxy, highest level of assurance required	Monitor the scale of the impact	Use habitat as a proxy to monitor scale of impact, (if not appropriate, consider species monitoring)	Use habitat as a proxy to monitor the scale of impact	Clarify the scale of impact on species through monitoring implementation control measures	Clarify scale of impact on habitat through monitoring implementation of control measures	Clarify the scale of impact on habitat (or species) through pre-construction surveys and species monitoring if required

Figure 12: Action Category descriptions and results

Appendix 3 Preliminary estimation of anticipated significant residual habitat impacts

1. Summary

This brief assessment presents estimates of significant residual impacts of the Project on priority habitats (i.e. gallery forest and mangrove) and direct residual impacts to wooded savannah (a Natural Habitat). In the mine area the assessment is only based on the southern section of the concession and the dam area. The estimates are based on a quality hectare metric which combines an estimate of the area impacted with the condition or quality of the forest in that area. Estimates of indirect impacts have very wide confidence intervals. They are therefore indicative only and are designed to illustrate the potential order-of-magnitude of impact significance.

Table 25: Summary of estimated significant residual impacts in the southern section of the concession and net gain approach: Gallery forest

Gallery forest	
Metric used:	Quality hectares
Estimated significant residual direct impact:	~ 15 QH
Estimated significant residual indirect impact in the southern section of the concession:	Up to 800 QH
Estimated total significant residual impact in the southern section of the concession:	Up to 815 QH[19]
Plan to deliver gains:	Improved management of an offset site (4 potential sites were identified as part of a chimpanzee offset pre-feasibility study (TBC 2015), further work is required to understand if these sites are appropriate to offset impacts to gallery forest habitat
Potential gains:	Not yet estimated, a feasibility study of the preferred offset site is required to estimate potential gains
Net gain feasible?	Yes, if a site with a large enough area of gallery forest can be found to generate the necessary averted loss or restoration gains

[19] Southern area of concession only for direct and indirect impacts and direct impacts arising from the dam construction in the northern concession

Table 26: Summary of estimated significant residual impacts and net gain approach: Mangrove

Mangrove	
Metric used:	Quality hectares
Estimated significant residual direct impact:	~ 54 QH
Plan to deliver gains:	Rehabilitation / Restoration of two sites is currently underway for the Project. The scale of the current activities may have to be adjusted if further direct impacts occur.
Potential gains:	Previously losses and gains have been estimated following government requirements, using a simple area-based approach. Further work is required to factor in mangrove quality to loss and gain estimations. Consideration of whether gains are possible through identification of additional restoration sites may be required.
Net gain feasible?	Yes, if the project continues to adaptively manage its approach to mangrove restoration and scale up activities if required

Table 27: Summary of estimated direct residual impacts to wooded savannah

Wooded savannah	
Metric used:	Quality hectares
Estimated significant residual direct impact:	~ 1,451 QH
Estimated significant residual indirect impact	~ 6,752 QH
Estimated total significant residual impact	~ 8,203 QH
Plan to deliver gains:	Improved management of an offset site , further work is required to understand if these sites are appropriate to offset impacts to wooded savannah habitat
Potential gains:	Not yet estimated, a feasibility study of the preferred offset site is required to estimate potential gains
No net loss feasible?	Yes, if the offset site is appropriate

2. The Quality Hectare metric

Within a given habitat-type, habitat condition, or quality, may vary from place to place. For example, some areas may have been significantly degraded due to clearance for agriculture in the past, some may have minor impacts from fuelwood collection whilst others may be essentially 'pristine' with no evidence of human disturbance at all. These different areas may have different levels of value for biodiversity – some forest specialist species may be absent or present at reduced densities in logged

forest for example. This means simply using the area of habitat is not a reliable measure of the biodiversity value of a given portion of a habitat.

To avoid this, the value of each portion of habitat can be weighted using a measure of the habitat's condition or quality compared to a 'pristine' reference site. Such metrics are called "extent × condition metrics" and are commonly used in biodiversity accounting for estimating and comparing losses and gains in biodiversity values ICMM and IUCN, "Independent Report on Biodiversity Offsets.".

Quality Hectares (QH) is a condition-extent biodiversity metric comprised of habitat area (extent) and habitat quality (condition). It is calculated for each portion of a habitat by;

- QH = Area of habitat (hectares) × ecological condition (quality) of the area

Ecological condition or 'quality' is expressed on a scale of 0-1, with 1 representing the 'pristine' reference condition of that habitat, and 0 representing complete habitat loss. Box 1 provides some examples of using QH to measure habitat quality.

Box 1: Examples of the use of a quality-hectare metric for estimating biodiversity losses

For example, a site which is already heavily degraded might have a Condition Score of 0.25. If 1,000 ha of such a habitat is completely destroyed, the number of QH lost is;

AoI [1,000 ha] × 0.25 Condition Score = 250 QH

Neighbouring habitat indirectly impacted by the project might start with a Condition Score of 0.25 and end with a Condition Score of 0.2. If 1,000 ha of such a habitat is impacted in this way, the number of QH lost is;

AoI [1,000 ha] × [0.25-0.2] = 50 QH

Measuring biodiversity losses in Quality Hectares therefore allows comparisons of the relative importance of impacts that may differ

3. Developing a measure of quality for priority habitats

Guinea has yet to develop a national approach for monitoring the state or quality of forested areas and the Project has not yet undertaken a quantitative assessment of habitat quality within the Mine area or Port area.

Measurement of the quality of the priority habitats could be based on parameters such as canopy cover, biomass, landscape patch size or recruitment. The parameters chosen should be good proxies for overall habitat quality. The parameters could either be measured on the ground or the required data collected via remote sensing and empirical relationships established between field

measurements and spectral data[20]. The quality metric may be based on a combination of these parameters or on just one parameter if appropriate.

In the Project´s EIA the condition of gallery forest within the Mine Area is reported as being from 'poor to good', with gallery forest in headwaters being particularly well preserved ERM, "Social and Environmental Impact Assessment (SEIA). Volume 1 Addendum for GAC´s Bauxite Export Project, Guinea.". Mangrove habitats in the Port area support a wide range of species and provide important ecosystem services to local communities but are described as modified by human encroachment (ERM 2015, ERM, "Mangrove Rehabilitation / Compensation Assessment Study, Kamsar, Guinea.". In the absence of quantitative data on the condition of gallery forest and mangrove, the average condition for both habitat types is provisionally and conservatively estimated to be 80% or 0.8 of a benchmark, pristine condition of 1. This quality factor recognises that both gallery forest and mangroves will have suffered from a degree of degradation prior to Project activities.

4. Estimating significant residual direct impacts

Gallery forest

The SEIA (ERM 2015) estimated that between 4 and 7 ha of gallery forest will be directly cleared by the Project; this assessment did not include direct impacts arising from the construction of the dam in the northern part of the concession or a buffer around infrastructure. In March 2017, a re-assessment of direct impact was undertaken by ERM. The analysis applied a 20 m buffer around infrastructure to account for disturbance effects and included the dam development. The revised estimate predicts 18.7 ha direct impact to gallery forest.

In QH this equates to 18.7 X 0.8 = 15 **QH**

Mangrove

The Mangrove rehabilitation / compensation assessment study (ERM 2014) quantified the area of direct clearance to be 68 ha.

In QH this equates to 68 X 0.8 = **54 QH**

Wooded savannah

Wooded savannah is a Natural Habitat for the Project. Under IFCPS6, the Project will be required to achieve a no net loss for this habitat type. Direct impacts to wooded savannah were estimated in March 2017 (using the same information and buffers as per gallery forest). Direct impact are estimated to be 1813.6 ha

In QH this equates to 1813.6 X 0.8 = **1451 QH**

5. Estimating significant residual indirect impacts

[20] This approach is becoming more widely used with advances in remote sensing

To date, no estimate of indirect impacts to priority biodiversity features has been undertaken by the Project. This assessment is to provide the Project with an order of magnitude estimate that will require further refinement as the Project progresses.

Gallery forest and wooded savannah

Indirect impacts to gallery forest and wooded savannah may arise from:

1. Changes in the hydrological regime as a result of mining on plateaus;
2. Displaced farming communities clearing forested areas for farming;
3. In-migration to the area leading to additional forest clearance for food demand and fuel wood; and
4. Speculative clearance from farmers in the concession anticipating future compensation from the project for farmed land.

Indirect impacts as a result of changes in the hydrological regime have not been included in this analysis. Through the Mine water MP the Project will monitor changes in water flow and quality, if these pass the thresholds set by the Project impacts to gallery forest should be monitored. Indirect impacts from speculative land clearance are also not included, the development of land cover change maps would help assess the scale of this impact.

Displaced farming communities clearing forested areas for farming

In the SEIA ERM, "Social and Environmental Impact Assessment (SEIA). Volume 2 Addendum for GAC´s Bauxite Export Project, Guinea.", 8 settlements where 1445 people or 206 households live (based on an average of 7 people per household as per the SEIA) will be directly impacted by the Project and will require relocation to new areas.

As presented in the SEIA, communities in the Mine area are dependent on herding and agricultural activities and 9 out of 10 households are involved in agriculture as a primary or secondary income. As a result of the relocation of communities there will be an impact to natural habitats within the Mine area as conversion for agricultural purposes occurs. Nine out of 10 households are currently involved in agriculture, if we assume that relocated households will continue the same agriculture practices in the new area this would mean that 185 households out of the 206 households are likely to clear land. In the Mine area, the average fallow time is reported as 5 years and 1-2 years cultivation with an average farm size of 1.5 ha. If 1.5 ha is required per 7 year cycle, each household requires a total area of 10.5 ha and a total area of **1,943 ha** for all relocated households.

In migration

The SEIA Ibid. reports a net increase in migration in the settlements in the road area of the concession since the inception of the Project, with annual population growth rates at 7%. The principal potential impacts from in-migration on gallery forest habitat and wooded savannah are from:

- Increased clearance for construction materials for in-migrants housing, logging activities, fuelwood and NTFP collection ERM, "Social and Environmental Impact Assessment (SEIA). Volume 1 Addendum for GAC´s Bauxite Export Project, Guinea.";
- Agricultural clearance to support an increased population.

No specific figures are available to calculate the impact area from these activities so in-migration impacts have been estimated from surrogate figures in the SEIA on the number of permanent staff the Project will employ (500 according to the SEIA, ERM, "Social and Environmental Impact Assessment (SEIA). Non-Technical Summary. Addendum for GAC´s Bauxite Export Project, Guinea." and uses IFC scenarios for economic migrants to calculate the potential scale of in migration IFC, "Projects and People: A Handbook for Addressing Project-Induced In-Migration.". The IFC guidelines are based upon ×3, ×6 and ×10 multipliers. Of the 500 permanent employees, approximately 1,500 to 5,000 opportunistic economic migrants may arrive to the area.

To calculate the indirect impact of these migrants the following assumptions were made;

- 10.5 ha of land supports 1 household of 7 people ERM, "Social and Environmental Impact Assessment (SEIA). Volume 2 Addendum for GAC´s Bauxite Export Project, Guinea.";
- Very coarsely, 1,500 – 5,000 opportunistic economic migrants = equivalent of 214 – 714 smallholdings = 2,247 – 7,497 ha;

Combining indirect impacts

The total area of indirect impacts may therefore be in the region of 1,943 + 2,247= **4,190 ha** to 1,943 + 7,497 = **9,440 ha (4,190 ha to 9,440 ha)** or in Quality Hectares, (4,190 x 0.8) **3,352 QH to** (9,440 x 0.8) **7,552 QH**

According to the ESIA (ERM 2015c) the ´mosaic of the slopes´ makes up the majority of habitat within the southern area of the concession (42%). This is a modified habitat of crops, fallow areas and thickets and some natural shrubby habitat. As it is already in the farm fallow system there may only be limited potential for this ´habitat type´ to be used for further agriculture. Bowal is not a suitable habitat for agriculture and makes up 21% of the southern concession. The remainder of the southern area consists of wooded savannah (34% or 10,098 ha), gallery forest (3.5% or approx. 1,000 ha) and forest patches. It will therefore be Natural Habitat, including priority habitat that is converted for agricultural use. The proportion of the impact that would occur to gallery forest as opposed to wooded savannah is unknown but as gallery forest is close to water and in flatter areas it is likely to be a preferred habitat type for conversion to agriculture. It is therefore possible that the majority of gallery forest habitat could be converted to agriculture as a result of the indirect impacts of the Project in the southern area of the concession if indirect impacts are not effectively managed by the Project. If gallery forest and wooded savannah are converted, the scale of indirect impacts in the southern concession could be up **to 800 QH (1,000 x 0.8) for gallery forest and up to 6,752 QH (8,440 x 0.8[21]).** If only wooded savannah is cleared then the **wooded savannah impacts would be up to 8,078 QH (10,098 x 0.8)**

To improve estimates of significant residual impact to priority habitat, 1. Habitat mapping should include a measure of quality, 2. Habitat mapping should be undertaken in the northern section of the concession 3. The background rate of habitat loss should be assessed to understand how the

[21] Calculation is based on the estimated total indirect impact (9,440 ha) minus the predicted impact to gallery forest (1000 ha), leaving 8,440 of potential impact to wooded savannah

rate is affected by the Project (i.e. what impacts are attributable to the Project and what would have occurred anyway without the Project).

It should be noted that wooded savannah is a valuable natural habitat for the ecosystem services it provides and the priority species that it supports. In the case of the Project, the priority species associated with the wooded savannah habitat is the chimpanzee, any offset measures for this habitat will therefore also be associated with the significance of the habitat for chimpanzees.

Mangrove

Indirect impacts to Mangrove may arise from:

1. Changes in the hydrological regime as a result road/rail construction;
2. In-migration to the area leading to additional mangrove clearance for agriculture and degradation due to harvesting of wood for fuel and building materials.

In-migration into Kamsar is reported to have exploded in the last 40 years as a result of increased development in the area such as the construction of the railway line and facilities by CBG Ibid.. As there are multiple companies operating in the port area, an assessment of cumulative impacts would provide a fuller picture of impacts than an individual project assessment. The Project will therefore aim to restore an area of mangroves larger than the requirement for direct impacts and work with other projects to monitor and understand cumulative impacts in the Nunez estuary.

Appendix 4 Overview of land disturbance permit process

The Project is applying an avoidance buffer to priority habitats to avoid impacts to priority habitat and species. Within the avoidance buffer are gallery forest habitats (a Critical Habitat), headwater streams and stream habitats (Natural Habitats). These habitats are important habitats within the concession as they support the delivery of ecosystem services and priority restricted range species. Within the mine design, infrastructure placement and operational activities will avoid the avoidance buffer. In some instances, the avoidance buffer cannot be entirely avoided. Disturbance to these areas, as well as any other disturbance will trigger a land disturbance permit process.

The land disturbance permit process will be used to:

- Avoid the most sensitive habitats, and preferentially choose less valuable natural habitat where possible.
- Assess if adverse impacts to priority species and habitats can be mitigated through micro-siting of infrastructure.
- Develop land disturbance permitting conditions to mitigate impacts
- Record residual impacts to priority habitats, Natural Habitats and priority species for rehabilitation and offset requirements

The land disturbance process has 4 main stages (see Figure 13). If pre-disturbance surveys assess that impacts cannot be adequately mitigated, the permit will be rejected. If impacts can be mitigated, the permit will be issued with land disturbance permit conditions to be complied with before, during and after the disturbance event.

Land disturbance stages

1. **Land disturbance planning**; a land disturbance permit process is triggered by the mine manager and a permit request submitted to the Environment and Social team. The permit should be submitted to the Environment and Social team at least 6 months to 1 year prior to the disturbance to allow the team sufficient time to undertake the required surveys and community consultation
2. **Pre-disturbance planning**; Based on the GIS database the Environment team will establish if the land disturbance request is within an avoidance buffer.

If disturbance is within an avoidance buffer;

1. **A pre-disturbance survey will be undertaken to assess impacts**. The pre-disturbance survey will assess the presence of priority species (see BMP Table 1) and assess the area of priority habitat and natural habitat (see BMP Table 2 and Table 3) that would be impacted. If impacts are likely to occur to freshwater habitats, water flow and water quality measurements must be undertaken as part of the pre-disturbance survey. If the GAC Environment team does not have the expertise to undertake pre-disturbance surveys for Project's priority species, external species specialists should be contracted. If priority species are recorded, the GPS coordinates for the location of the species will be

established and recorded within the Project's spatially referenced database as a location for the species (in order for the mine managers and contractors to have detailed information of areas to be avoided). The social team will assess the impacts for local communities on priority ecosystem services (particularly provisioning and cultural services). Through the pre-disturbance survey process the environment and social teams will establish if avoidance and minimisation measures can be put in place to minimise adverse impacts. The permit should be rejected if the results of the pre-disturbance survey reveal;

- the presence of a sacred site that cannot be moved;
- record the only known location for a priority species within the concession,
- record the presence of vulture nests and micro-siting cannot avoid impacts to the nests;
- record the presence of Red Colobus and micro-siting of infrastructure cannot avoid impacts to the habitat

2. If impacts can be avoided through micro-siting infrastructure away from priority features or minimised to reduce the significance of impacts, the pre-disturbance survey should establish the conditions upon which the land disturbance permit can be issued (i.e. the avoidance, minimisation (including translocation, where appropriate), restoration and monitoring measures that must be agreed to and implemented for the permit to be granted). The conditions will include consideration of;

Prior to disturbance

- micro-siting of infrastructure requirements to avoid the locations of priority species;
- translocation requirements for priority species;
- soil removal and storage requirements;

During disturbance

- noise reduction requirements;
- progressive clearance requirements;
- vegetation removal requirements[22];
- dust reduction requirements;
- water quality and water flow monitoring requirements;

[22] In particular vegetation removal is required within the area that will be flooded to minimise eutrophication and health risks arising from rotting vegetation in the reservoir

- species specific monitoring requirements (e.g. any translocated species should be monitored to assess the outcome of translocation, e.g. any vulture nesting sites should be monitored to assess the outcome of avoidance and minimisation measures)

Post-disturbance

- technical rehabilitation requirements (e.g. restoration of similar topographic conditions, maximum slope angles, top soil replacement);
- biological rehabilitation requirements and targets (species to be replanted, area to be replanted, growth of replanted species required to achieve land disturbance closure);
- Community rehabilitation requirements
- Additional ongoing monitoring requirements

Any impacts to priority species or habitats will be recorded within the Projects database for defining future rehabilitation and offset requirements.

3. The land disturbance permit conditions should be approved by and signed off by the environment and mine manager prior to disturbance.

If the disturbance is outside an avoidance buffer;

1. A site check will be undertaken to assess if the disturbance request area is entirely within Modified Habitat (farmed areas, plantations or fallow areas) or within Bowal habitat. If the area is within these habitat types the community team will discuss with the owners/communities the community's expectations and establish the land disturbance permit conditions prior to approval and sign off by the environment and mine manager.
2. If the area to be disturbed contains wooded savannah or forest patches an assessment of whether the area is used by chimpanzees and whether the area contains trees that are used as nesting sites by vultures should be undertaken by an appropriate biodiversity specialist and cover an area wider than the anticipated direct footprint of the disturbance activity. The assessment should be based on a set of standardised protocols for each species that are developed by species specialists and describe the minimum survey requirements. If either species are recorded, the GPS coordinates for the location of the species will be established and recorded within the Project's GIS database as a location for the species. Avoidance and minimisation measures should be established as land disturbance permit conditions e.g. if nesting trees for vultures are encountered, these trees must be left and a buffer established around the trees to protect them from disturbance.
3. The land disturbance permit conditions should be approved by and signed off by the environment and mine manager prior to disturbance.

3. **Disturbance;** The environment team will ensure that the pre-disturbance permit conditions and the disturbance conditions during operations are followed. Any non-compliance should be immediately reported to line managers and appropriate actions undertaken e.g. operations halted until permit conditions are complied with.
4. **Rehabilitation;** The environment team will verify the technical rehabilitation undertaken to determine if it meets permit conditions. If biological rehabilitation was required by permit conditions, the environment team to periodically verify quality of biological rehabilitation and determine when biological rehabilitation is complete.

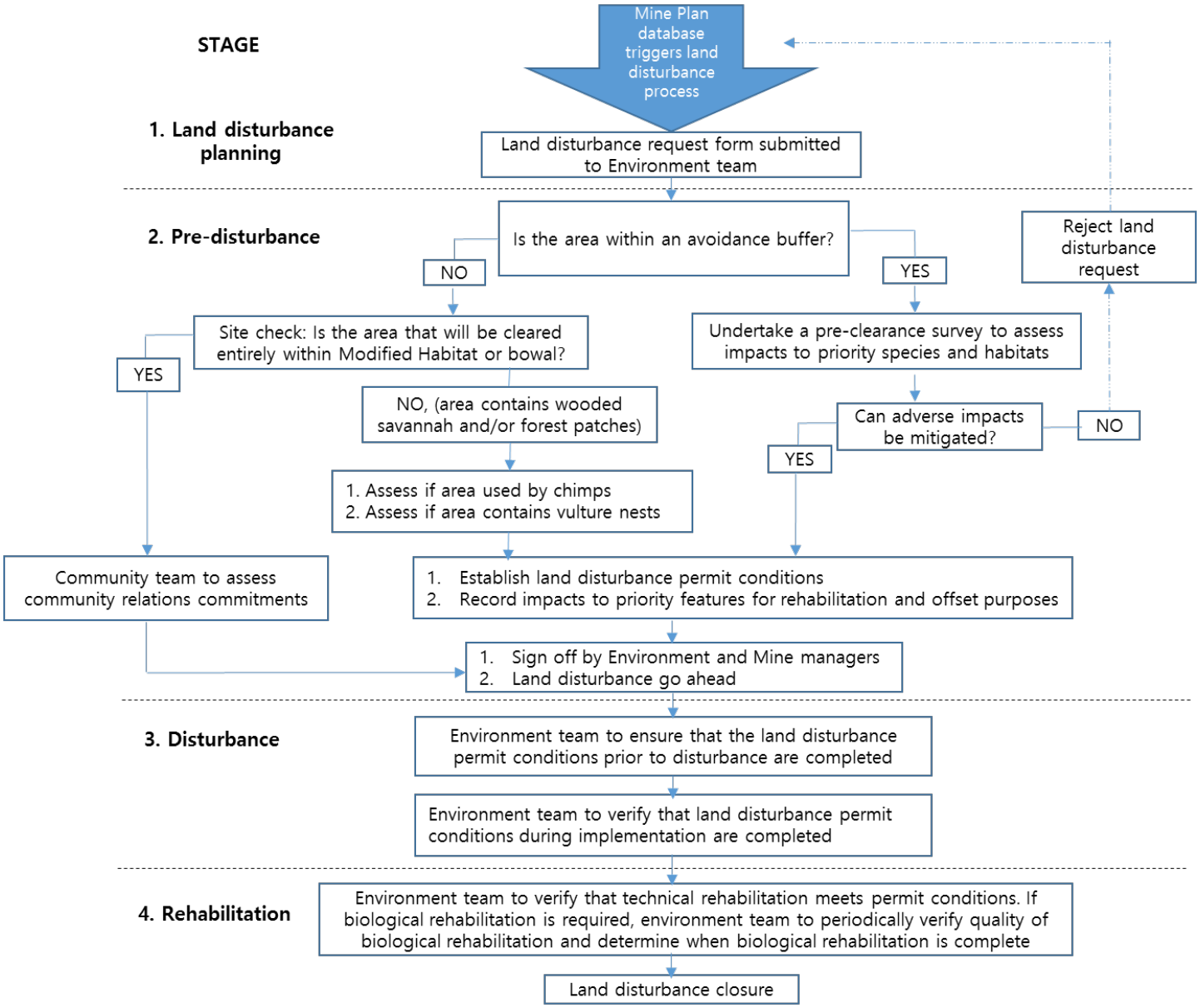


Figure 13: Overview of the land disturbance permit process

Appendix 5 Avoidance buffer maps by plateau

Avoidance buffer maps have been developed by ERM based on the following considerations and approaches;

- Avoidance buffer distances were taken from the Project's SEMP (ERM 2015) and are based on merging the following buffers:

  1. 50 m buffer from any water body; this buffer was developed based on a stream network obtained by hydrological modelling tools embedded into ArcGIS and based on SRTM digital elevation model. (Note: this means that such streams are not obtained by visual interpretation or field survey, but are representing potential stream as a result of a modelling approach)

  2. 300 m buffer along headwaters feeding gallery forest and gallery forest; this buffer was developed based on available satellite imagery by visual interpretation

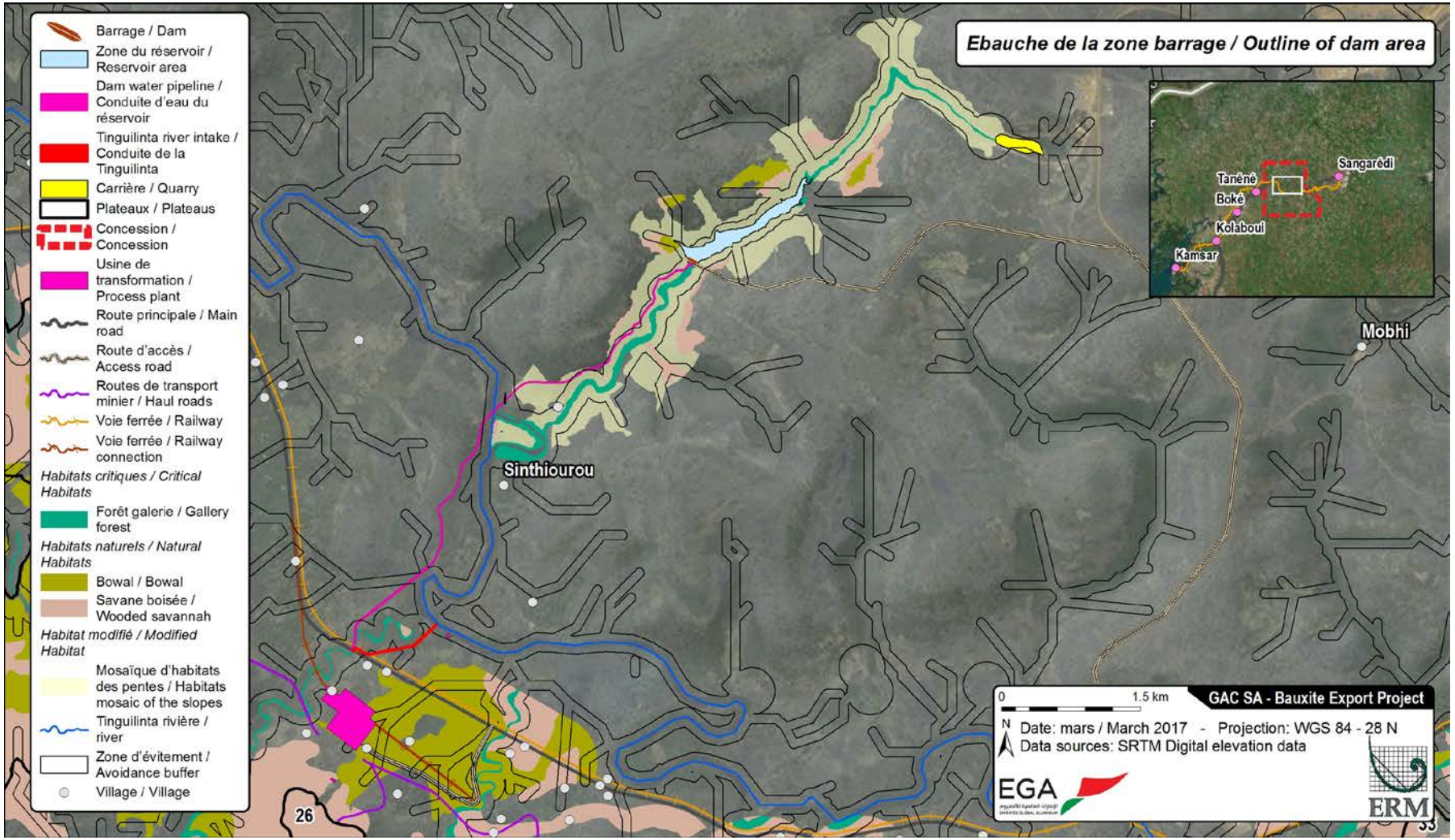
  3. 100 m buffer from Tinguilinita river; this buffer was developed by digitizing the river based on available satellite imagery

  4. 250 m buffer from wells; this buffer was developed based on the results of field survey activities undertaken by ERM during the baseline studies

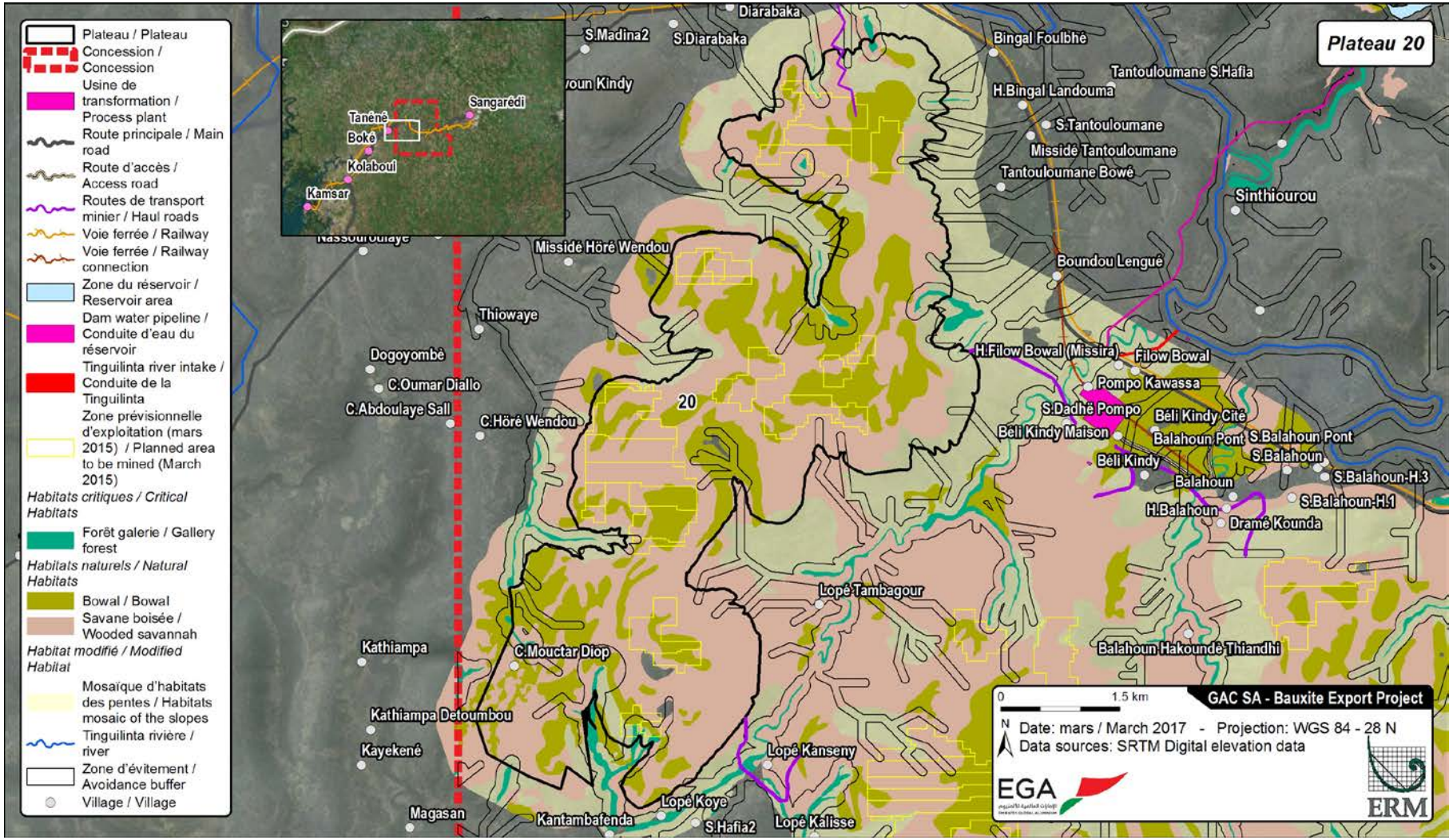
- The Mine Plan used in the maps is from March 2015.

The GAC biodiversity team is responsible for the management of GIS information for the buffer areas and for ensuring that GIS information collected from pre-disturbance surveys on the extent of priority habitats and species are fed into the projects spatial database (once available), to inform mine planning and micro siting of infrastructure to enable effective management planning.

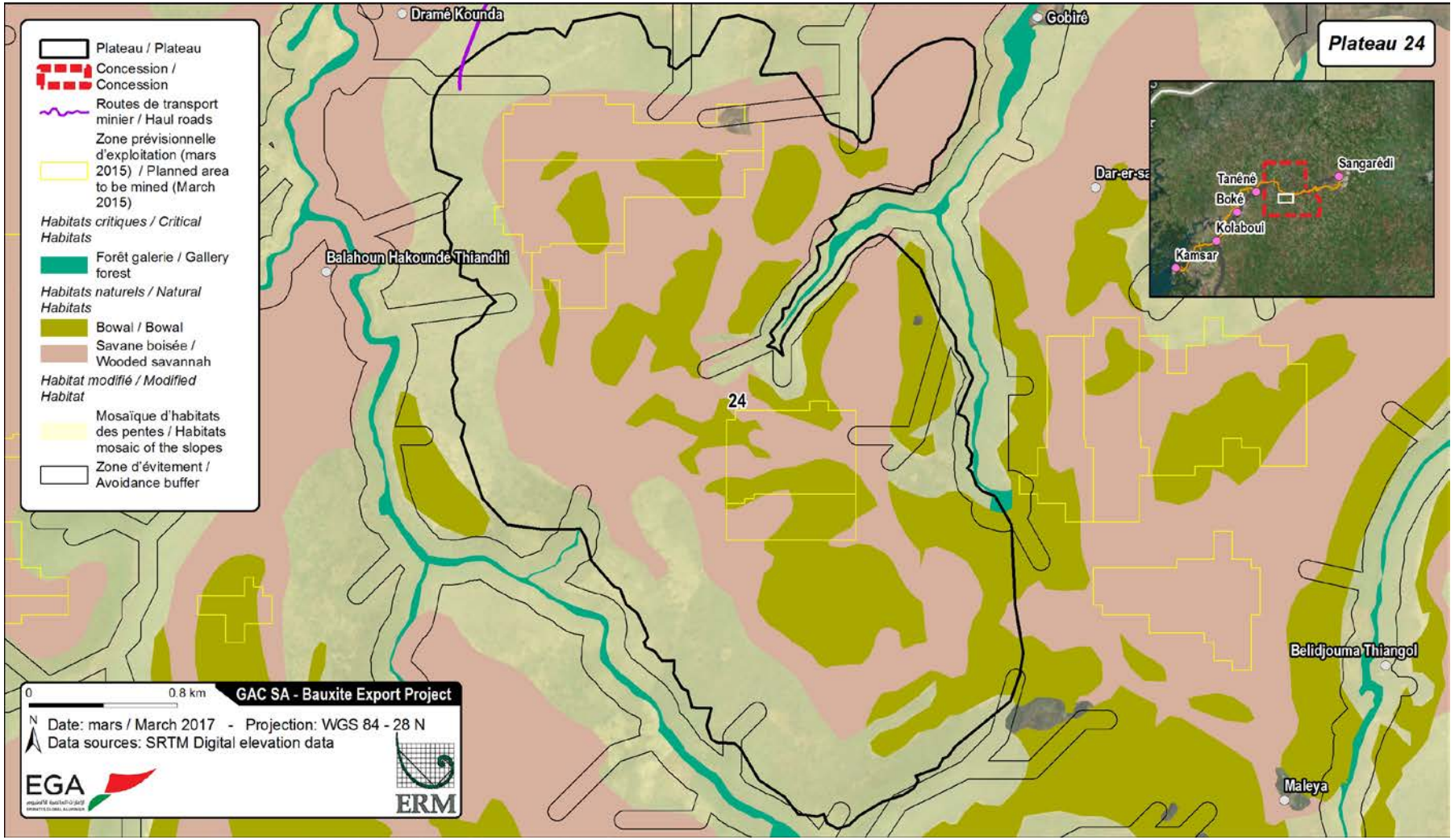
Dam/reservoir and water pipeline area



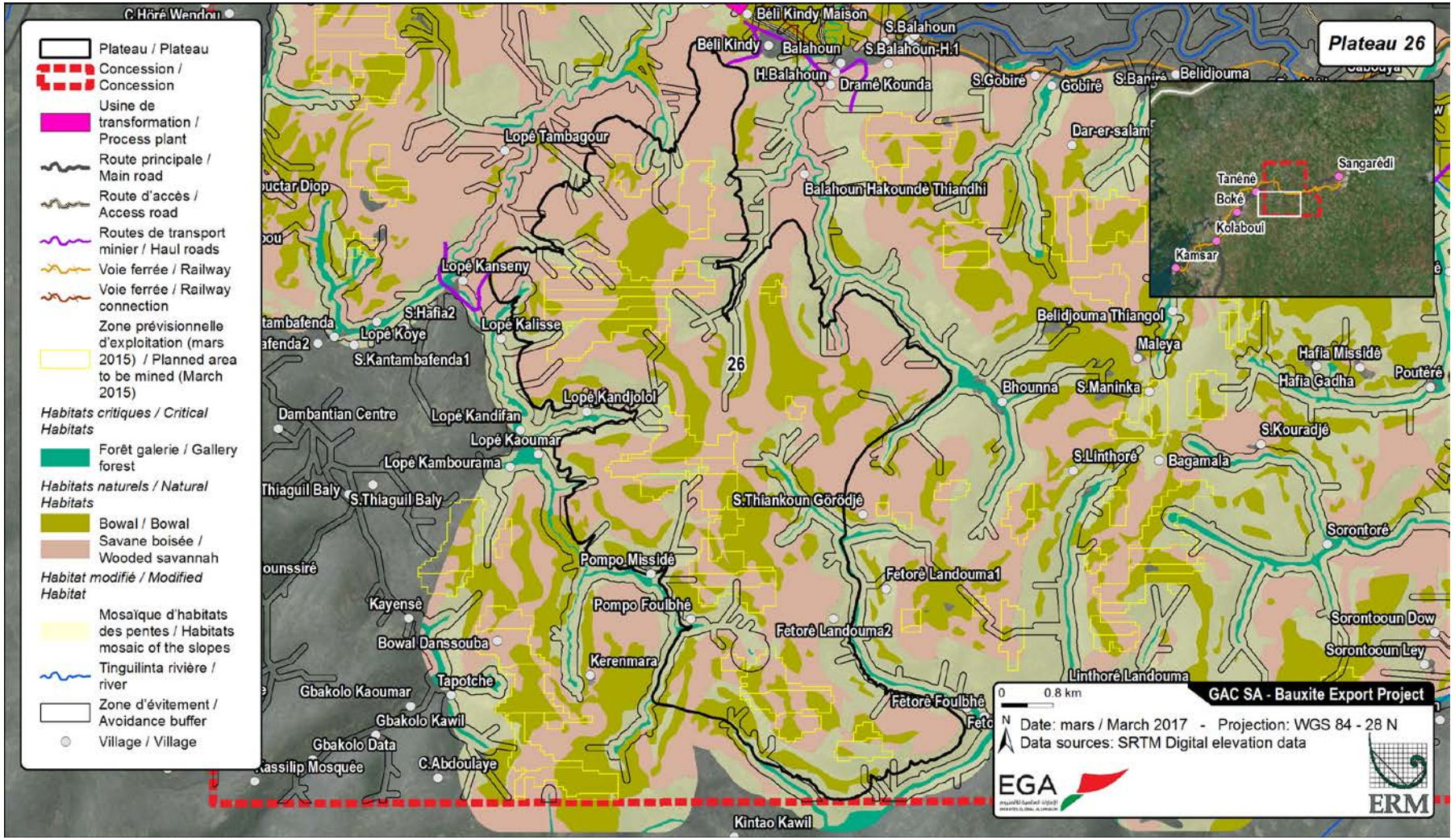
Plateau 20


Plateau 20
Plateau / Plateau
Concession / Concession
Usine de transformation / Process plant
Route principale / Main road
Route d'accès / Access road
Routes de transport minier / Haul roads
Voie ferrée / Railway
Voie ferrée / Railway connection
Zone du réservoir / Reservoir area
Dam water pipeline / Conduite d'eau du réservoir
Tinguilinta river intake / Conduite de la Tinguilinta
Zone prévisionnelle d'exploitation (mars 2015) / Planned area to be mined (March 2015)
Habitats critiques / Critical Habitats
Forêt galerie / Gallery forest
Habitats naturels / Natural Habitats
Bowal / Bowal
Savane boisée / Wooded savannah
Habitat modifié / Modified Habitat
Mosaïque d'habitats des pentes / Habitats mosaic of the slopes
Tinguilinta rivière / river
Zone d'évitement / Avoidance buffer
Village / Village
Tanènè
Sangarédi
Boké
Kolaboui
Kamsar
Diarabaka
S.Madina2
S.Diarabaka
Bingal Foulbhé
Tantouloumane S.Hafia
H.Bingal Landouma
S.Tantouloumane
Missidé Tantouloumane
Tantouloumane Bowé
Sinthiourou
Missidé Höré Wendou
Boundou Lengué
Thiowaye
Dogoyombé
C.Oumar Diallo
C.Abdoulaye Sall
C.Höré Wendou
20
H.Filow Bowal (Missira)
Filow Bowal
Pompo Kawassa
S.Dadhé Pompo
Béli Kindy Cité
Béli Kindy Maison
Balahoun Pont
S.Balahoun Pont
Béli Kindy
S.Balahoun
S.Balahoun-H.3
Balahoun
S.Balahoun-H.1
H.Balahoun
Dramé Kounda
Lopé Tambagour
Kathiampa
C.Mouctar Diop
Balahoun Hakoundé Thiandhi
Kathiampa Detoumbou
Kayekené
Lopé Kanseny
Magasan
Kantambafenda
Lopé Koye
S.Hafia2
Lopé Kalisse
0
1.5 km
GAC SA - Bauxite Export Project
N
Date: mars / March 2017 - Projection: WGS 84 - 28 N
Data sources: SRTM Digital elevation data
EGA
ERM

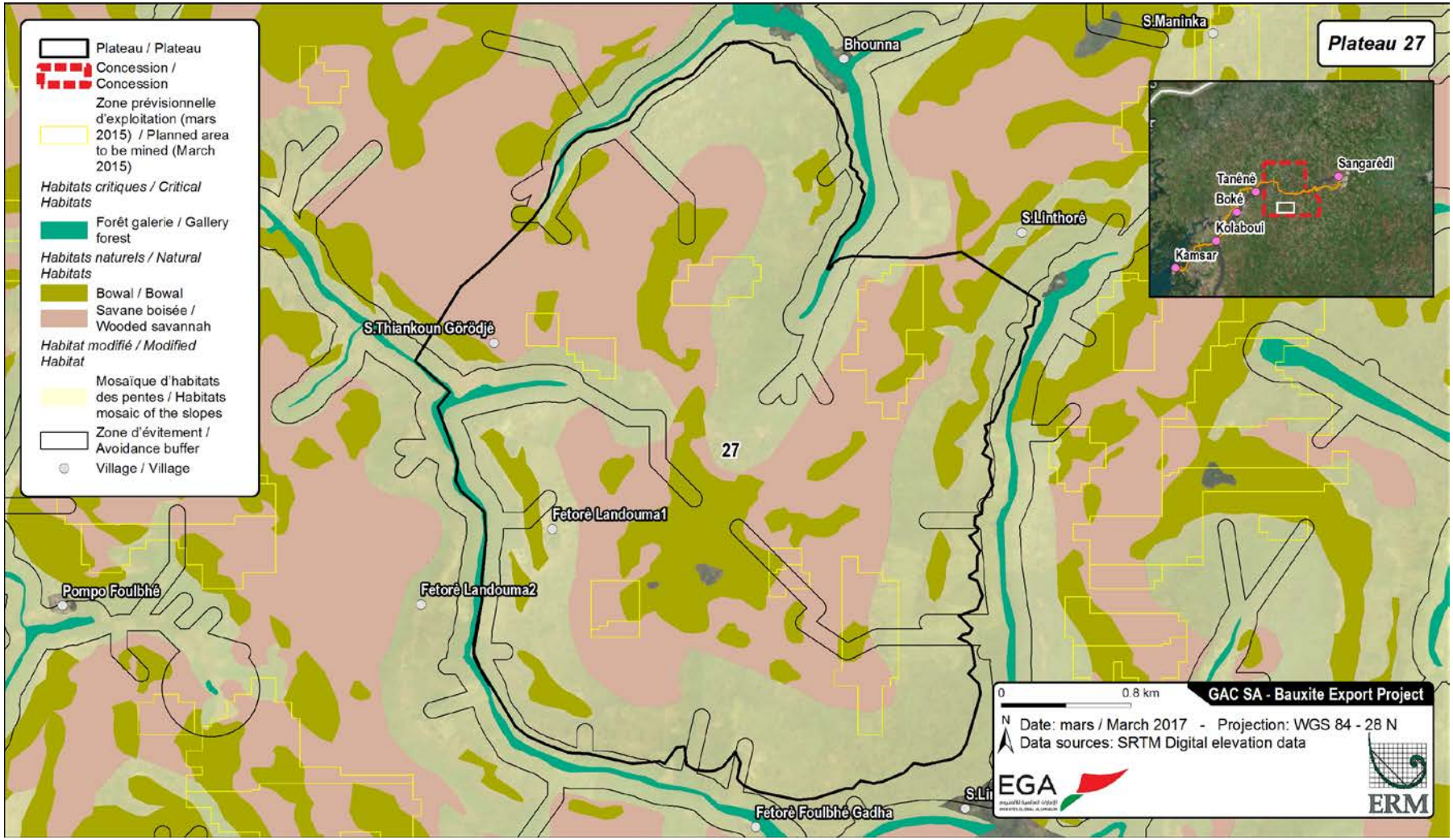
Plateau 24


Plateau / Plateau
Concession / Concession
Routes de transport minier / Haul roads
Zone prévisionnelle d'exploitation (mars 2015) / Planned area to be mined (March 2015)
Habitats critiques / Critical Habitats
Forêt galerie / Gallery forest
Habitats naturels / Natural Habitats
Bowal / Bowal
Savane boisée / Wooded savannah
Habitat modifié / Modified Habitat
Mosaïque d'habitats des pentes / Habitats mosaic of the slopes
Zone d'évitement / Avoidance buffer
Dramé Kounda
Gobiré
Balahoun Hakoundé Thiandhi
24
Dar-er-sa
Belidjouma Thiangol
Maleya
Plateau 24
Sangarédi
Tanêné
Boké
Kolaboui
Kamsar
0
0.8 km
GAC SA - Bauxite Export Project
N
Date: mars / March 2017 - Projection: WGS 84 - 28 N
Data sources: SRTM Digital elevation data
EGA
ERM

Plateau 26


Plateau 26
Plateau / Plateau
Concession / Concession
Usine de transformation / Process plant
Route principale / Main road
Route d'accès / Access road
Routes de transport minier / Haul roads
Voie ferrée / Railway
Voie ferrée / Railway connection
Zone prévisionnelle d'exploitation (mars 2015) / Planned area to be mined (March 2015)
Habitats critiques / Critical Habitats
Forêt galerie / Gallery forest
Habitats naturels / Natural Habitats
Bowal / Bowal
Savane boisée / Wooded savannah
Habitat modifié / Modified Habitat
Mosaïque d'habitats des pentes / Habitats mosaic of the slopes
Tinguilinta rivière / river
Zone d'évitement / Avoidance buffer
Village / Village
Béli Kindy Maison
S.Balahoun
Béli Kindy
Balahoun
S.Balahoun-H.1
H.Balahoun
Dramé Kounda
S.Gobiré
Gobiré
Belidjouma
Dar-er-salam
Lopé Tambagour
Balahoun Hakoundé Thiandhi
Lopé Kanseny
S.Hafia2
Lopé Koye
Lopé Kalisse
S.Kantambafenda1
26
Belidjouma Thiangol
Maleya
Hafia Missidé
Hafia Gadha
Poutéré
Bhounna
S.Maninka
Lopé Kandjolol
Dambantian Centre
Lopé Kandifan
Lopé Kaoumar
S.Kouradjé
Lopé Kambourama
S.Linthoré
Bagamala
S.Thiaguil Baly
S.Thiankoun Görödjé
Sorontoré
Pompo Missidé
Fetoré Landouma1
Kayensè
Pompo Foulbhé
Sorontoun Dow
Fetoré Landouma2
Bowal Danssouba
Sorontoun Ley
Kerenmara
Tapotche
Linthoré Landouma
Gbakolo Kaoumar
Fétoré Foulbhé
Gbakolo Kawil
Gbakolo Data
C.Abdoulaye
Kintao Kawil
Tanéné
Sangarédi
Boké
Kolaboui
Kamsar
0 0.8 km
GAC SA - Bauxite Export Project
N
Date: mars / March 2017 - Projection: WGS 84 - 28 N
Data sources: SRTM Digital elevation data
EGA
ERM

Plateau 27


Plateau / Plateau
Concession / Concession
Zone prévisionnelle d'exploitation (mars 2015) / Planned area to be mined (March 2015)
Habitats critiques / Critical Habitats
Forêt galerie / Gallery forest
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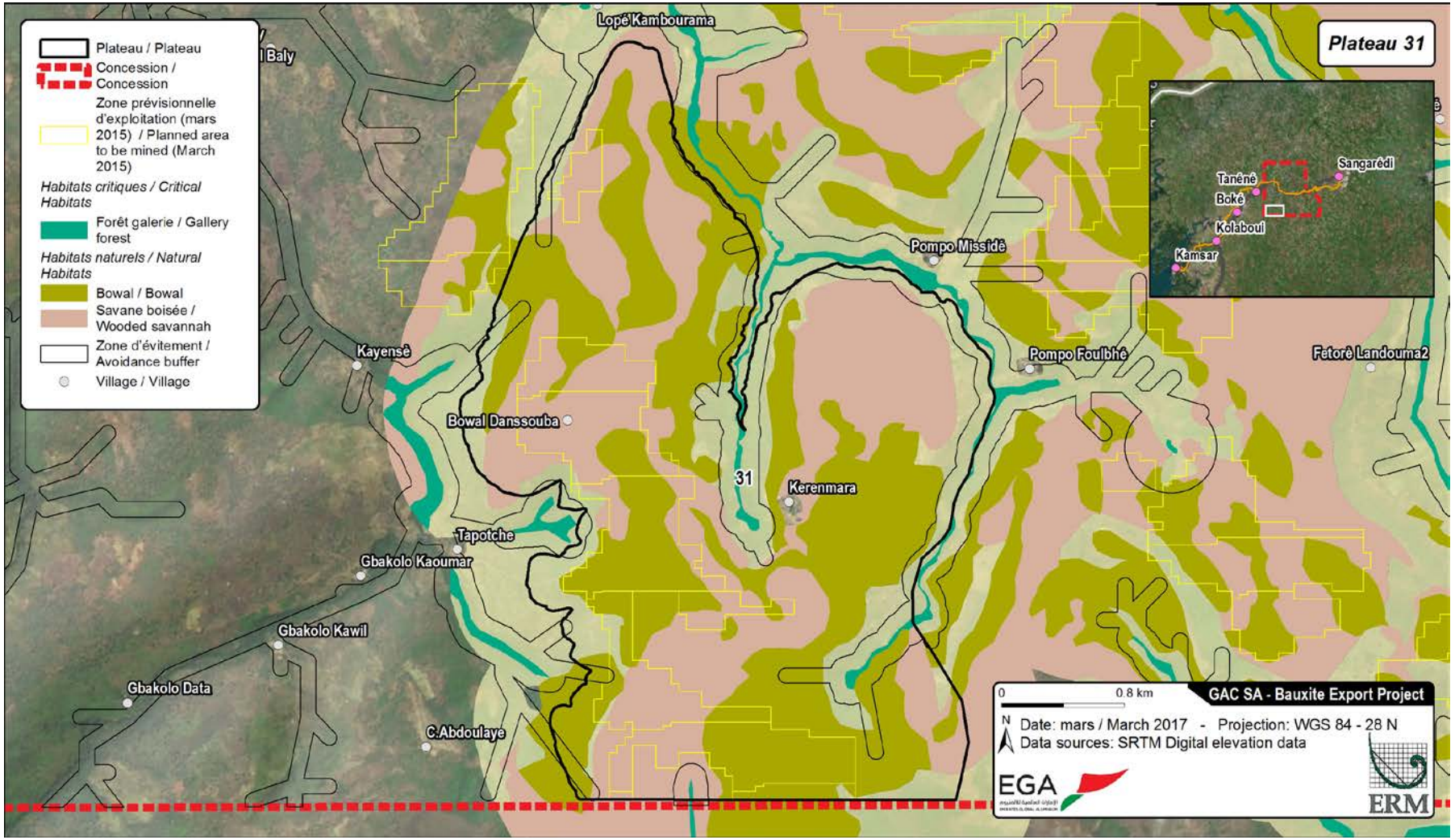
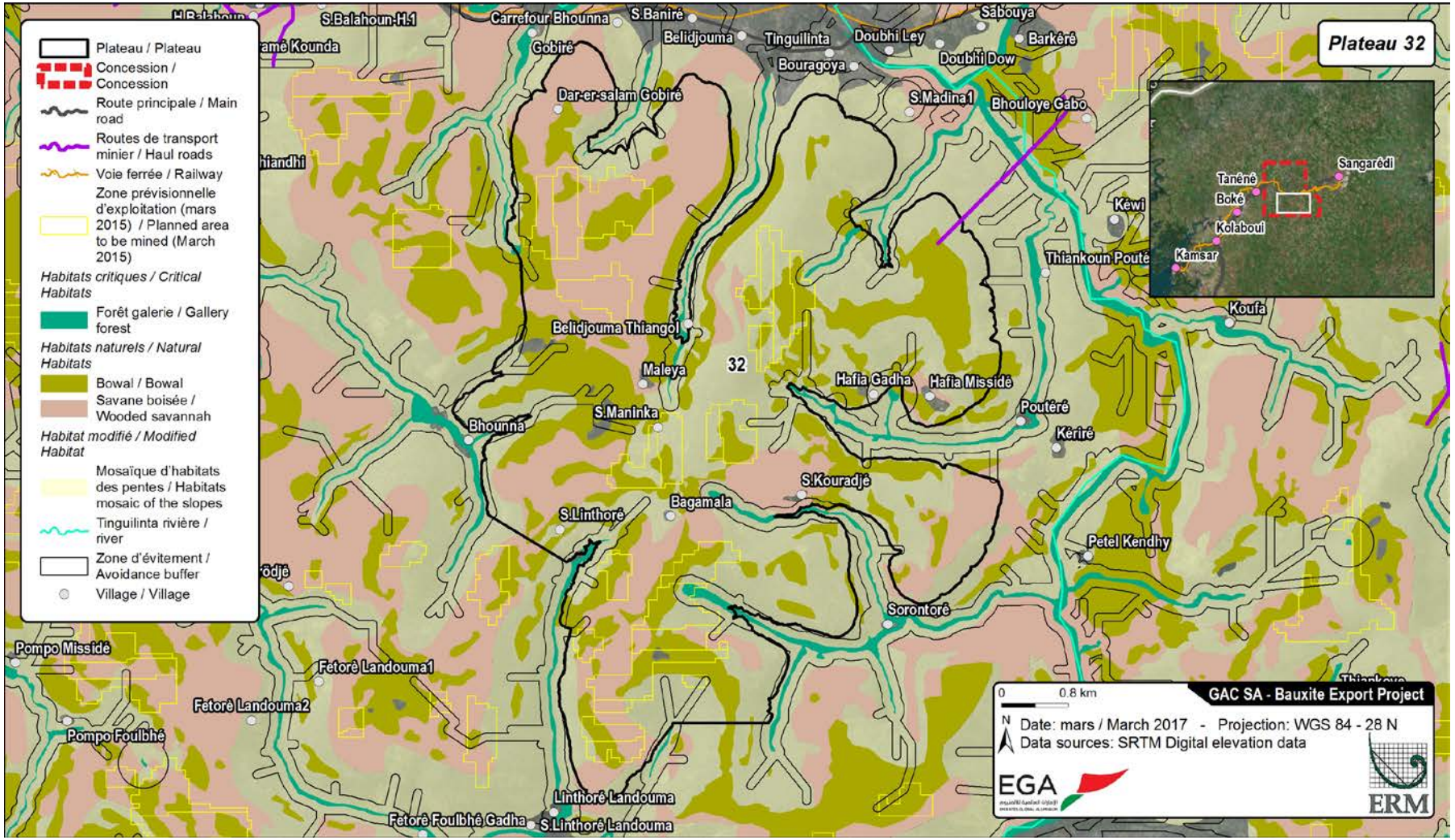
Mosaïque d'habitats des pentes / Habitats mosaic of the slopes
Zone d'évitement / Avoidance buffer
Village / Village
Bhounna
S.Maninka
S.Linthoré
S.Thiankoun Görödjé
27
Fetorè Landouma1
Fetorè Landouma2
Pompo Foulbhé
Fetorè Foulbhé Gadha
Plateau 27
Sangarédi
Tanêné
Boké
Kolaboui
Kamsar
0
0.8 km
N
Date: mars / March 2017 - Projection: WGS 84 - 28 N
Data sources: SRTM Digital elevation data
GAC SA - Bauxite Export Project
EGA
ERM

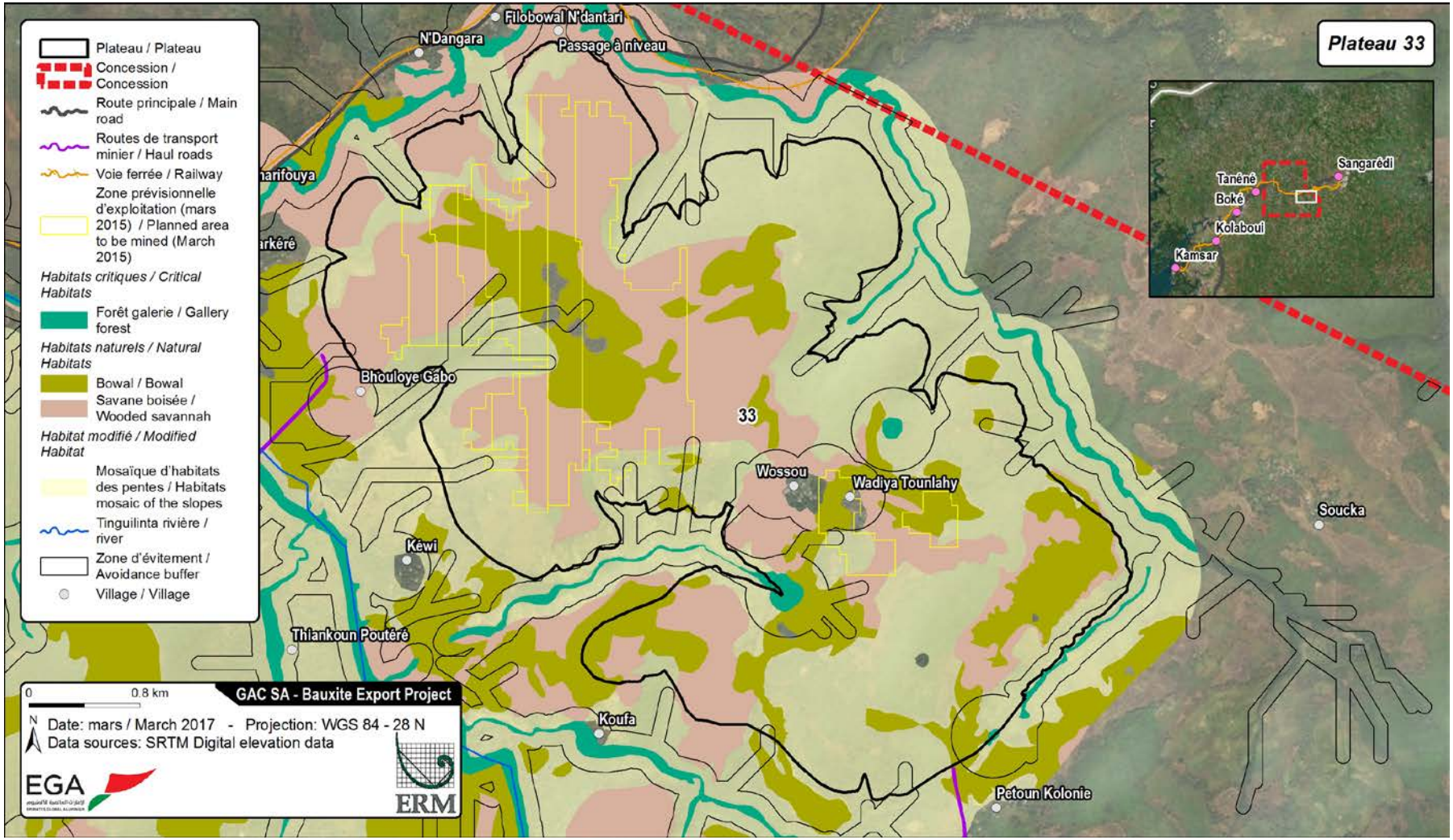
Plateau 31


Plateau 31
Plateau / Plateau
Concession / Concession
Zone prévisionnelle d'exploitation (mars 2015) / Planned area to be mined (March 2015)
Habitats critiques / Critical Habitats
Forêt galerie / Gallery forest
Habitats naturels / Natural Habitats
Bowal / Bowal
Savane boisée / Wooded savannah
Zone d'évitement / Avoidance buffer
Village / Village
Lopé Kambourama
Baly
Kayensè
Bowal Danssouba
31
Kerenmara
Pompo Missidè
Pompo Foulbhé
Fetorè Landouma2
Tapotche
Gbakolo Kaoumar
Gbakolo Kawil
Gbakolo Data
C.Abdoulaye
Tanènè
Boké
Kolaboui
Kamsar
Sangarédi
0
0.8 km
GAC SA - Bauxite Export Project
N
Date: mars / March 2017 - Projection: WGS 84 - 28 N
Data sources: SRTM Digital elevation data
EGA
ERM

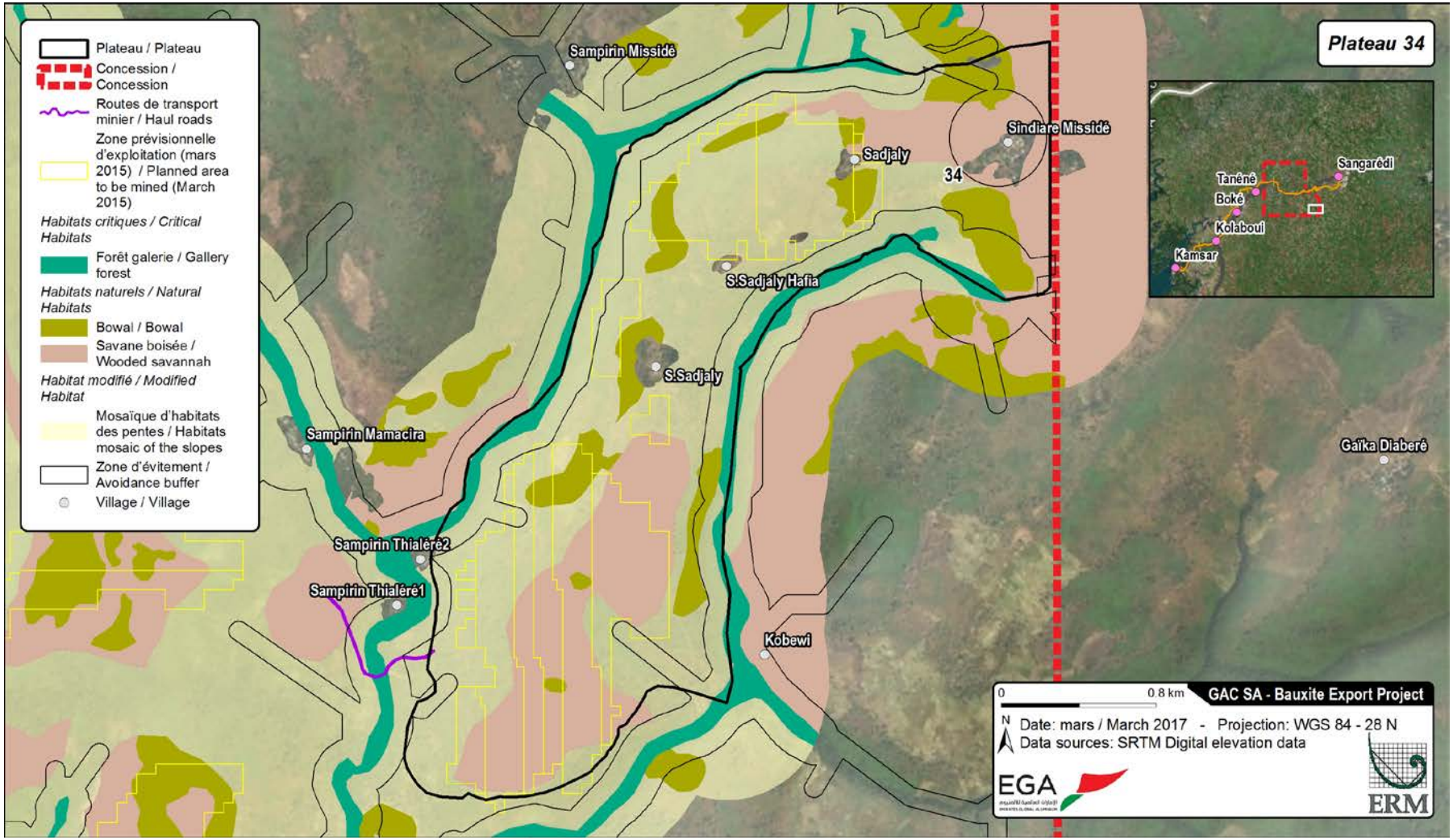
Plateau 32


Plateau 32
Plateau / Plateau
Concession / Concession
Route principale / Main road
Routes de transport minier / Haul roads
Voie ferrée / Railway
Zone prévisionnelle d'exploitation (mars 2015) / Planned area to be mined (March 2015)
Habitats critiques / Critical Habitats
Forêt galerie / Gallery forest
Habitats naturels / Natural Habitats
Bowal / Bowal
Savane boisée / Wooded savannah
Habitat modifié / Modified Habitat
Mosaïque d'habitats des pentes / Habitats mosaic of the slopes
Tinguilinta rivière / river
Zone d'évitement / Avoidance buffer
Village / Village
S.Balahoun-H.1
Carrefour Bhounna
S.Baniré
Belidjouma
Tinguilinta
Doubhi Ley
Sabouya
Barkéré
Doubhi Dow
Bouragoya
Gobiré
Dar-er-salam Gobiré
S.Madina1
Bhouloye Gabo
Kéwi
Thiankoun Pouté
Koufa
Tanêné
Sangarédi
Boké
Kolaboui
Kamsar
Belidjouma Thiangol
Maleya
32
Hafia Gadha
Hafia Missidé
Poutéré
Kériré
S.Maninka
Bhounna
S.Kouradjé
Bagamala
S.Linthoré
Petel Kendhy
Sorontoré
Pompo Missidé
Fetoré Landouma1
Fetoré Landouma2
Pompo Foulbhé
Linthoré Landouma
Fetoré Foulbhé Gadha
S.Linthoré Landouma
0
0.8 km
GAC SA - Bauxite Export Project
N
Date: mars / March 2017 - Projection: WGS 84 - 28 N
Data sources: SRTM Digital elevation data
EGA
ERM

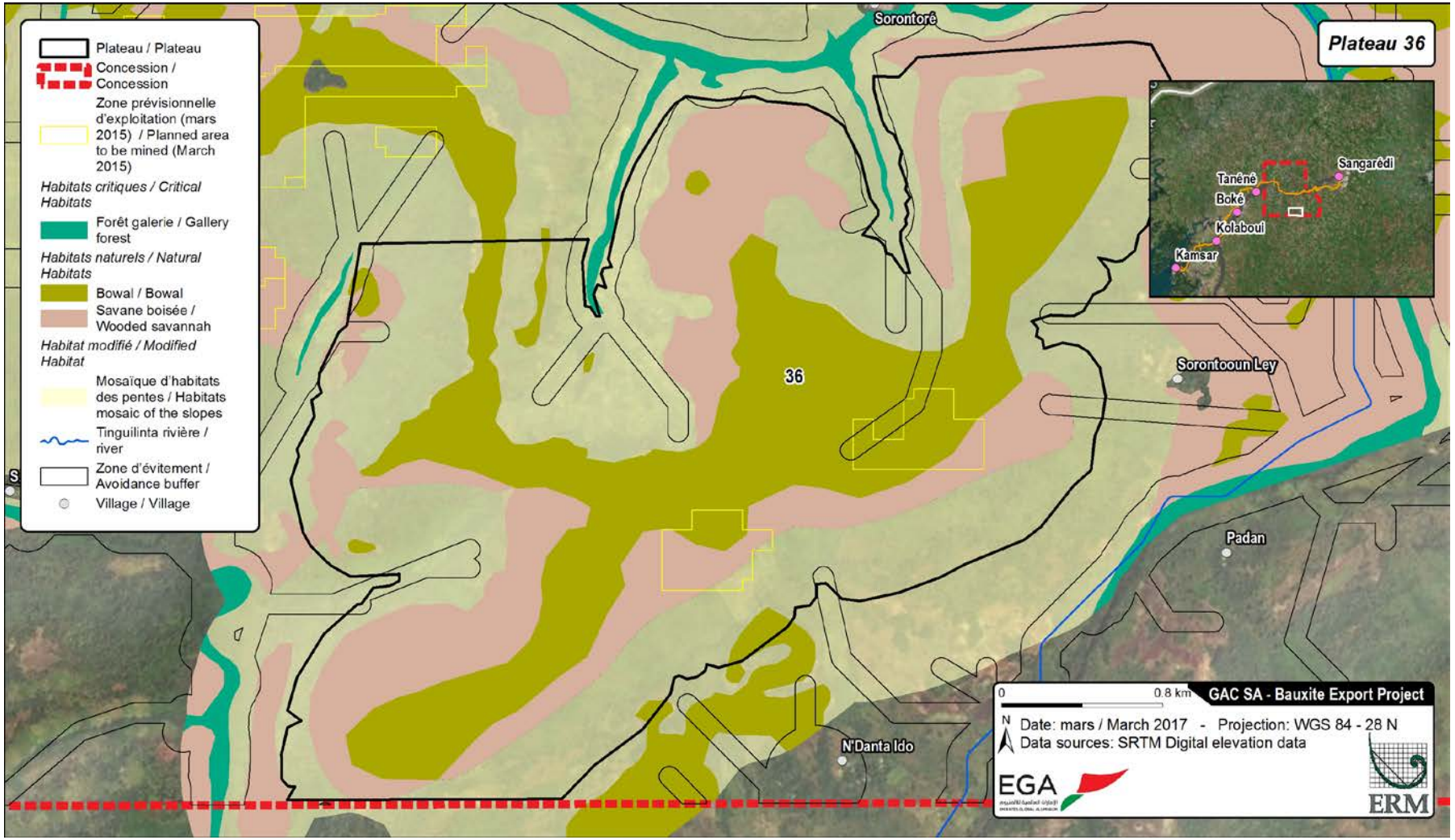
Plateau 33


Plateau 33
Plateau / Plateau
Concession / Concession
Route principale / Main road
Routes de transport minier / Haul roads
Voie ferrée / Railway
Zone prévisionnelle d'exploitation (mars 2015) / Planned area to be mined (March 2015)
Habitats critiques / Critical Habitats
Forêt galerie / Gallery forest
Habitats naturels / Natural Habitats
Bowal / Bowal
Savane boisée / Wooded savannah
Habitat modifié / Modified Habitat
Mosaïque d'habitats des pentes / Habitats mosaic of the slopes
Tinguilinta rivière / river
Zone d'évitement / Avoidance buffer
Village / Village
Filobowal N'dantari
N'Dangara
Passage à niveau
Bhouloye Gabo
33
Wossou
Wadiya Tounlahy
Soucka
Kéwi
Thiankoun Poutéré
Koufa
Petoun Kolonie
Tanêné
Boké
Kolaboui
Kamsar
Sangarédi
0
0.8 km
GAC SA - Bauxite Export Project
N
Date: mars / March 2017 - Projection: WGS 84 - 28 N
Data sources: SRTM Digital elevation data
EGA
ERM

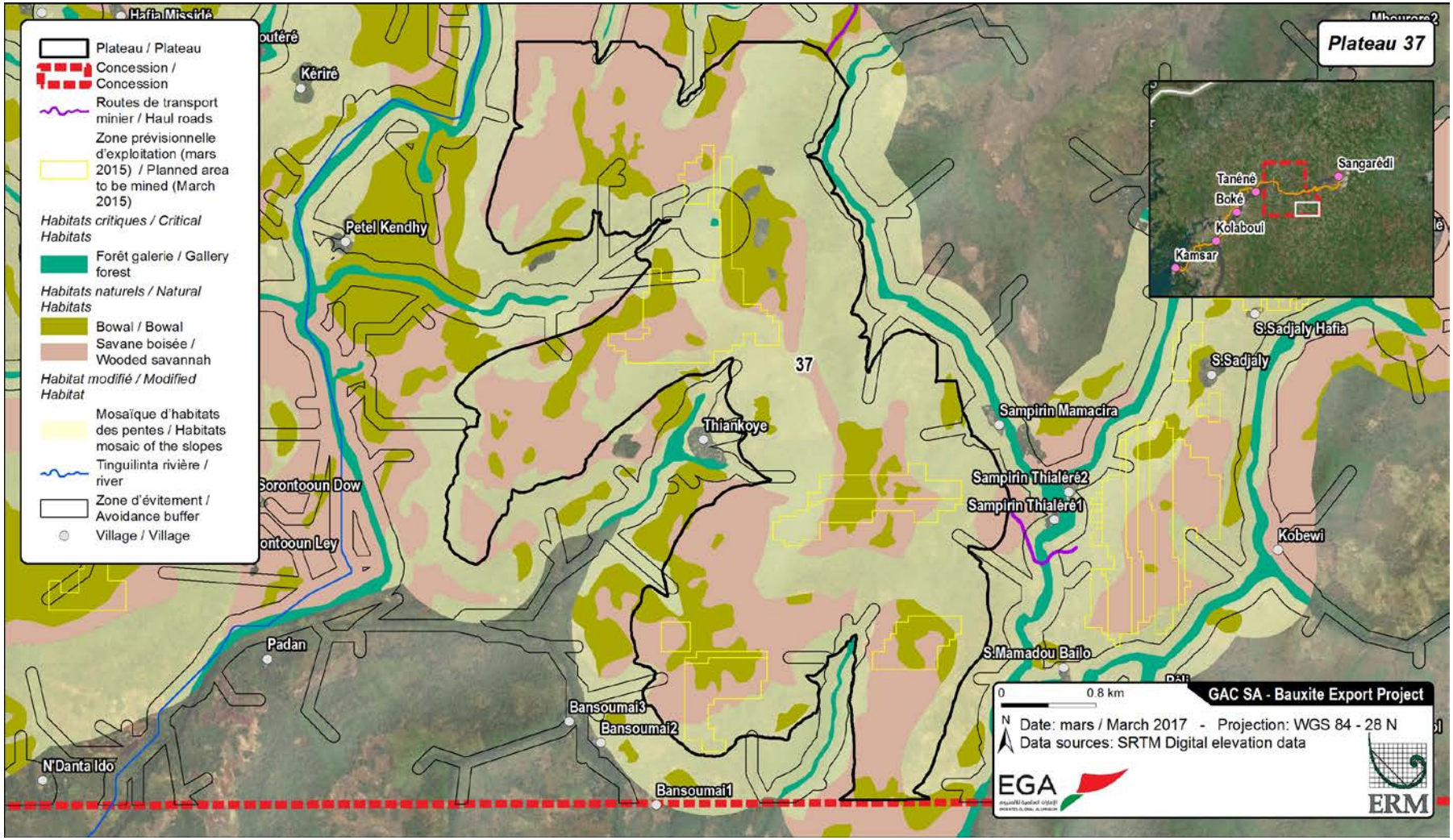
Plateau 34


Plateau / Plateau
Concession / Concession
Routes de transport minier / Haul roads
Zone prévisionnelle d'exploitation (mars 2015) / Planned area to be mined (March 2015)
Habitats critiques / Critical Habitats
Forêt galerie / Gallery forest
Habitats naturels / Natural Habitats
Bowal / Bowal
Savane boisée / Wooded savannah
Habitat modifié / Modified Habitat
Mosaïque d'habitats des pentes / Habitats mosaic of the slopes
Zone d'évitement / Avoidance buffer
Village / Village
Sampirin Missidé
Sindiare Missidé
Sadjaly
34
S.Sadjaly Hafia
S.Sadjaly
Sampirin Mamacira
Gaïka Diaberé
Sampirin Thialéré2
Sampirin Thialéré1
Kobewi
Plateau 34
Sangarédi
Tanêné
Boké
Kolaboui
Kamsar
0
0.8 km
GAC SA - Bauxite Export Project
N
Date: mars / March 2017 - Projection: WGS 84 - 28 N
Data sources: SRTM Digital elevation data
EGA
ERM

Plateau 36


Plateau / Plateau
Concession / Concession
Zone prévisionnelle d'exploitation (mars 2015) / Planned area to be mined (March 2015)
Habitats critiques / Critical Habitats
Forêt galerie / Gallery forest
Habitats naturels / Natural Habitats
Bowal / Bowal
Savane boisée / Wooded savannah
Habitat modifié / Modified Habitat
Mosaïque d'habitats des pentes / Habitats mosaic of the slopes
Tinguilinta rivière / river
Zone d'évitement / Avoidance buffer
Village / Village
Sorontoré
Plateau 36
Tanêné
Sangarédi
Boké
Kolaboui
Kamsar
36
Sorontooun Ley
Padan
N'Danta Ido
0
0.8 km
GAC SA - Bauxite Export Project
N
Date: mars / March 2017 - Projection: WGS 84 - 28 N
Data sources: SRTM Digital elevation data
EGA
ERM

Plateau 37


Plateau / Plateau
Concession / Concession
Routes de transport minier / Haul roads
Zone prévisionnelle d'exploitation (mars 2015) / Planned area to be mined (March 2015)
Habitats critiques / Critical Habitats
Forêt galerie / Gallery forest
Habitats naturels / Natural Habitats
Bowal / Bowal
Savane boisée / Wooded savannah
Habitat modifié / Modified Habitat
Mosaïque d'habitats des pentes / Habitats mosaic of the slopes
Tinguilinta rivière / river
Zone d'évitement / Avoidance buffer
Village / Village
Plateau 37
Tanêné
Sangarédi
Boké
Kolaboui
Kamsar
Kériré
Petel Kendhy
37
Thiankoye
Sampirin Mamacira
Sampirin Thialéré2
Sampirin Thialéré1
S.Sadjaly Hafia
S.Sadjaly
Kobewi
Sorontooun Dow
Padan
S.Mamadou Bailo
Bansoumai3
Bansoumai2
Bansoumai1
N'Danta Ido
0
0.8 km
N
Date: mars / March 2017 - Projection: WGS 84 - 28 N
Data sources: SRTM Digital elevation data
GAC SA - Bauxite Export Project
EGA
ERM

Appendix 6 Ecosystem service mitigation measures

The ESR (TBC 2017), identified gaps and overlaps in mitigation measures for priority ecosystem services across the Projects management plans. To ensure alignment in measures between social and environmental activities additional mitigation measures recommended for adoption within social and environmental management plans are found in Table 28 for the mine area and Table 29 for the port area.

Table 28: Additional measures for mine plans to protect or restore priority ecosystem services

Mine area	Mitigation measure	Management Plan to add mitigation the measure to
Provisioning services		
Bushmeat	From the BMP, add the following mitigation measures to the LRP and CIS; 1. Engage hunters' associations and traditional authorities to devise alternatives to unsustainable hunting (like support to animal husbandry) (GCM11) 2. Support dialogue between communities and Eaux & Forêts (E&F) officers on enforcement of hunting rules (GCM12)	LRP CIS
Wild plants, fruits, honey	Establish community-managed nurseries and conduct trials of enrichment plantings (using native species).	RAPs PIIM CIS
Cultivated crops	Monitor how spatial extent of agriculture changes in Project's area of influence	BMEP (and Projects spatially referenced data base)
Livestock farming (including transhumance)	Support dialogue between communities and E&F officers on enforcement of rules about fire. Monitor to assess the level of impact that loss of access to pasture lands has on transhumance herds; monitor transhumance grievances; if impacts are observed (or grievances aired), work with those affected to develop additional mitigation measures and a compensation scheme.	PIIM Social monitoring activities and grievance mechanism
Wild-caught fish	Agree with communities how to use the dam reservoir, taking into account water level fluctuations; if water levels allow, stock the dam's reservoir with indigenous species and prohibit the introduction of exotic species.	Dam RAP LRP
Freshwater – surface water	Provision of boreholes / wells for communities to reduce dependency on streams	Align activities environment and social teams to ensure location of boreholes is appropriate from an environmental and social perspective
Timber/wood products and biomass fuel	1. Support plantations of fast-growing, indigenous species with clear ownership and based on a business model. 2. Support dialogue between communities and E&F on enforcement of rules concerning harvesting of trees, emphasizing traditional authorities.	RAP LRP CIS PIIM
NTFPs and natural medicine	Establish community-managed nurseries and conduct trials of enrichment plantings of scarce resources.	RAP PIIM CIS
Regulating services		
Air quality regulation	Test effectiveness of tree planting to control dust at RAP sites	RAP

Mine area	Mitigation measure	Management Plan to add mitigation the measure to
Surface and groundwater regulation, natural hazard regulation and erosion control	Monitor change in vegetative cover/land use to identify areas at greater risk of vegetation loss. Target appropriate measures to high-risk areas (e.g. agricultural/livestock intensification, reforestation) Support dialogue between communities and E&F on enforcement of rules concerning harvesting of trees, emphasizing traditional authorities.	BMEP (and Spatially referenced database) RAPs PIIM CIS
Pest regulation	Sensitize farmers, agricultural extension agents and traditional authorities on the risks of pest infestations linked to habitat change, monocultures and other factors favoring pests.	ADS PIIM
Disease regulation	Undertake HIA and develop design criteria for Project's engineering specifically to reduce diseases or their vectors.	SEMP
Supporting services		
Habitat provision	1. Adopt criteria to ensure the selection of site for the relocation of communities avoids areas that are important to priority biodiversity features where possible and favours areas with Modified Habitat 2. Use spatial data management system to identify areas of potential risk or conflict between habitat provision and other planned or unplanned land uses.	RAPs Spatially referenced database

Table 29: Additional measures for port plans to protect or restore priority ecosystem services

Port area	Mitigation measures	Management Plan to add mitigation the measure to
Cultivated crops	Explore options to address communities agricultural concerns around the port e.g. assess feasibility of investment in engineered solutions such as improved dykes	ADS CIS
Provision of fish/shellfish Shoreline protection Water purification	Joint study of cumulative impacts of port operations on local fisheries by all mining companies operating at Kamsar to determine mitigation measures	PIIM Regional development planning plans (i.e. plans owned by third parties)
Freshwater – surface water	Use engineered solutions (wells, connecting to CBG's water supply) if needed.	PIIM CIS
Salt production	Use engineered solution (pipe clean salt water if local supply is disturbed) if needed.	SEMP
Timber and wood products and biomass fuel	Assess the feasibility of substituting locally harvested timber with other materials to reduce dependency.	PIIM CIS
Disease regulation	Cumulative impacts may overwhelm Project's efforts. Engineered solution likely to be effective to reduce dependency on ES.	