



Pre-clearing biodiversity surveys for the dam, reservoir, water pipeline, process plant, port platform and resettlement zone clearing activities, GAC Project, Guinea



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Guinea Alumina Corporation S.A.

Final Report

11 January 2017



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Final Report

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ACRONYMS

CR	Critically endangered (IUCN red list)
EGA	Emirates Global Aluminium
EN	Endangered (IUCN red list)
ERM	Environmental Resources Management
GAC	Guinea Alumina Corporation S.A.
IFC	International Finance Corporation
IFC PS	International Finance Corporation Performance Standards
IUCN	International Union for Conservation of Nature
NA	Not applicable
NT	Near threatened (IUCN red list)
PCBS	Pre-clearing biodiversity surveys
SEIA	Social and environmental impact assessment
SEMP	Social and Environmental Management Plan
UGP	Upper Guinean Province
VU	Vulnerable (IUCN red list)
WCF	Wild Chimpanzee Foundation

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1 INTRODUCTION

1.1 BACKGROUND

In 2004, Guinea Alumina Corporation S.A. (GAC) signed a concession agreement with the Government of the Republic of Guinea to develop a bauxite mining and refining project in the sub-prefecture of Sangarédi, prefecture of Boké, north-western Guinea. The agreement also includes a port concession in the coastal city of Kamsar, to allow for the shipping of production onto the international market. The whole project is hereafter referred to as “The Project”.

As an initial phase of this development, GAC submitted an initial and integrated social and environmental impact assessment (SEIA) for the development of mining and alumina refining operations in the northern half of its mining concession between 2004 and 2006. This SEIA was approved by Guinean authorities. Following ownership and project design modifications, GAC - through its parent company Emirates Global Aluminium entity (EGA) - contracted Environmental Resources Management (ERM) to update the SEIA studies. A SEIA Addendum for the southern concession and the port was developed by ERM and its partners, compliant with the International Finance Corporation Performance Standards (IFC PS), and was approved by the Guinean government in 2016 (ERM, 2015). Other related Project developments were subject to SEIA, including the creation of a water reservoir in the Tiouladiwol valley (ERM, 2016a) and the Mining Bauxite Samplers (MBS) project (ERM, 2016b).

This document is related to the natural habitat and chimpanzee nests aerial survey conducted by Sylvatrop in December 2016 (*Sylvatrop Consulting, 2017*), which is provided in Annexe 2 of this document. The main findings of the aerial survey report are referred to in this report. However, it should be noted that these are two separate studies and should therefore be considered as stand-alone documents.

1.2 PRE-CLEARING BIODIVERSITY SURVEYS (PCBS)

As part of GAC’s engagement within the Social and Environmental Management Plan (SEMP) of the SEIA Addendum (2015), pre-clearing biodiversity surveys (PCBS, hereafter) must be performed prior to the development of each Project item. A first PCBS was conducted by Sylvatrop Consulting for the Plateau 20 Haul Road and mine development (*Sylvatrop Consulting, 2016*).

In November 2016, ERM was contracted by GAC to conduct a PCBS for the following Project developments:

- dam and water reservoir in the Tiouladiwol valley;

- access road to the dam;
- water pipeline from the dam to the process plant;
- process plant and associated facilities (Beli Kindy area);
- resettlement area for Beli Kindy people;
- access road to the resettlement area; and
- GAC platform clearance work in Kamsar.

1.3

CONTENTS OF THIS DOCUMENT

This PCBS report has the following structure:

- Chapter 1: Introduction
- Chapter 2: Study area and methodology
- Chapter 3: Results
- Chapter 4: Discussion and recommendations
- Chapter 5: References
- Annex 1: Survey results
- Annex 2: *Sylvatrop (2017)* aerial survey report

2.1 ERM FIELD TEAM

The ERM field team surveyed all the areas of concern between 27/11/2016 and 02/12/2016, with the aim of targeting the main biodiversity sensitivities that will or could potentially be affected by the above-mentioned Project developments.

ERM field team was composed by 16 specialists, as follows:

- two (2) international consultants (ERM) with experience in biodiversity surveys in Guinea;
- two (2) Guinean mammals specialists (Guinée Ecologie) with extensive experience in the Project area;
- two (2) Guinean chimpanzees specialists (Guinée Ecologie / WCF) with extensive experience in the Project area, specifically looking at chimpanzees in the Tiouladiwol valley and beyond;
- two (2) Guinean botanists (Guinée Ecologie) with extensive experience in the Project area;
- two (2) Guinean ornithologists (Guinée Ecologie) with extensive experience in the Project area;
- two (2) Guinean herpetologists (Guinée Ecologie) with extensive experience in the Project area, covering both reptiles and amphibians; and
- two (2) ichthyologists (Guinée Ecologie) with experience in the Project area.

2.2 STUDY AREA

In order to optimize time and efforts, and due to accessibility constraints, the study area was split up into 5 areas, as shown in *Figure 2.1* and *Figure 2.2*:

- Area 1: Tiouladiwol dam and water reservoir;
- Area 2: Pipeline - lower Tiouladiwol River;
- Area 3: Pipeline - between the Tinguilinta River and the national road;
- Area 4: Process plant and associated facilities;
- Area 5: Resettlement zone and access road; and
- Area 6: GAC platform in Kamsar.

The versions of the Project items that were considered during the survey (e.g., access road, Tiouladiwol dam, process plant, water pipeline) are the ones that were provided to ERM by GAC prior to the start of field activities in December 2016. Design modifications that occurred after the field mission are therefore not considered in this document.

Figure 2.1 Study area - Mine (Area 1 to Area 5)

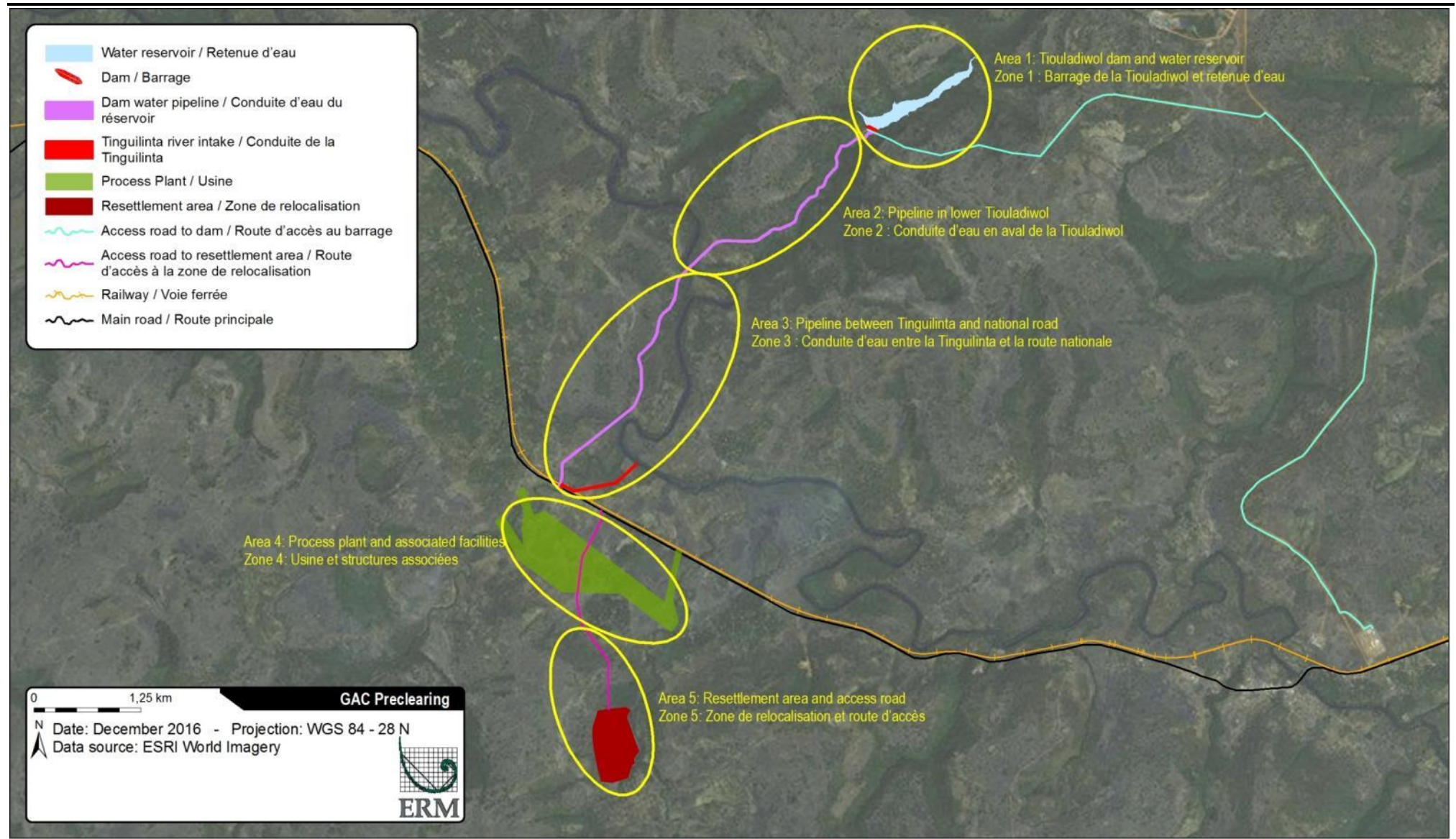
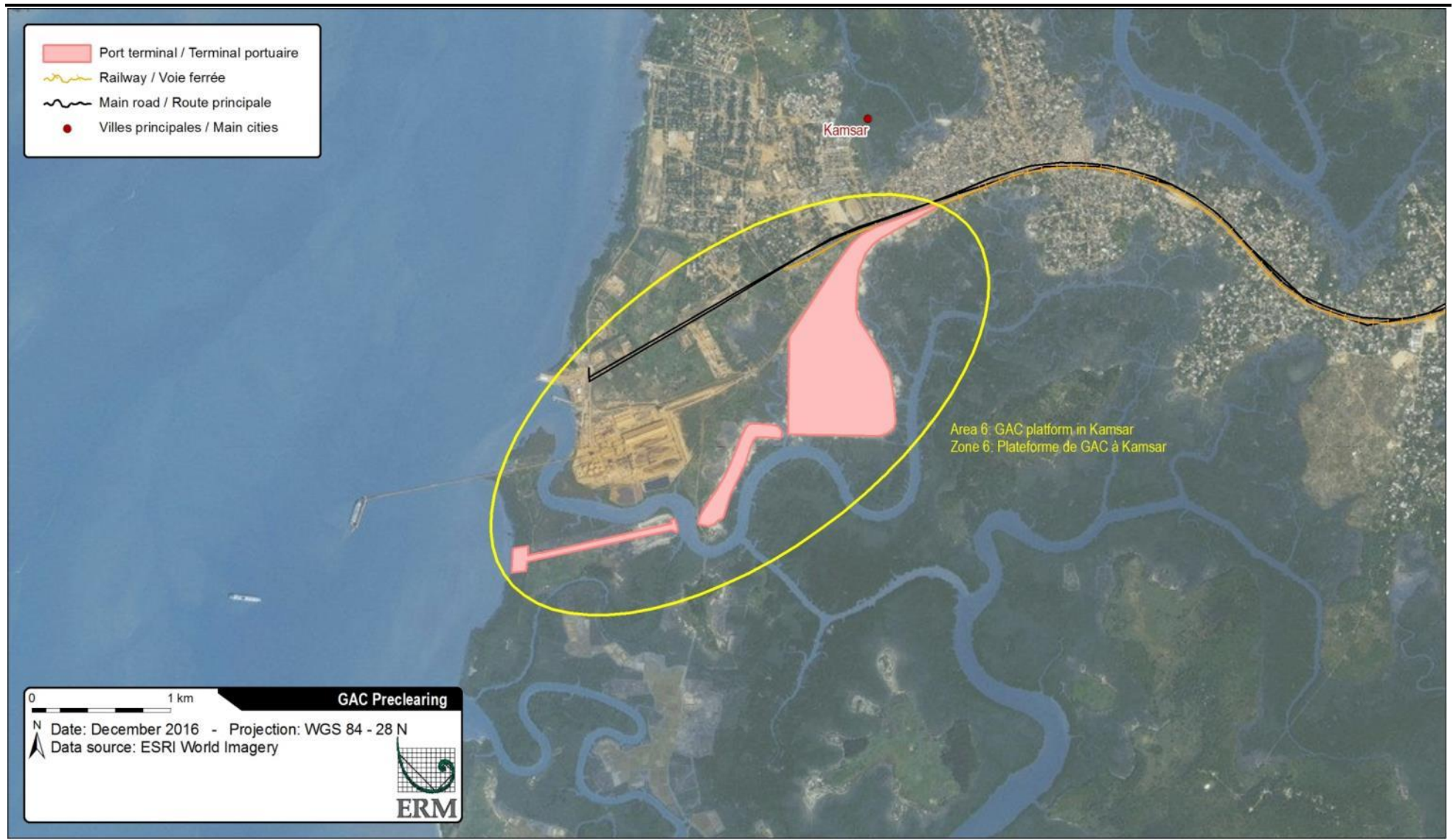


Figure 2.2 Study area - Kamsar (Area 6)



2.3

METHODOLOGICAL DIFFERENCES BETWEEN BASELINE SURVEYS AND PCBS

The aim of PCBS is slightly different from biodiversity surveys that are typically conducted as part of biodiversity baseline surveys for environmental and social impact assessment studies.

Baseline surveys generally focus on wider areas and aim at providing an overview of species and habitats that are present – or potentially present – in the areas of concern, at a larger scale. Hence, during the SEIA Addendum (2015) baseline studies that covered the entire GAC southern concession, only certain selected representative areas and habitat types were surveyed in order to inform on the biodiversity of the entire area (diversity per taxonomic group, main habitat types, most sensitive habitats, sensitive species per habitat type, etc.).

PCBS specifically focus on the areas that will be subject to clearing and their immediate surroundings. What is targeted is not the overall biodiversity of the wider area (already known from previous studies, e.g. SEIA Addendum, 2015), but to determine which are the most sensitive areas in terms of high biological diversity and species of concern (e.g., threatened species, protected species, endemic species), at a finer scale and in a delimited area.

2.4

APPROACHED USED DURING THIS PCBS CAMPAIGN

The survey approach was mainly habitat-based. The surveyors focused more on habitat quality and suitability for species presence (mainly sensitive species) to understand the functioning of the landscape from an ecosystem standpoint. Field observations were integrated with expert-based judgment to provide a comprehensive assessment of the biodiversity features of the area.

The methodology used for each area/group is described below.

2.4.1

Area 1 to Area 5

Under the supervision of ERM staff, a “multi-taxa” team (birds, mammals, plants, herpetofauna) extensively surveyed the entire study areas.

Species presence was determined through direct and indirect observations, discussions with local communities, habitat suitability considerations and previous field surveys in the area. One local guide was used to facilitate accessibility and to obtain information on the presence, location, local name and characteristics of most sensitive species and habitats.

Although each experts group (e.g., botanists, ornithologists, etc.) focused on their taxonomic group of interest (in this case plants, birds, etc.), whenever possible the team would walk together and at similar speed, to ensure interaction between and across groups of experts. By doing so it was possible for a group to inform another group about the presence of a species that

belong to that group. Also, the overall understanding of the study area was enhanced thanks to the findings reported by each group to the entire team. Some images are shown in *Figure 2.3*.

Yet, when deemed necessary, specific mono-taxonomic surveys were conducted by each group of experts when the “multi-taxa” common methodology was deemed less effective. In particular, this was encouraged when there was a possibility for the groups to find species of conservation concern. For instance, when habitats potentially suitable for sensitive reptiles or amphibians were observed, the herpetologists would spend some time on their own until they deemed the area was sufficiently surveyed. Likewise, when well-preserved forest patches were encountered, the mammal’s team would seek indirect signs of chimpanzees on most suitable trees. Some images are shown in *Figure 2.4*.

Figure 2.3 Multi-taxa team working together



Figure 2.4 Taxa-specific surveys conducted by each experts group



To the greatest extent, the team sought to remain within the Project footprint (e.g., walking along the future water pipeline, the future access road, etc.), but surveyed areas included additional zones beyond the accurate footprint, since:

- for accessibility reasons some of the direct footprint areas could not be visited and therefore adjacent areas had to be used as “proxy” to assess habitat type and quality; and
- extending the surveyed area enabled to better understand the ecological structure of the landscape and therefore to grasp the interactions between species and habitats at a larger scale.

Details of day-to-day surveys are provided in *Table 2.1* and tracks are shown in *Figure 2.5* and *Figure 2.6*.

Table 2.1 *Break down of the "multi-taxa" surveys*

Date	Surveyed area
27/11/2016	Reconnaissance Visit - Sinthiourou Tiouladi and Beli Kindy villages
28/11/2016	Area 1: Access road to dam + Tiouladiwol River future water reservoir + Aidé Koba site ⁽¹⁾
29/11/2016	Area 2: Upper water pipeline from dam to Tinguilinta River
30/11/2016	Area 3: Lower water pipeline from Tinguilinta River to process plant
01/12/2016	Area 4: Process plant + Beli Kindy area + Pompowol River + Offtake pipeline from Tinguilinta River to process plant
02/12/2016	Area 4: Balahounwol River Area 5 : Resettlement area + Akunde Tiande village and surrounding area + access road from national road to resettlement area

(1) *Aidé Koba is a well-preserved gallery forest and a sacred site along the Tiouladiwol river (see Section 3.2.1). Additional information can also be found in the Dam SEIA (ERM, 2016a).*

2.4.2 *Area 6 (Kamsar)*

A team composed by an ERM staff, a botanist and an ornithologist surveyed the GAC platform in Kamsar on 30 November 2016. Considering the industrial nature of this area and its surrounding, it was not deemed necessary to mobilize the entire team for this task, but rather to focus on most sensitive biodiversity features (mangroves, water birds). Opportunistic observations on other taxa were annotated.

The survey track is shown in *Figure 2.7*.

Figure 2.5 Survey tracks in Area 1, Area 2 and Area 3

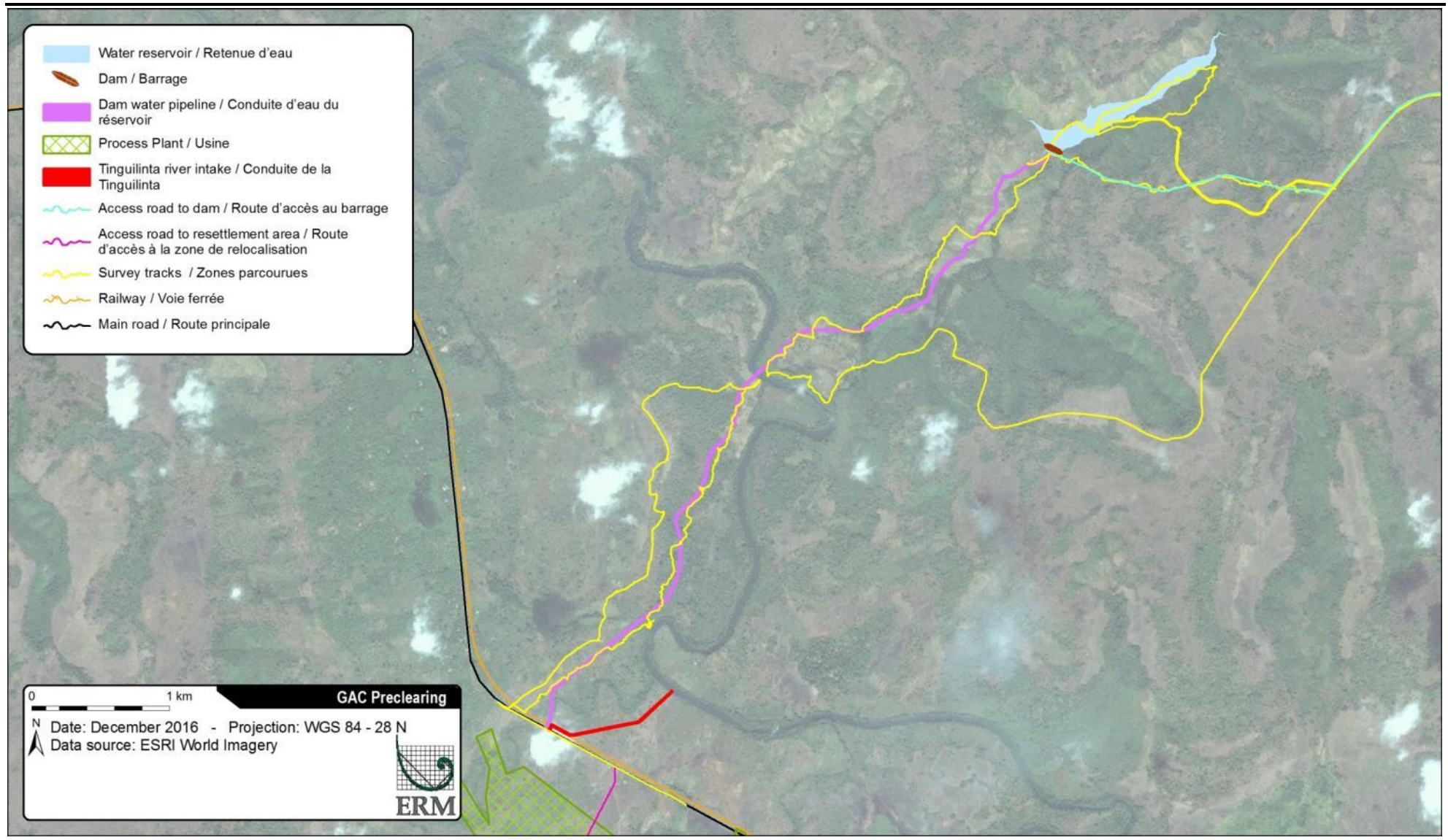


Figure 2.6 Survey tracks in Area 4 and Area 5

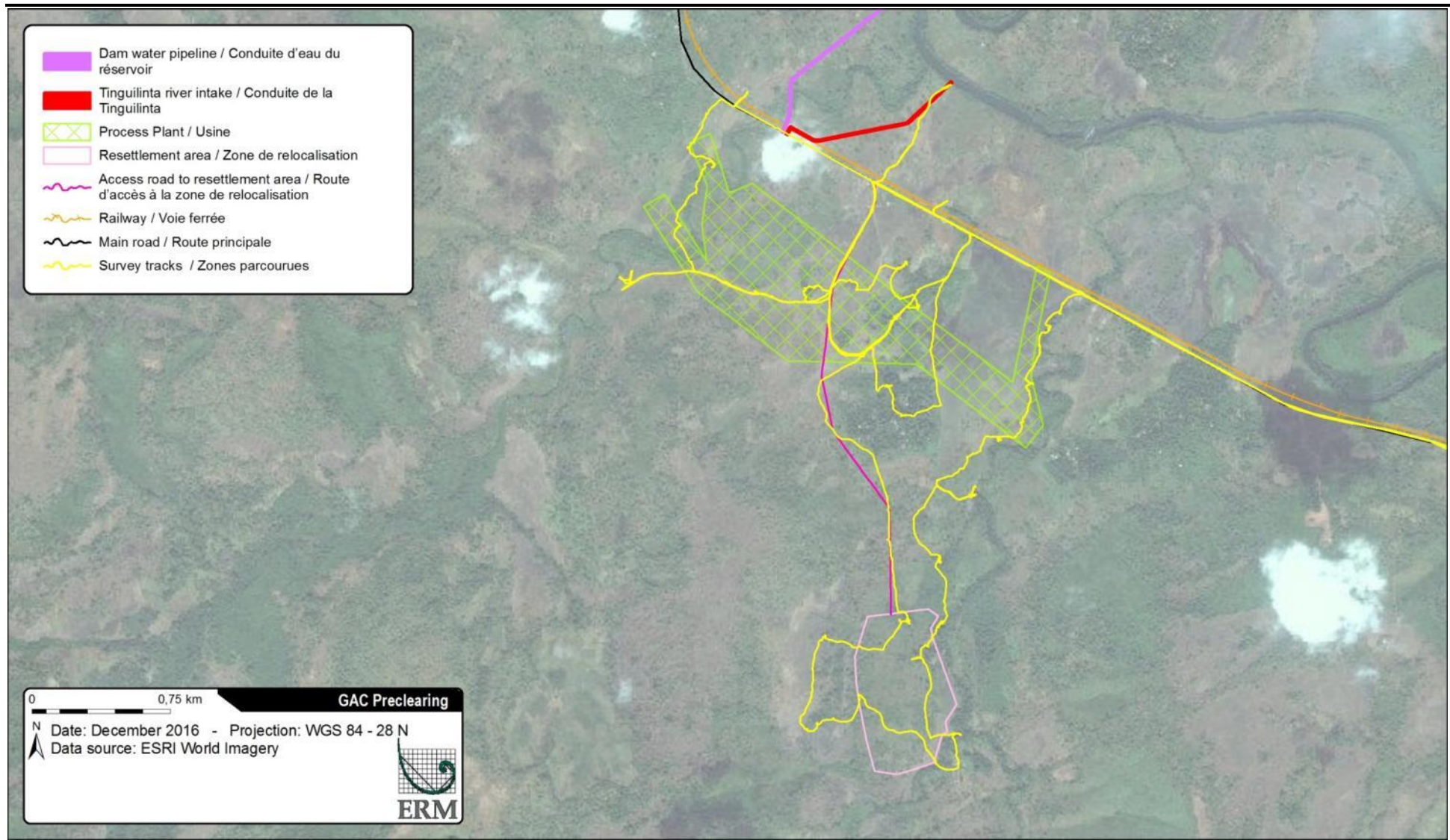


Figure 2.7 Survey tracks in Area 6



2.4.3

Fish survey team

Considering the substantial differences between terrestrial and freshwater biodiversity surveys, the fish team followed a different tailored methodology.

With the support of local fishermen and fisherwomen, the ichthyologists' team conducted fishing activities at chosen locations and with two complementary methods: short net fishing and gill net fishing.

Short net fishing consisted of experienced local fisherwomen walking upwards a portion of the river to catch fish and other freshwater crustaceans by the means of 60-cm large and 30-cm depth round nets, usually made out of mosquito nets. This technique was used during the SEIA Addendum (2015) baseline surveys and for the dam SEIA (2016), and is considered to provide good results for the capture of small fish species (*Figure 2.8*).

Gill net fishing consisted of the deployment of a large meshing net across a given portion of the river. The net is left unattended all night and is retrieved the following morning to gather the fish and crustaceans that got entangled during the night. The net has a mesh size of approximately 35 mm so it is ideal for catching larger species (*Figure 2.9*).

Caught fish were then identified, measured and weighted.

Fishing sites are described in *Table 2.2* and shown in *Figure 2.10*.

Figure 2.8 *Short net fishing*



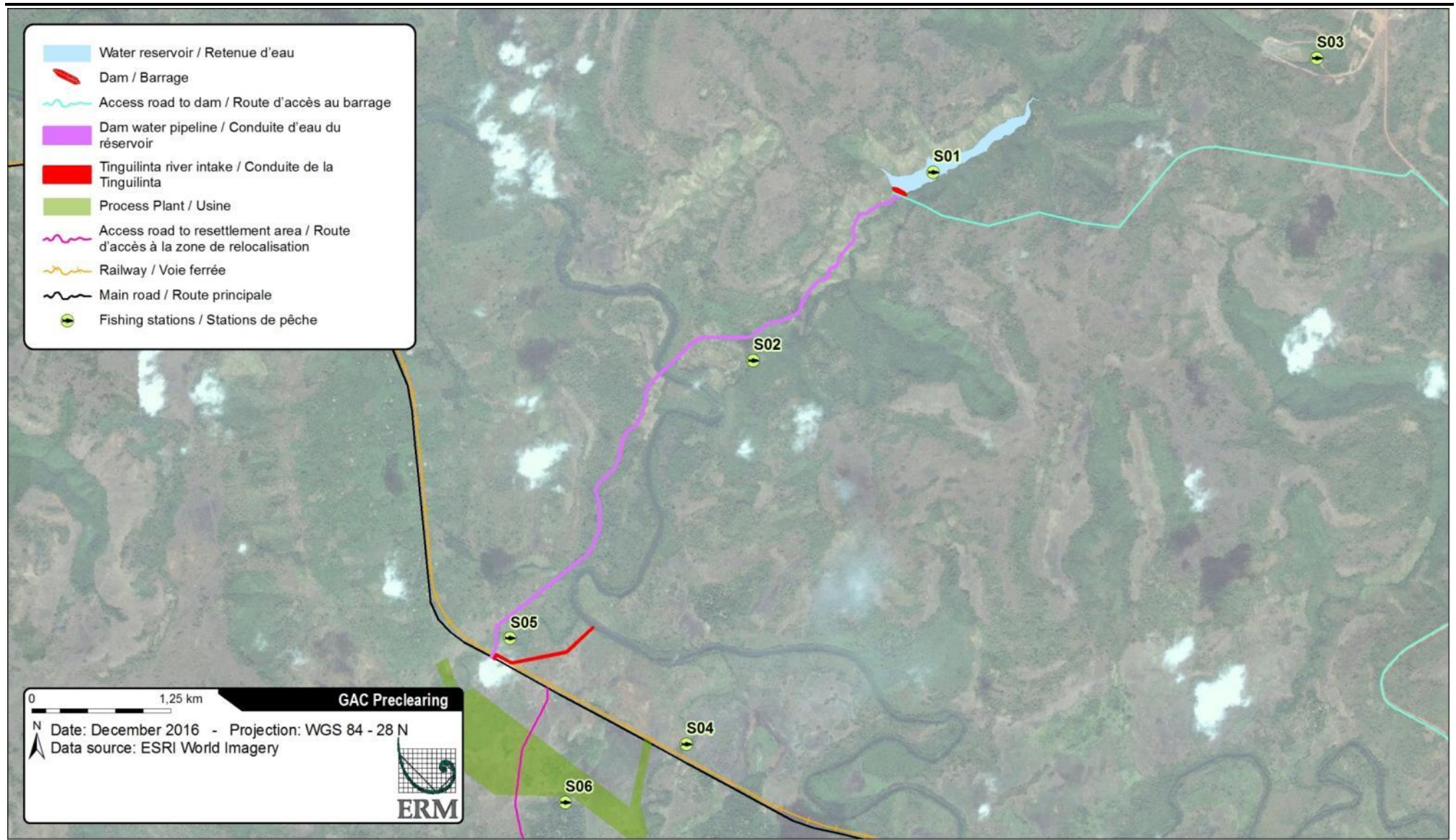
Figure 2.9 Gill net fishing



Table 2.2 Characteristics of fishing sites

N°	Date (2016)	Station / River	Fishing methods	N° of fishing and length	Coordinates WGS84 UTM 28N (m)	
					(N)	(W)
S01	28/11	Middle Tiouladiwol	Gill net	Full night	603173,520	1224570,032
			Short net	1h30m + 45m		
S02	29/11	Lower Tiouladiwol	Gill net	Full night	601551,951	1222872,535
			Short net	1h45m + 25m		
S03	30/11	Upper Tiouladiwol	Short net	1h20 + 45m + 40m	606632,390	1225598,716
S04	01/12	Balahounwol	Gill net	Full night	600947,453	1219410,985
			Short net	1h30 + 45m		
S05	02/12	Pompowol	Gill net	Full night	599359,612	1220364,887
			Short net	1h30m + 45m		
S06	02/12	“Boundou Beli Kindy”	Short net	2h	599856,107	1218885,958

Figure 2.10 Location of fishing stations



2.4.4

Chimpanzee team

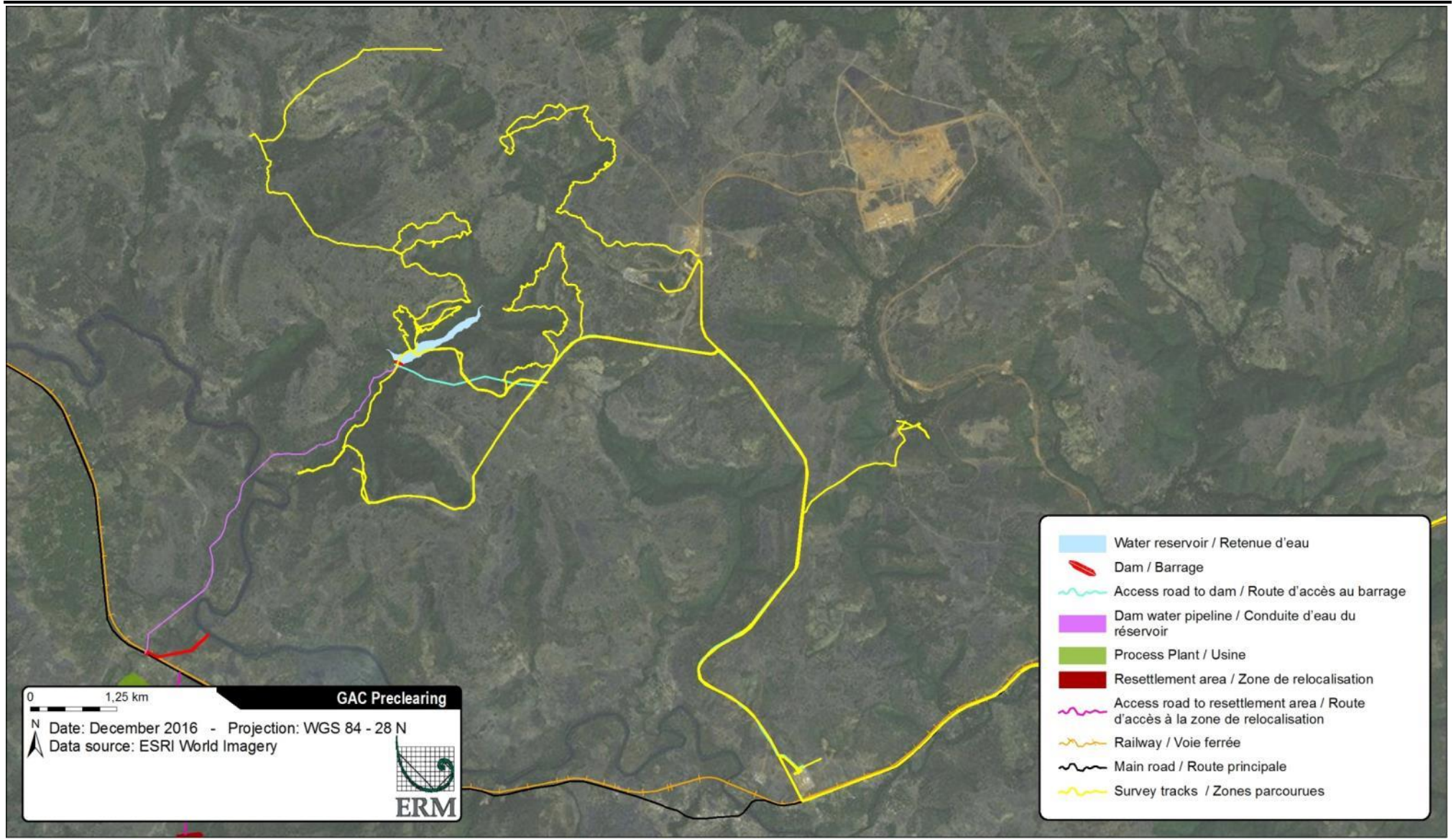
Following IFC's request during the recent IFC/GAC workshop in Paris in November 2016, it was agreed to perform a tailored chimpanzee's survey in the Tiouladiwol valley to thoroughly inform on their potential presence and distribution around the reservoir area and beyond.

While the mammals survey team performed the surveys along with the other teams through the entire study area (Area 1 to Area 5 – see *Section 2.4.1*), the chimpanzees team specifically worked around the Tiouladiwol basin and exclusively focused on chimpanzees.

Collected data included direct observations, calls, nests, food leftovers, indirect signs of passage, etc. Inquiries with local communities were also conducted to obtain information on historical presence, population size and animal behaviours.

The survey track of the chimpanzee team is shown in *Figure 2.11*.

Figure 2.11 Survey tracks of the chimpanzee team



To facilitate the analysis, results are grouped by areas (from Area 1 to Area 6, see *Section 2.2*). For each area, an overview of the main findings is provided and the main sensitivities are highlighted. Detailed taxa-specific collected data are provided in Annex 1 (*Section 6*): flora (*Table 6.1*), herpetofauna (*Table 6.2*), mammals (*Table 6.3*), birds (*Table 6.4*) and fish (*Table 6.5*).

Since the chimpanzee team specifically focused on the Tiouladiwol basin, their findings are presented in *Section 3.1.3*. Specific results on fish biodiversity are provided in *Section 3.1.4* and *Section 3.3.3*.

3.1 AREA 1 – TIOULADIWOL WATER RESERVOIR

3.1.1 Access road to the dam

Habitats

The future access road to the dam will depart from the existing trail that goes to the village of Sinthiourou Tiouladi. It will mainly cross natural habitats of mixed savanna, including grassy savanna (bowal), wooded savanna and brush savanna. Some sensitive habitats are crossed by the road as it reaches the wooded crest of the Tiouladiwol valley. The road then goes down to the river bottom through the valley slopes which are under fallow land (crop rotation system). It ultimately reaches the river bottom and its palm-dominated gallery forest.

A more detailed break-down of the habitats crossed by the road is provided in *Table 3.1*.

Fauna

No major findings were recorded, but some chimpanzee's calls were heard several times from the other side of the valley (see *Section 3.1.3*). A number of indirect signs of mammals, including wild pigs and ungulate, were recorded mainly in grassy and shrub savanna. No sensitive herpetofauna species were recorded, although the dense thicket found around "Boundou Djolol" headwater is a potentially suitable habitat for sensitive species (see *Table 3.1*).

Sensitivity assessment

A biodiversity sensitivity assessment of the habitats that will be impacted by the future dam access road is provided in *Table 3.1*. Their location is shown in *Figure 3.8*.

Table 3.1 *Sensitivity assessment of habitats that will be crossed by the dam access road*

Code	Habitat type	Description	Figure	Biodiversity sensitivity
AR01	Bowal	Presence of scattered trees in the bowal.	Figure 3.1	Low
AR02	Wooded area	Some large trees along the road footprint.	Figure 3.2	Medium
AR03	Bowal	Grassy savanna.	-	Low
AR04	Wooded area	Some large trees, including a big <i>Erythrophyllum guineensis</i> .	-	Medium
AR05	Headwater gallery / Dense thicket	The road will cross a headwater (Boundou Djolol) - Communities reported that surface water flows during wet season - Suitable habitat for sensitive herpetofauna species?	Figure 3.3	High
AR06	Bowal	Grassy savanna.	-	Low
AR07	Mixed savanna	Wooded and brush savanna.	Figure 3.4	Medium
AR08	Wooded area	Large trees on valley crest. Suitable habitats for chimpanzees.	Figure 3.5	High
AR09	Fallow land	Old farmland (crop rotation system).	Figure 3.6	Low
AR10	Gallery forest	Dominated by palm trees – degraded.	Figure 3.7	Medium

(1) *The biodiversity sensitivity rate is based on a qualitative assessment which takes into account the ecological value of the habitat (by itself and in relation to the wider ecosystem) the species of concern that can be present in it.*

Figure 3.1 *Bowal habitat (AR01)*



Figure 3.2 *Wooded savanna (AR02)*



Figure 3.3 *“Boundou Djolol” headwater (AR05)*



Figure 3.4 *Wooded savanna (AR07)*



Figure 3.5 *Wooded area on the valley crest (AR08)*



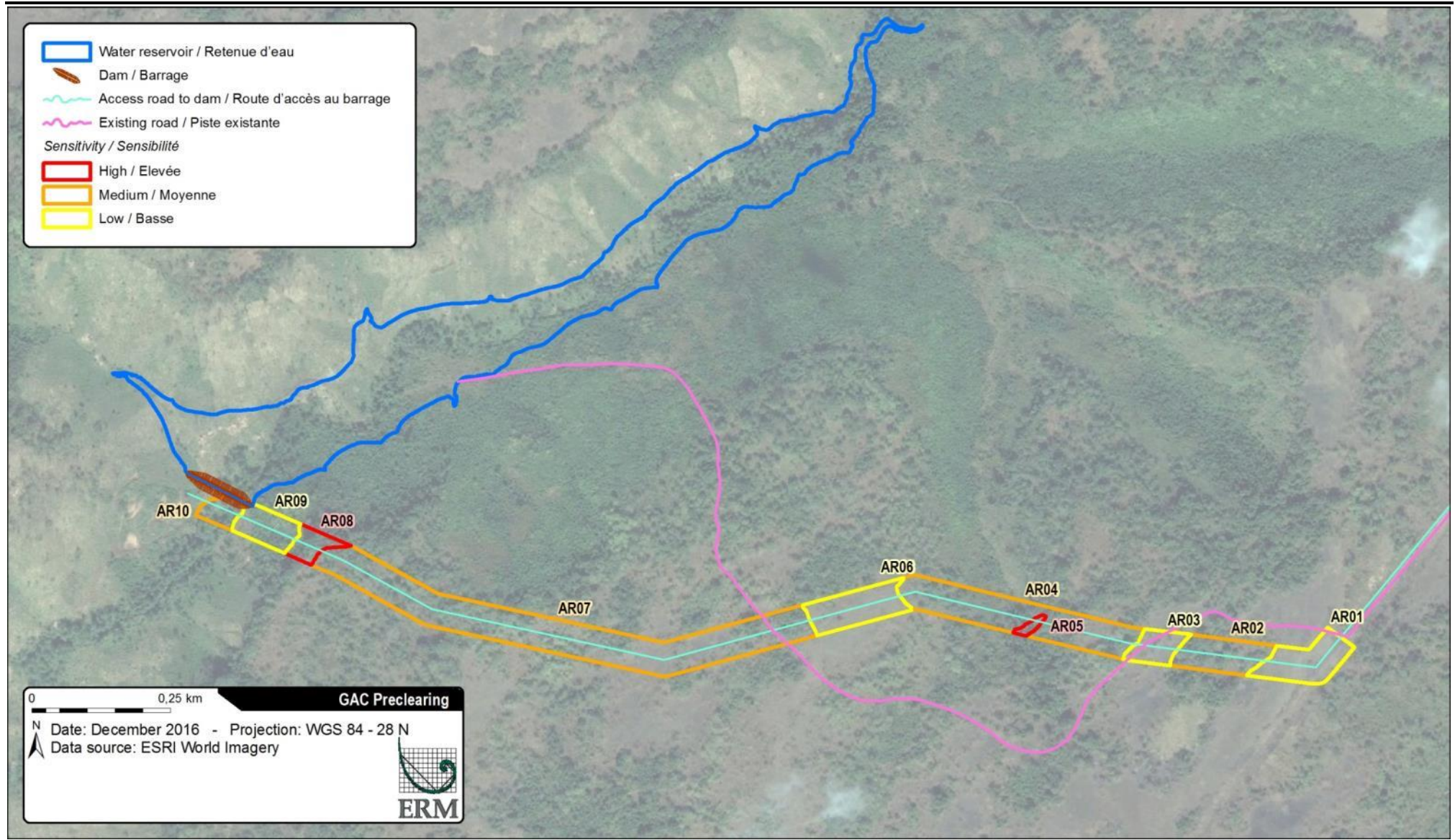
Figure 3.6 Fallow land on valley slopes (AR09)



Figure 3.7 Gallery forest - intersection between access road and dam (AR10)



Figure 3.8 Map of the sensitivities identified along the dam access road (Area 1)



Previous Dam SEIA

The Tiouladiwol water reservoir was surveyed during the field campaigns conducted in January 2016 as part of the Updated Dam SEIA (ERM, 2016a). During those campaigns, systematic taxa-specific surveys were conducted for birds, flora, reptiles and amphibians and a habitat classification map was produced (Figure 3.9).

Since the overall biodiversity of the middle Tiouladiwol was already known prior to this field campaign, this PCBS aimed at providing an additional qualitative assessment of the reservoir area through opportunistic spotting and multi-taxa surveys at selected locations along the gallery forest (e.g. Aidé Koba).

Habitats

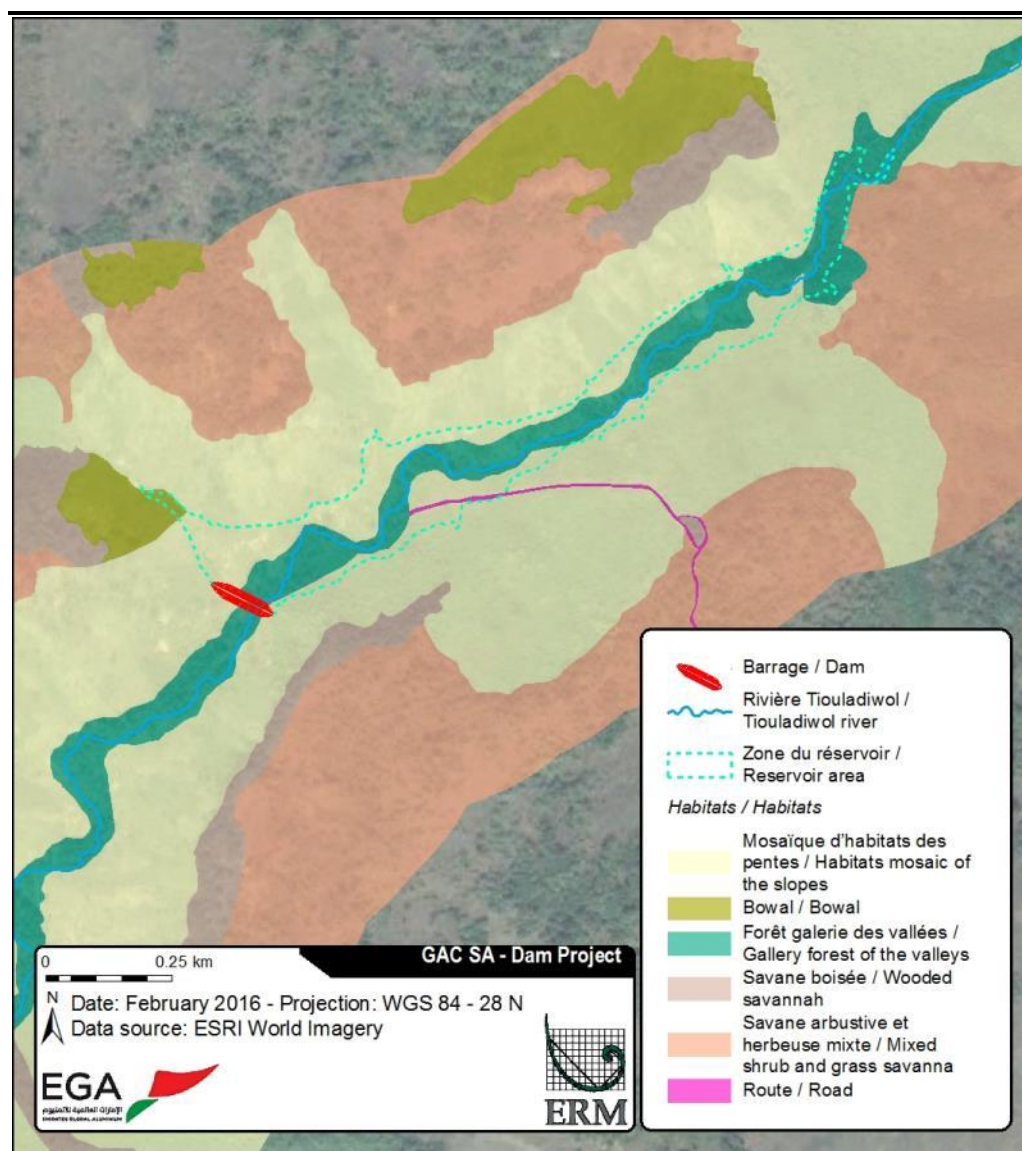
About one half of the habitat that will be lost due to reservoir flooding consists of gallery forests, and approximately the other half is agricultural mosaics of the slopes, which include fallow land, thicket, crops and patches of tree and shrubby savanna (For further details see Section 6.8.2 of ERM, 2016a).

Overall, the middle Tiouladiwol valley is a relatively degraded gallery forest, dominated by palm trees (*Elaeis guineensis*) and used by local communities for agricultural purposes (fallow land plantations on the valley slopes, palm oil production in the valley bottom).

Nonetheless, a number of natural plant species are found along the gallery forest (108 species belonging to 45 families were identified during the systematic surveys conducted in November 2015 as part of the Dam SEIA – ERM, 2016b). Among these species, 3 are considered vulnerable (VU) by the IUCN red list: *Mitragyna stipulosa*, *Khaya senegalensis* and *Azalia Africana*.

In particular, a portion of the central gallery forest named Aidé Koba is well preserved and has an important cultural value for local communities. A photo of the site is shown in Figure 3.12 and the location within the valley is shown in Figure 3.9. Further details are provided in ERM, 2016a.

Figure 3.9 Habitat classification in the reservoir area (Dam SEIA)



Source: ERM, 2016a

For a more detailed analysis of habitat classification and mapping, see the aerial survey report from *Sylvatrop Consulting (2017)*, provided in Annex 2 of this document.

Fauna

No birds or herpetofauna species of concern were surveyed in the reservoir area. Local people reported that a small species of crocodile dwells in the Tiouladiwol and can be observed at night. This is arguably the West African Dwarf Crocodile (*Osteolaemus tetraspis*), vulnerable (VU) according to the IUCN, whose presence was confirmed in the small headwater of “Boundou Beli Kindy” in Area 4 (see Section 3.3.1)

Several direct and indirect chimpanzee signs were recorded (sightings, calls, palm tree branch used by the chimpanzees) by the mammals experts within the middle Tiouladiwol valley and on the valley slopes. These findings are

integrated with the ones of the chimpanzee’s team and discussed in *Section 3.1.3* hereafter.

Sensitivity assessment

A biodiversity sensitivity assessment of the habitats that will be flooded by the Tiouladiwol water reservoir is provided in *Table 3.5*. Their location is shown in *Figure 3.13*.

Table 3.2 *Sensitivity assessment of habitats that will be flooded by the water reservoir*

Code	Habitat type	Description	Figure	Biodiversity sensitivity
WR01	Gallery forest	Degraded and dominated by palm trees. Human pressure.	Figure 3.10	Medium
WR02	Mosaics of the slopes	Dense fallow land (crop rotation system) on valley slopes.	Figure 3.11	Low
WR03	Preserved gallery forest	Aide Koba sacred site on Tiouladiwol upper reservoir	Figure 3.12	High

Based on the aerial survey conducted by *Sylvatrop Consulting (2017)*, the breakdown of habitat loss due to the creation of the dam and water reservoir is as follows:

- 12,4 ha of gallery forest;
- 15,9 ha of mosaics of the slopes; and
- 46% of Aidé Koba sacred forest.

More details can be seen in the full report provided in Annexe 2.

Figure 3.10 *Palm-dominated gallery forest along the Tiouladiwol river (WR01)*



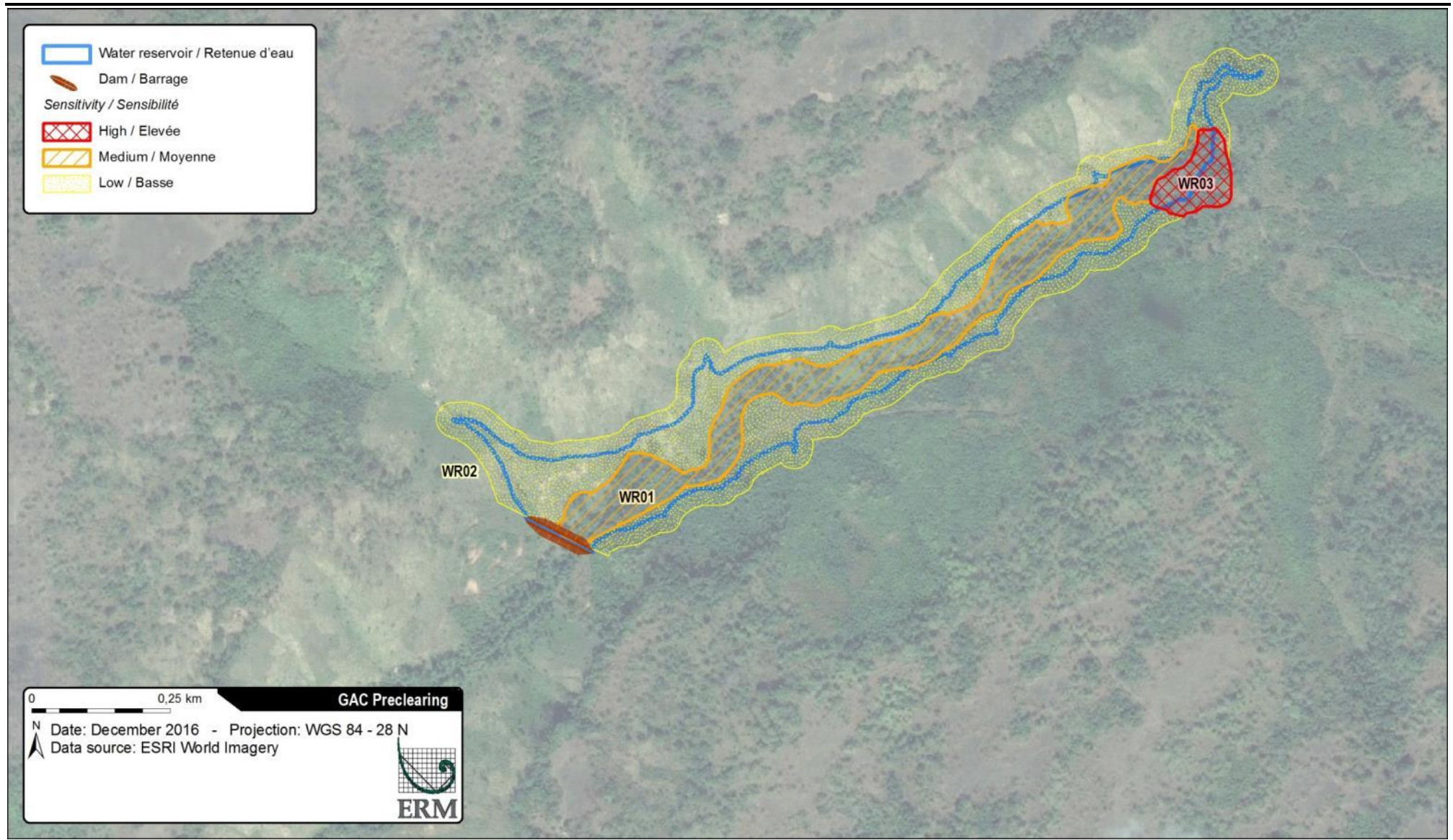
Figure 3.11 Fallow land on valley slopes (WR02)



Figure 3.12 Aidé Koba well-preserved gallery forest (WR03)



Figure 3.13 Map of the sensitivities identified in the Tiouladiwol water reservoir (Area 1)



3.1.3

Chimpanzees

Context

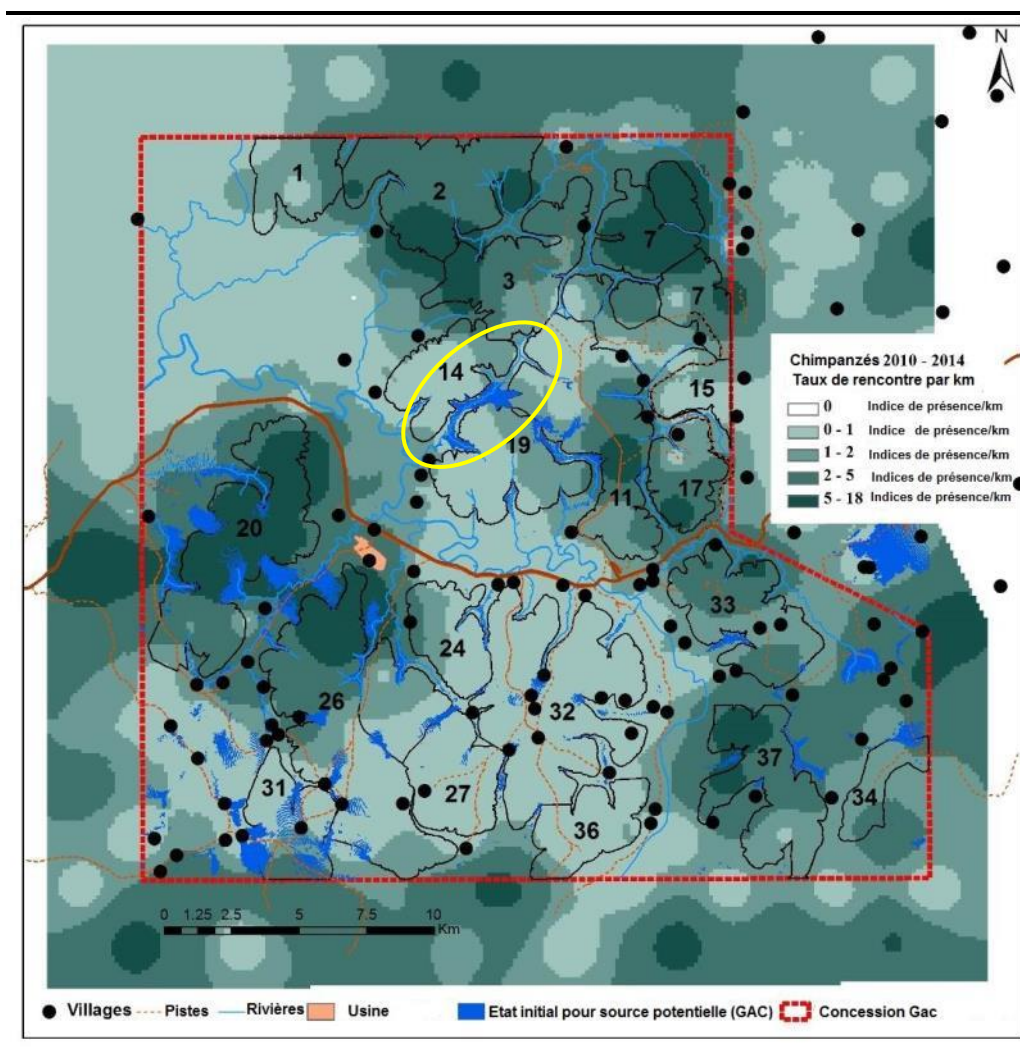
The Western Chimpanzee (*Pan troglodytes verus*) is listed as critically endangered (CR) by the International Union for Conservation of Nature (IUCN) Red List since 2016 ¹.

Within the GAC concession boundaries (c. 685 km²), the population of chimpanzees has been estimated at 147 individuals (based on average yearly monitoring between 2010 and 2014 undertaken by the Wild Chimpanzee Foundation, WCF). As the boundary of the concession cannot reflect the chimpanzee group limits and that chimpanzee groups possess overlapping territories with neighboring groups, the areas bordering the concession should also be considered, for a total area of 1,050 km². The Standard Deviation expresses the precision of the method and thus provides the maximum and minimum interval within which with 95% probability the real number lays. Thus, on average for the past 4 years, it can be considered that between 186 and 289 individuals were living in the GAC concession. (WCF, 2015). These numbers are a large range estimation, but they highlight the sensitivity of the GAC concession for this (sub)species. During these monitoring activities, chimpanzee's encounter rates in the Tiouladiwol valley was relatively low compared to other areas (Figure 3.14).

Also, during the biodiversity baseline studies conducted as part of the dam ESIA update (ERM, 2016a), no specific signs of chimpanzees were recorded and several interviewed local villagers suggested that chimpanzees were no longer present in the Tiouladiwol valley.

¹ <http://www.iucnredlist.org/details/15935/0> - visited in December 2016

Figure 3.14 Chimpanzee encounter rates recorded during WCF's 2010-2014 monitoring campaign in GAC's concession



Source: WCF, 2015

Note: in yellow the location of the Tiouladiwol reservoir

The field mission conducted as part of this PCBS allowed gathering further field information for clarifying the sensitivity of the Tiouladiwol valley and its surroundings with regards to chimpanzees.

This section covers the findings collected for the wider Tiouladiwol area (Tiouladiwol valley + surroundings). It includes and integrates the results obtained during:

- the systematic surveys of the chimpanzee’s team, who inventoried the Tiouladiwol area and its surroundings between 28/11 and 02/12 (5 days);
- the opportunistic encounters of the “multi-taxa” team (in which there were two mammals experts), who visited part of the middle and lower Tiouladiwol during on 28/11 and 29/11 (2 days); and

- interviews conducted by the chimpanzee’s team experts with selected villagers from Sinthiourou Tiouladi, Mobhi and Parawi.

Whenever possible and for the sake of cross-checking coherence between two independent studies, the main findings of *Sylvatrop Consulting (2017)* aerial survey are taken into consideration. During this study, a wider areas was systematically surveyed with a drone and a number of nests were identified on the top of the canopy. For the detailed methodology, analysis and findings, see the full report provided in Annexe 2 of this document.

Survey results

Many direct and indirect observations of chimpanzees were recorded during the field visit in the Tiouladiwol area and beyond (*Figure 3.18*).

Direct observations

A group of approximately 10 individuals was observed at a distance of about 500 m by both the chimpanzee’s team and the multi-taxa team on large trees located on the top of the valley crest at the level of the upper reservoir (*Figure 3.15*). Their call could be heard from the other side of the valley. From that distance, the precise size of the group could not be gauged.

Figure 3.15 *Large trees on the top of the Tiouladiwol valley north crest (upper reservoir) where chimpanzees were observed*



Nests

At least 16 nesting sites were recorded for a total of 187 nests of different stages. These include:

- 21 nests of level I;
- 20 nests of level II;
- 107 nests of level III; and

- 39 nests of level IV.

A description of each nest degradation stage is provided in *Table 3.3* and some pictures are shown in *Figure 3.16*.

Table 3.3 *Commonly used classification for chimpanzee's nest stages*

Stage n°	Name	N° of nests observed	Stage description	Age (approx.) ⁽¹⁾
I	Very fresh nest	21	All nest leaves are green, presence of odorous droppings and urine below the nest (e.g., presence of flies)	A couple of days ⁽²⁾
II	Fresh nest	20	Majority of nest leaves are still green, but droppings/urine are degraded and no longer odorous	Several days
III	Old nest	107	Nest leaves are no longer green, but the nest kept its original shape	Few weeks to few months
IV	Very old nest	39	No more leaves, but the nest shape can be roughly distinguished thanks to branches	Several months

(1): The age of the nest depends very much on local conditions such as climate, tree species, precise location of the nest, exposition to radiation/precipitation, etc. It can only be determined through a case-by-case analysis. Chimpanzees tend to move and change nest locations every night but under particularly good conditions they can stay a few nights in the same site.

Figure 3.16 *Different stages of chimpanzees nests (II on the left, IV on the right)*



The tree species on which nests were found include mainly *Erythrophleum guineense*, *Parkia biglobosa*, *Parinari excelsa* and *Cola cordifolia*, but also *Azelia africana*, *Anisophyllea laurina*, *Albizia zygia*, *Dialium guineense*, *Markhamia tomentosa*, *Vitex doniana*, *Terminalia sp.*, *Spondias sp.*, and *Sterculia sp.*

Habitat types where nests were observed were mainly woodlands on the valley crest, at the edge between the valley slope and the plateau.

Other indirect observations

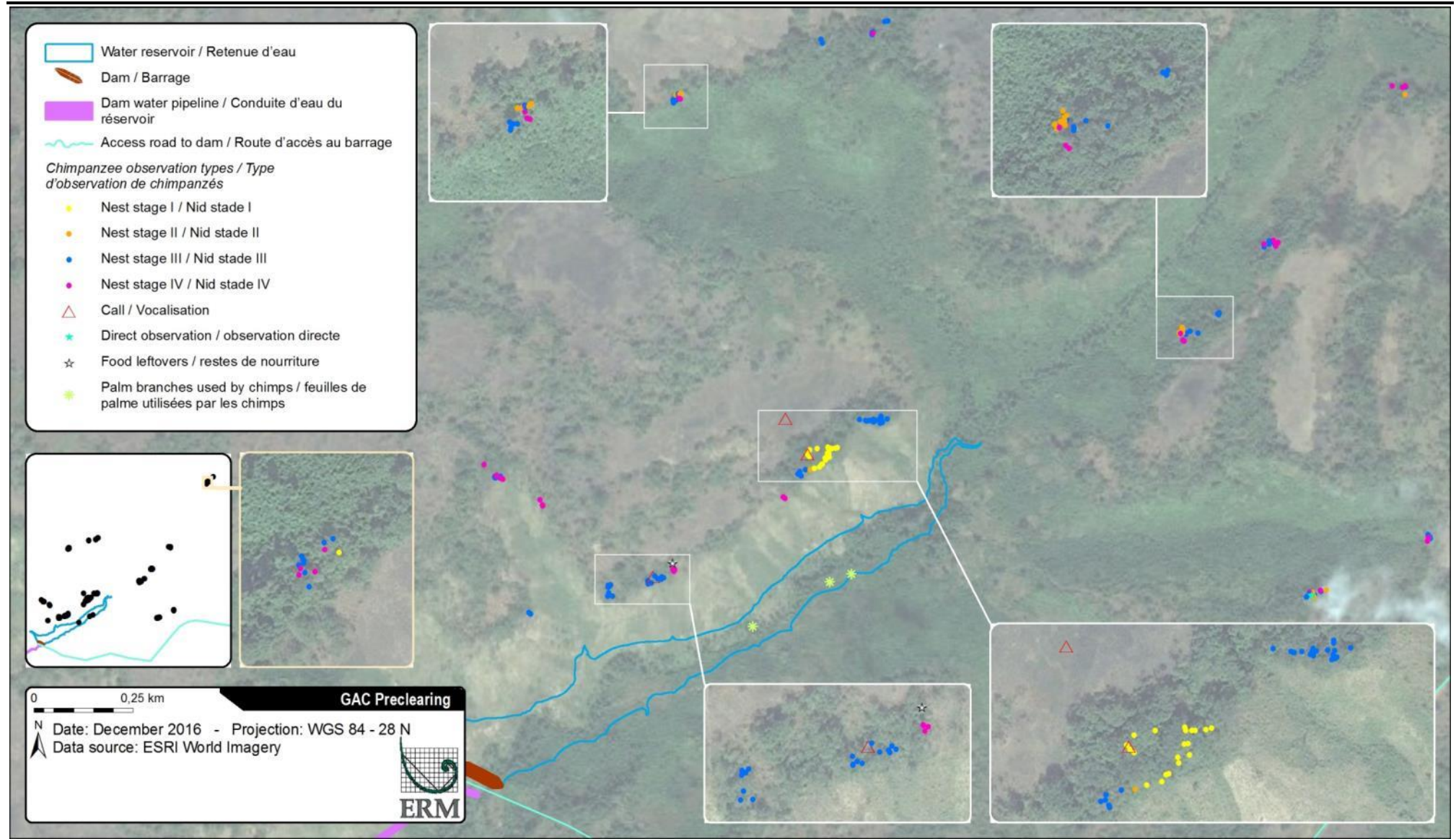
In addition, other indirect sightings of chimpanzees were recorded during the mission, including:

- food leftovers, in wooded area on the top of the middle Tiouladiwol valley crest (same location as where the group was observed) and in the Tiouladiwol gallery forest within the reservoir footprint; and
- palm tree branches used by chimpanzees for sugary palm sap consumption, in the Tiouladiwol gallery forest within the reservoir footprint, some of which seem to have been used the same day of the survey (*Figure 3.17*).

Figure 3.17 Palm tree branches used by chimpanzees for palm sap consumption



Figure 3.18 Direct and indirect signs of chimpanzees recorded during the field visit



Comparison with Sylvatrop (2017) findings

These results are coherent with *Sylvatrop (2017)* aerial survey findings.

In *Sylvatrop (2017)* study, 506 nests and 97 potential nests were recorded, mainly in the tree lines on the top of the valley slopes (both sides), in woodland habitats on the plateaus and on in the mosaics habitats of the slopes (see *Figure 20* and *Figure 21* in Annexe 2 of this document).

Some nests were identified on gallery forest habitats within the water reservoir future footprint, particularly in Aidé Koba sacred site.

Results interpretation

In light of these findings and of the qualitative information collected through interviews with local communities, the following considerations can be made:

- An estimated number of at least 10 individuals occurred in the Tiouladiwol valley area during the surveys. This is only an estimation based on the cross-checking of the different sighting sources (e.g., direct signs, indirect observations, aerial survey, and expert judgement) and the precise number cannot be determined at this stage. Whether these chimpanzees belong to one group, to several groups, or to several sub-groups within the main group is unclear. Likewise, whether these chimpanzees are “permanent residents” of the Tiouladiwol valley is unclear given the relatively small territory area represented by the study area. Further surveys in the areas surrounding the Tiouladiwol valley would be needed to estimate population numbers and their territory range in this part of the concession.
- They mainly nest on large trees on both sides of the Tiouladiwol valley, at various locations and in different habitat types, both upstream and downstream of the future water reservoir. Even though many nesting sites were recorded on the valley crest tree lines, a number of nests have also been recorded in the mosaics of the slopes and in the gallery forest within the water reservoir future footprint. There seem to have a predilection for the northern side of the valley, possibly for better habitat conditions.
- Chimpanzees regularly change nesting sites and they move around the area along various habitat types to look for food (e.g., fruits, palm tree sugar), including the gallery forest of the Tiouladiwol river. The fact that many nests of different degradation stages have been observed at the same location suggests that suitable nesting sites are regularly used by the group.
- Chimpanzees are reportedly seen close to villages’ plantations eating fruits (e.g., mangos, pineapple, oranges, etc.). This seems to be related to the fact that local people no longer hunt chimpanzees since environmental

awareness activities have been carried out in the area. “Fruit theft” by chimpanzees is considered an issue of concern by villagers.

- Land clearing for agricultural purposes is a deterrent for chimpanzees’ presence. This explains the more numerous chimpanzees sighting along the middle Tiouladiwol River, which is currently not under cultivation, with extensive vegetation regrowth due to fallow land rotation.
- Based on the aerial survey undertaken by *Sylvatrop (2017)*, nests were recorded in the forest of Aidé Koba. Also, according to interviewed villagers, Aidé Koba appears to be an area of predilection for chimpanzees because of food abundance (fruits), preserved habitats and limited human presence.

3.1.4 Fish biodiversity (Tiouladiwol basin)

The results of fishing activities conducted in the three locations of the Tiouladiwol River are shown in Table 3.4. The detailed list of species is provided in Table 6.5 (Annex 1).

Table 3.4 Results of fishing activities conducted in the Tiouladiwol

St.	Tot. n° of ind.	N° of sp.	Most abundant species ⁽¹⁾	Species of concern (IUCN red list)
S01	51	15 fish + 1 crab	<i>Brienomyrus brachyisteus</i> (13), <i>Ctenopoma kingsleyae</i> (7), <i>Marcusenius thomasi</i> (6), <i>Barbus macrops</i> (5)	-
S02	92	13 fish + 1 crab	<i>Epiplatys fasciolatus</i> (28), <i>Ctenopoma kingsleyae</i> (20), <i>Brienomyrus brachyisteus</i> (9), <i>Paramphilius teugelsi</i> (9), <i>Chrysichthys nigrodigitatus</i> (7), <i>Epiplatys bifasciatus</i> (7)	<i>Paramphilius teugelsi</i> (VU)
S03	1356	5 fish + 1 crab	<i>Barbus raimbaulti</i> (567), <i>Barbus macrops</i> (485), <i>Barbus pobguini</i> (297)	-

Note: st.=station; ind.=individuals; tot.=total; sp.=species; VU=vulnerable (IUCN red list).

(1) More than 5 fished individuals.

These results are consistent with the results of the Dam ESIA baseline surveys (see *ERM 2015a*). Some species that were collected during that study have not been found during this mission, and *vice versa*. Also, for a number of taxa, identification issues are common, therefore precaution is needed when it comes to providing the detailed list of inventoried species.

Among the species of potential concern collected during the mission, the most sensitive one is *Paramphilius teugelsi*. This species was not collected during the Dam ESIA but its potential presence was mentioned.

A qualitative appraisal of the Tiouladiwol sensitivity and of the impacts related to the creation of the water reservoir is provided in the Dam ESIA and remains valid for this study.

3.1.5 Overview of high sensitivities identified in Area 1

High sensitivities identified in Area 1 are listed in Table 3.5.

Table 3.5 High sensitivities identified in Area 1

Code	Name	Description	Within Project footprint? ⁽¹⁾
AR05	Boundou Djolol	Headwater and associated dense thicket habitat.	Inside (AR)
AR08	-	Wooded area on the valley crest.	Inside (AR)
WR03	Aidé Koba	Well-preserved gallery forest in the middle Tiouladiwol.	Inside (RE)

(1) See Figure 3.8 and Figure 3.13. AR=access road to the dam; RE=water reservoir.

In addition, with regards to chimpanzees, the whole Tiouladiwol basin can be considered of high sensitivity. Wooded areas along valley crests and on the surrounding plateaus are particularly important because they represent suitable nesting sites for this species.

3.2 *AREA 2 AND AREA 3 – WATER PIPELINE*

3.2.1 *Area 2 - Water pipeline between the dam and the Tinguilinta River*

Habitats

The section of the water pipeline between the dam and the Tinguilinta will be routed across the valley slopes until approximately the village of Sinthiourou Tiouladi. Towards the dam, the valley slopes are made of fallow land / thickets of various ages depending on the crop rotation calendar. Some areas (thickets) seem to have been out of cultivation for years. These habitats cover almost the entire footprint of the pipeline.

Towards the downstream part of the valley, the pipeline will mainly cross young cashew nut plantations, which are significantly expanding due to governmental incentives in the Boké region. On overall, these habitats are of low biodiversity sensitivity, except at one location where a sacred cave has been observed onsite. The tree lines that cover the valley crest are potential nesting sites for chimpanzees (nests have been observed upstream, close to the reservoir – see *Section 3.1.3*) but are not within the direct footprint of the water pipeline.

Around Sinthiourou Tiouladi, the pipeline will cross young cashew nut plantations, where natural trees have been eliminated by farmers to enhance crop production through the “suffocation” technique by cutting a circular belt around the trunk bark which eventually leads to the tree’s death (see *Figure 3.19*). Other crops are planted (e.g., cassava).

In the vicinities of the Tinguilinta, on the foot of the hill slope, the pipeline crosses some mixed savanna habitats with scattered large trees. Along the Tinguilinta, a thin gallery forest is present, with some large trees on the river banks.

Figure 3.19 "Suffocated" tree for farming purposes



Fauna

No fauna species of concern has been recorded in this area during the field visit. This is coherent with the overall modified nature of the area. The only sites where potential sensitive animal species could be found are the few high sensitivity habitats identified; this is the sacred cave on the valley slope, the gallery forest along the Tinguilinta and the small protected forest patch outside the project footprint (cemetery).

Table 3.6 *Sensitivity assessment of habitats that will be impacted by the water pipeline between the dam and the Tinguilinta river*

Code	Habitat type	Description	Figure	Biodiversity sensitivity
LT01	Fallow land / thicket	Variable age depending on crop rotation calendar	Figure 3.20	Low
LT02	Plantations	Mainly recent cashew nut plantations, but also other crops (e.g., cassava). It covers almost the entire future clearing area until the Tinguilinta. Some scattered trees can be observed.	Figure 3.21	Low
LT03	Wooded area	Sacred cave of "Panmehou", untouched by local communities	Figure 3.22	High
LT04	Wooded area	Tree line on the valley crest	Figure 3.23	Medium
LT05	Wooded savanna	Grassland with scattered trees	Figure 3.24	Medium
LT06	Wooded area	Large trees of <i>Parkia biglobosa</i> and <i>Prosopis africana</i>	Figure 3.25	Medium
LT07	Gallery forest	Gallery forest along the Tinguilinta, with scattered large trees	Figure 3.26	High
LT08	Forest patch	Small protected forest patch (cemetery). Not within the direct footprint.	-	High

Figure 3.20 *Fallow land / thicket along the future water pipeline towards the dam (LT01)*

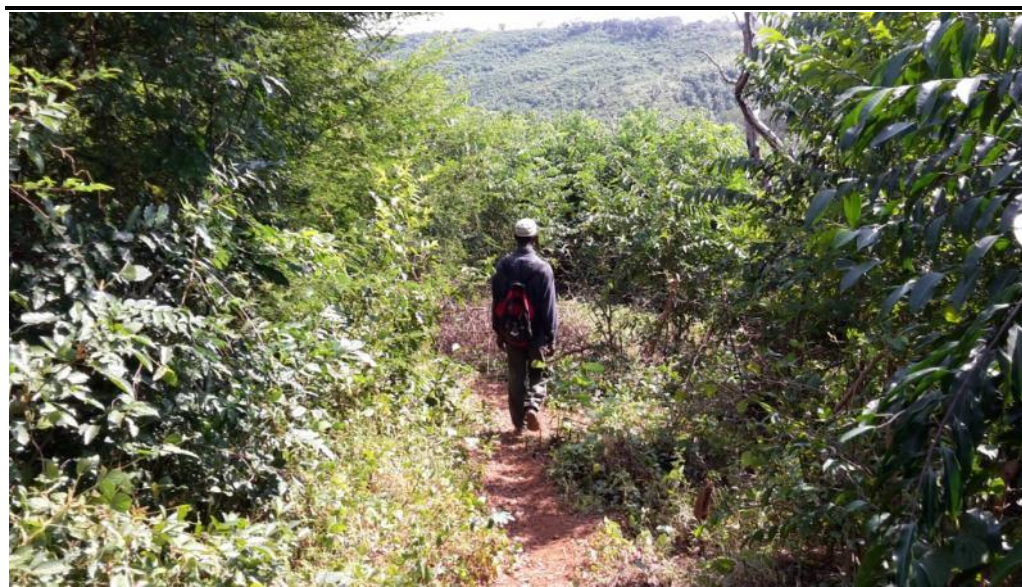


Figure 3.21 Plantations cover the majority of the habitats of valley slopes (LT02)



Note: dominant plantations are cashew nuts (top), but also other crops such as cassava (bottom).

Figure 3.22 Sacred cave of "Panmehou" on the valley slopes (LT03)



Figure 3.23 Tree line on the valley crest (LT04)



Figure 3.24 **Wooded savanna on the foot of the hill slope close to Sinthiourou Tiouladi (LT05)**



Figure 3.25 **Large trees close to the future water pipeline (LT06)**



Figure 3.26 *Large Erythrophyllum guineensis* along the Tinguilinta gallery forest (LT07)



Figure 3.27 Map of the sensitivities identified along the future water pipeline between the dam and the Tinguilinta River (Area 2)



Habitats

The area to be cleared for the installation of the water pipeline between the Tinguilinta and the national road is flat and heterogeneous. Along almost the entire pipeline route, vegetation is a mixture of natural wooded savanna, old plantations transformed into fallow lands and thickets, and plantations.

Three additional natural habitats were observed in the immediate surroundings, but these are not directly crossed by the proposed pipeline route: a grassy savanna, a dense forest area (lack of big trees) and the gallery forest that extends along the edges of the Tinguilinta River. The latter is not directly crossed by the pipeline route as the crossing site is characterized by the presence of thicket. Yet the gallery forest is located less than 50 m away from the area to be cleared.

Along the first hundreds of meters after the Tinguilinta crossing point, the pipeline route crosses alternatively some thicket habitats and cashew nut plantations, with areas of degraded wooded and grassy savannas, intermittently until the national road.

This habitat heterogeneity entails a limited sensitivity for the entire area given the relatively small size of the identified natural habitat patches and the nearby presence of human activities. Also, the areas of wooded savanna are characterized by a low density of trees of small and medium size surrounded by grassland.

The main environmentally sensitive areas identified are:

- the Boundou Lengué river crossing;
- an ephemeral water course surrounded by fallow lands at both river banks; and
- the dense forest patch located east of the pipeline route close to the Tinguilinta river. This forest is outside the pipeline footprint and hence it is not expected to be affected by clearing works. Two additional locations with large trees were recorded.

From a social perspective, the pipeline route crosses an area occupied by houses belonging to Boundou Lengué village, about 400 m before the national road.

A more detailed breakdown of the habitats crossed by the road is provided in *Table 3.7* and *Figure 3.38*.

Fauna

Direct and indirect records of fauna within this section of the water pipeline include two species of lizards, 39 species of birds and 4 species of mammals. None of the species recorded is considered of concern.

There are, however, some areas crossed by the proposed pipeline route that are considered suitable habitats for certain sensitive species of birds, such as wooded savannas that could host individuals of two bird species, the Black bellied bustard (*Lissotis melanogaster*) and the Denham's bustard (*Neotis denhami*). Nevertheless, the degraded conditions of this habitat make the potential presence of these species unlikely.

The hippopotamus (*Hippopotamus amphibius*) has been reported to be present in the Tinguilinta river crossing during the peak of the wet season, when the flow of the river is high. Also, local communities reported that the West African Crocodile (*Crocodylus suchus*) is found in the Tinguilinta river, but its presence could not be confirmed.

Sensitivity assessment

A biodiversity sensitivity assessment of the habitats that will be impacted by the future water pipeline between the Tinguilinta river and the process plant is provided in Table 3.7. Their location is shown in Figure 3.38.

Table 3.7 *Sensitivity assessment of habitats that will be impacted by the water pipeline between the Tinguilinta River and the process plant*

Code	Habitat type	Description	Figure	Biodiversity sensitivity
PL00	River	Tinguilinta river crossing. Reported presence of crocodiles and hippopotamus.	-	High
PL01	Thicket	Abandoned cashew nut plantation.	-	Medium
PL02	Agricultural area	Cashew nut plantation.	-	Low
PL03	Thicket	Dense thicket with some large trees (<i>Daniellia oliveri</i>).	Figure 3.28	Low
PL04	Agricultural area	Cashew nut plantation.	-	Low
PL05	Wooded savanna	Degraded savanna.	-	Low
PL06	Wooded area	Some large trees (<i>Daniellia oliveri</i> and <i>Parkia biglobosa</i>).	-	Medium
PL07	Agricultural area	Recent cashew nut plantation interspersed with natural trees.	Figure 3.29	Low
PL08	Wooded savanna	Small patch of degraded savanna.	Figure 3.30	Low
PL09	Agricultural area	Plantation with beans, millet, pepper and rice.	Figure 3.31	Low
PL10	Wooded savanna	Degraded savanna surrounded by plantations to the east and a better-preserved savanna (larger trees) to the west.	-	Low
PL11	Grassy savanna	Small patch of grassy savanna in a plain.	-	Low
PL12	Wooded savanna	Degraded savanna, with very small patches of plantations in it.	Figure 3.32	Low
PL13	Wooded savanna	One stand of <i>Landolphia heudelotii</i> considered as endangered by the Guinean monography on biodiversity (MTPE, 1997).	-	High
PL14	Agricultural area	Crops interspersed with trees.	-	Low
PL15	Wooded savanna	Degraded savanna.	-	Low

Code	Habitat type	Description	Figure	Biodiversity sensitivity
PL16	Fallow land	Dense fallow land (crop sites on rotation or abandoned).	-	Low
PL17	River	Boundou Lengué river crossing. Lack of Gallery forest but the site is likely to attract several fauna species. Forest galleries can be found 30 m SW of this crossing, at the edge of the Tinguilinta river.	Figure 3.33	Medium
PL18	Fallow land	Dense fallow land (crop sites on rotation or abandoned).	-	Low
PL19	Agricultural area	Cashew nut plantation	Figure 3.34	Low
PL20	Fallow land	Recently abandoned crops with presence of cashew nut trees and then reeds that host several Red headed Quelea (<i>Quelea erythrops</i>) nests.	Figure 3.35	Low
PL21	Agricultural area	Cashew nut plantation.	-	Low
PL22	Village	The pipeline route traverses at least one house within Boundou Lengué village ⁽¹⁾ .	Figure 3.36	High
PL23	Agricultural area and grassy savanna	Cashew nut plantations interspersed with grassy savanna.	Figure 3.37	Low
PL24	Grassy savanna	Presence of a big <i>Erythrophyllum guineensis</i> tree.	Figure 3.37	High

(1) Although not a "biodiversity" sensitivity, this high "social" sensitivity is considered to be of concern for the Project and therefore was included in this table.

Figure 3.28 Dense thicket near the Tinguilinta river (PL03)



Figure 3.29 Plantation along the future water pipeline (PL07)



Figure 3.30 Wooded savanna along the future water pipeline (PL08)



Figure 3.31 Crops along the future water pipeline (PL09)



Figure 3.32 Degraded wooded savanna (PL12)



Figure 3.33 Boundou Lengué River (PL17)



Figure 3.34 Cashew nut plantation (PL19)



Figure 3.35 Local guide crossing some fallow land along the pipeline route (PL20)



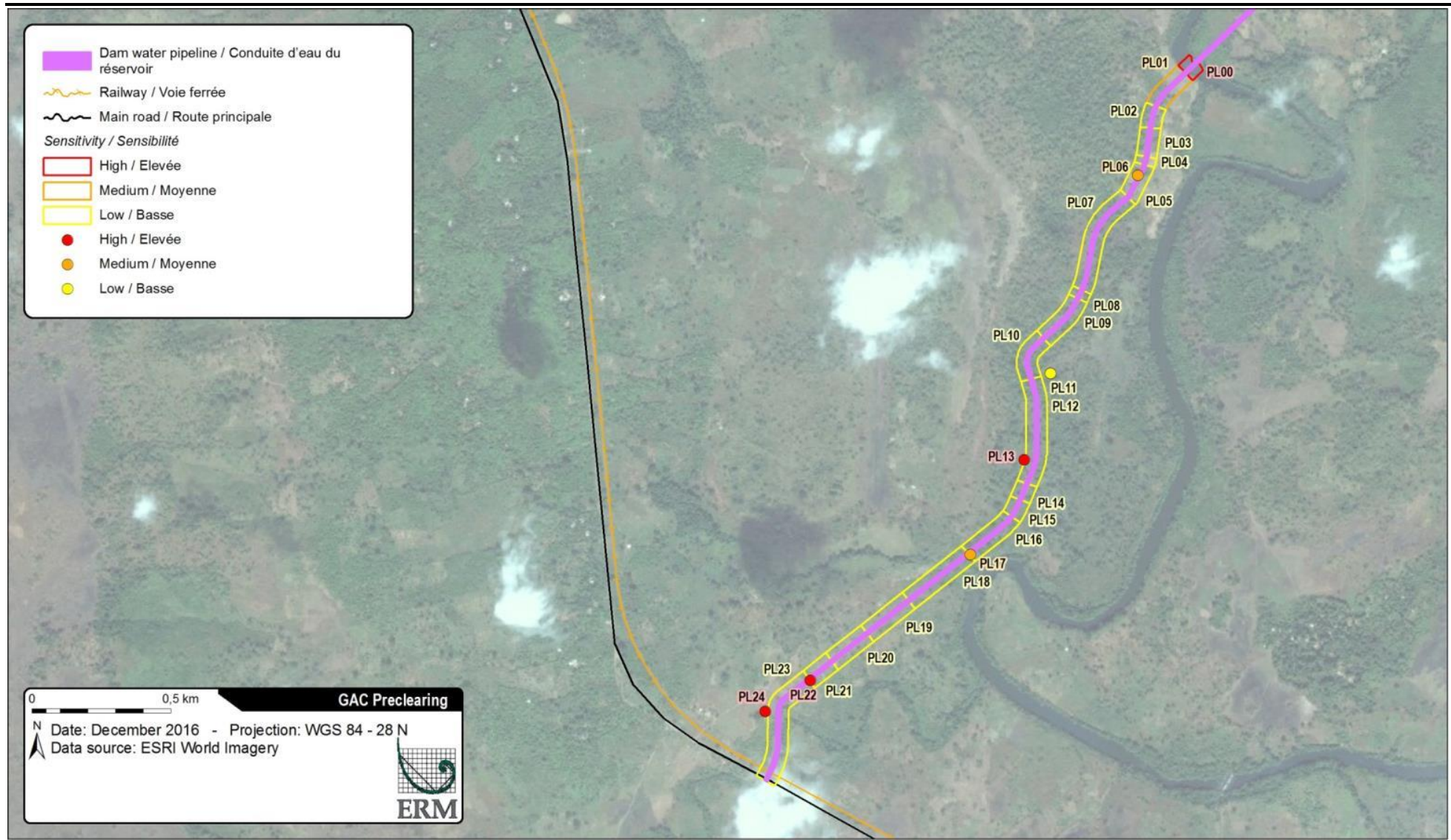
Figure 3.36 House located within the water pipeline route (PL22)



Figure 3.37 *Grassy savanna and a large Erythrophyllum guineensis tree (PL23 and PL24)*



Figure 3.38 Map of the sensitivities identified along the future water pipeline between the Tinguilinta River and the process plant (Area 2)



Note: following the submission of the draft report of this study, GAC communicated to ERM that they envisage to slightly deviate the water pipeline in order to avoid the houses of Boundou Lengué that were to be crossed by the pipeline route (PL22 - high sensitivity).

3.2.3 Overview of high sensitivities identified in Area 2 and Area 3

High sensitivities identified in Area 2 and Area 3 are listed in Table 3.5.

Table 3.8 High sensitivities identified in Area 2 and 3

Code	Name	Description	Within Project footprint? ⁽¹⁾
LT03	Panmehou	Sacred cave untouched by local communities.	Inside (WP)
LT07	-	Gallery forest along the Tinguilinta river crossing (same as PL00 but on the other river bank).	Inside (WP)
LT08	-	Small protected forest patch, outside the direct footprint. Presence of a cemetery.	Outside
PL00	-	Gallery forest along the Tinguilinta river crossing. Reported presence of crocodiles and hippopotamus.	Inside (WP)
PL13	-	One plant of <i>Landolphia heudelotii</i> considered as endangered by the Guinean monography on biodiversity (MTPE, 1997).	Edge (WP)
PL22	Boundou Lengué	The pipeline route traverses at least one house within Boundou Lengué village.	Inside (WP)
PL24		Location of a big <i>Erythrophyllum guineensis</i> tree in a habitat of grassy savanna.	Edge (WP)

(1) See Figure 3.27 and Figure 3.38. WP=water pipeline. Edge=site located close to the project footprint and therefore subject to be impacted by site clearance.

3.3 AREA 4 AND AREA 5 – PROCESS PLANT AND RESETTLEMENT ZONE

3.3.1 Area 4 – Process plant and associated facilities

Habitats

The area located where the process plant and associated facilities will be constructed is flat and located between the Pompowol river (around the village of Boundou Lengué) and the Balahounwol river (around the village of Balahoun). Habitat types vary significantly depending on the areas:

- Forest galleries: located along both rivers (Pompowol and Balahounwol), they are generally degraded (palm-dominated and cleared for agricultural purposes almost until the river shores), except at specific locations usually preserved for their cultural value (see Table 3.9). In these well-preserved areas, a number of lianas can be found (e.g. *Combretum afzelii*) as well as typical gallery forest tree species (e.g., *Pterocarpus santalinoides*, *Cola cordifolia*, *Diospyros elliotii*, *Parkia bicolor*, *Anthocleista nobilis*, *Turraeanthus Africana*, *Trichoscypha smeathmannii*, *Anthostema senegalense*) and other species such as *Myrianthus serratus*, *Voacanga thouarsii*, *Sarcocephalus pobeguunii*, *Macaranga heudelotii*. A well-preserved and locally protected (by communities) gallery forest is located around the headwater of “Boundou Beli Kindy”, between Beli Kindy Cité and Beli Kindy Mosquée.
- Cashew nut plantations: they cover a large part of the western side of the future process plant (towards Pompowol river), a large area around the

village of Beli Kindy (in the middle of the flatland) and part of the eastern side of the plant (by the Balahounwol river). They are planted and used by local communities of the surrounding villages. A common practice by local farmers to enhance crop production is to clear all natural trees by cutting a small belt around the trunk bark in order to “suffocate” the tree (see Figure 3.40). Three tree species are usually preserved from this practice because of their utilitarian value to the communities: *Parkia biglobosa*, *Parinari excelsa* and *Pterocarpus erinaceus*.

- Grassy savanna: it covers a large area of the future process plant footprint, to the west and east of Beli Kindy. It is dominated by Graminae and part of it is flooded during the wet season and early dry season (a few almost dried up ponds were observed during the field visit). Species composition of these grasslands could not be determined during the field campaign because of the unfavourable season due to the recent bush fires made by villagers (October/November).
- Forest patches: a number of small, scattered and well-preserved forested areas can be found in the middle of the grassy flatland. These are usually found around water accumulation points or headwaters and are voluntarily protected by local communities for their sacredness (e.g. presence of djinns/spirits). They also include forested areas at abandoned villages’ locations, where trees (mainly planted ones, such as mango trees, orange trees, etc.) have grown and vegetation have become denser. Their location is discussed in Table 3.9 and shown in Figure 3.57.
- Wetland: A wetland area was observed during the visit and is likely to be important biodiversity hotspot (mainly for birds and amphibians) during dry season months. It is split up in two parts: one to the south of the national road (close to Beli Kindy Mosquée) and one on the other side of the road. The first one is partially on the project footprint. The second one is outside the project footprint but it seems to be ecologically linked to the first one.

On the other side of the road, where the Tinguilinta river water intake pipeline will be installed, the area is in its entirety covered by cashew nut plantations. Some scattered and small natural areas can occasionally be found, but these are mainly degraded. A wetland area has also been observed immediately north to the national road, which is potentially sensitive for bird and amphibian species.

Fauna

During the survey, the following sensitive species were recorded:

- Nile Monitor (*Varanus niloticus*) on a grassland habitat. This is a common species and not a species of concern at a global level but it is partially protected in Guinea and considered vulnerable according to the *Monographie Nationale de Guinée* (1997).

- West African Dwarf Crocodile (*Osteolaemus tetraspis*), found by local people at Boundou Beli Kindy headwater during night time (Figure 3.39). This is a vulnerable (VU) according to the IUCN. It is endangered according to the *Monographie Nationale* and is entirely protected in Guinea. The specimen was killed by local communities, who claimed to occasionally consume this species. Villagers reported that the species is common in small water streams in the area (e.g., Balahounwol, Pompowol).
- White-backed Vulture (*Gyps africanus*), found in Beli Kindy Mosquée. Notwithstanding its abundance throughout Africa, it is a critically endangered species (CR) according to the IUCN due to recent rapid population declines because of habitat loss, conversion to agro-pastoral systems, declines in wild ungulate populations, hunting for trade, persecution, collisions and poisoning.

No direct or indirect signs of chimpanzees were observed during the survey in Area 4. As confirmed by local communities, this species is not found in this area but more southwards at a farther distance from the national road.

Figure 3.39 *A specimen of West African Dwarf Crocodile found by a villager in Boundou Beli Kindy*



Note: the specimen was killed by a villager during night-time hours and shown to the ERM team the following day. The ERM team reminded villagers that this is an endangered, rare and fully protected species in Guinea.

Table 3.9 *Sensitivity assessment of habitats that will be impacted by the process plant and its associated facilities*

Code	Habitat type	Description	Figure	Biodiversity sensitivity
PP01	Gallery forest	Degraded gallery forest along Pompowol river, dominated by palm trees. Crop plantations can be found close to the river shores.	Figure 3.40	Medium
PP02	Gallery forest	Well-preserved natural gallery forest, protected by local communities to make sure the river (Pompowol) does not dry up and can be used all year through for laundry	Figure 3.41	High
PP03	Cashew nut plantations	Large single crop plantations on the western, central and eastern part of the process plant footprint.	Figure 3.42	Low
PP04	Grassy savanna	Large Graminae-dominated flat grassland partially flooded during wet season.	Figure 3.43	Low
PP05	Forest patch	Small community-protected forest patch (with spirit according to local people)	Figure 3.44	High
PP06	Forest patch	Dense forest patch locally known as “Wendou Cité”, protected by local people to reject the spirits. Villagers are not allowed to hunt inside.	Figure 3.45	High
PP07	Wetland	Flooded savanna in wet season		Medium
PP08	Forest patch	Small wooded area protected in the past because of a spirit (not anymore)	Figure 3.47	Medium
PP09	Wetland	Small wetland likely sensitive for birds and amphibians during dry season. Surrounded by wooded area.	Figure 3.48	Medium
PP010	Gallery forest	“Boundou Beli Kindy”, headwater with permanent pond, surrounded by a gallery forest. Protected and considered of high importance by local people. Used for fishing activities. This is where the dwarf crocodile was found.	Figure 3.49	High
PP11	Forest patch	Abandoned village now densely vegetated. Dominance of mango trees	Figure 3.50	Medium
PP12	Forest patch	Protected forest patch where clearing is forbidden. It is also called “Boundou Beli Kindy” but there is not permanent water pond.	Figure 3.51	High
PP13	Cashew nut plantations	Between the national road and the Tinguilinta, where the river offtake pipeline will be constructed	Figure 3.52	Low
PP14	Wetland	Wetland area likely sensitive for birds and amphibians. Not directly impacted by project footprint.	Figure 3.53	Medium
PP15	Gallery forest	Degraded gallery forest along Balahounwol river, dominated by palm trees. Presence of common invasive species (<i>Croton hirtus</i>), an indicator of habitat degradation.	Figure 3.54	Medium

Code	Habitat type	Description	Figure	Biodiversity sensitivity
PP16	Gallery forest	Community-protected gallery forest along Balahounwol river locally known as "Woundihoun Balahounwol". Presence of pythons and monkeys at night.	Figure 3.55	High
PP17	Gallery Forest	Community-protected and well-preserved gallery forest locally known as "Dideré Mouké". Fishing and washing area. Reported presence of monkeys.	Figure 3.56	High

Figure 3.40 *Degraded gallery forest along the Pompowol river (PP01)*



Note: on the foreground a typical "suffocated" tree, local farming technique aiming at enhancing crop production. See also Figure 3.19.

Figure 3.41 *Well-preserved gallery forest along the Pompowol river (PP02)*



Figure 3.42 *Cashew nut plantations covering part of Area 4 (PP03)*



Figure 3.43 *Grassy savanna in the middle of Area 4 (PP04)*



Figure 3.44 *Protected forest patch with “spirit/ djinn” (PP05)*



Figure 3.45 *“Wendou Cité” community-protected forest patch (PP06)*



Figure 3.46 Flooded savanna in wet season next to "Wendou Cité" (PP07)



Figure 3.47 Small wooded area protected in the past (PP08)



Figure 3.48 Small wetland close to Beli Kindy Cité (PP09)



Figure 3.49 Community-protected headwater "Boundou Beli Kindy" (PP10)



Figure 3.50 Mango-dominated forest at abandoned village location (PP11)



Figure 3.51 Community-protected forest patch (other part of "Boundou Beli Kindy") (PP12)



Figure 3.52 Cashew nut plantations where the river intake pipeline is planned (PP13)



Figure 3.53 Wetland area between the national road and the Tinguilinta river (PP14)



Figure 3.54 Palm-dominated gallery forest along Balahounwol river (PP15)



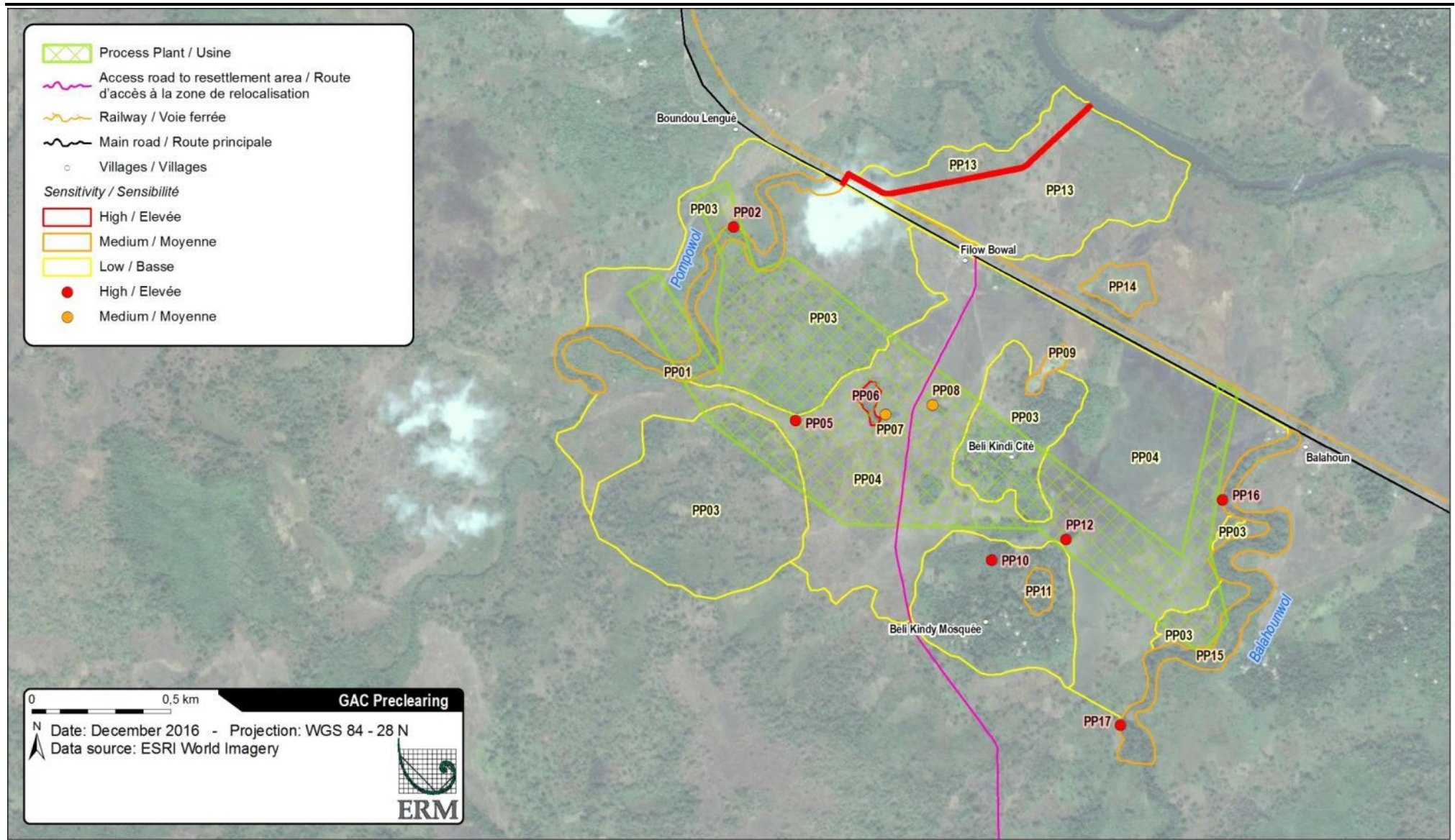
Figure 3.55 Woundihoun Balahounwol community-protected gallery forest (PP16)



Figure 3.56 Dideré Mouké community-protected and well-preserved gallery forest (PP17)



Figure 3.57 Map of the sensitivities identified around the future process plant and its associated facilities (Area 4)



Habitats

The resettlement zone is located in an area that is covered by a mixed savanna mainly dominated by recent cashew nut plantations. Some natural trees and bushes are found, but many have been “suffocated” for farming purposes, through the same technique as in surrounding areas (see *Section 3.3.1*). Patches of abandoned fallow land and thickets have also been observed. Along the Balahounwol and Dakandouka rivers, respectively to the east and to the south of the resettlement zone, a variably degraded gallery forest is present (similarly to PP15). Overall, the habitats within the resettlement footprint are modified.

Yet, a number of small discrete sensitive areas were observed during the field visit in the immediate vicinities of the planned resettlement footprint, either close to the Balahounwol river to the east (e.g., sites of “Boundou Thierno Oumar”, “Dideré Mouké (2)” and “Wondiri Ka Waïloubé”) or on the foot of the hill slope to the west (e.g., sites of “Boundou Soumata”, “Bowal Soumata” and “Boundou Horé Ka Waïloubé”). These are mainly headwaters, well-preserved gallery forests or small forest patches which are valued and protected by local people for cultural (sacredness) and utilitarian (water use, fishing) reasons. Although not necessarily directly affected by the resettlement footprint area, and therefore its associated clearing activities, these sites could be indirectly affected by construction works and people’s presence. Many of these sites were specifically indicated by the local guide to be of importance for local communities.

At the junction between the northern part of the resettlement zone and the access road to the north, a small but dense forest patch was observed. According to the local guide, this forested area corresponds to the ancient village where Beli Kindy people used to live before they moved closer to the national road. Unsurprisingly, many large fruit trees (e.g., palm trees, mango trees, orange trees) were observed. It also hosts a cemetery. The place is now known as “N’dantari Ka Wailoubé”.

The habitats crossed by the future access road, part of which is currently an existing track, are mainly a mixed savanna with cashew nut plantations towards the resettlement area and grassy savanna towards the plant. Small wooded areas and isolated large trees can be observed along the track.

Fauna

With regards to fauna species, the most notable finding was the observation of several indirect signs of chimpanzees at many of the sensitive areas described above, this is in the Balahounwol gallery forest, in the forest patches found to the west of the resettlement area and in the dense forest of the ancient village of Beli Kindy. Observations included:

- five (5) nests of stage III in “Boundou Soumata” on large *Erythrophleum guineensis* trees (Figure 3.58). For an explanation of stage categories see Table 3.3);
- two (2) stage II nests and two (2) stage III nests in “N'dantari Ka Waïloubé” on *Erythrophleum guineensis*, *Parinari excelsa*, *Elaeis guineensis* (palm tree) and on an association between a mango and a palm tree;
- orange leftovers in “N'dantari Ka Waïloubé” (Figure 3.59); and
- palm trees branches used for sugary sap consumption in “Dideré Mouké (2)” (Figure 3.60).

The local guide confirmed that their presence in these well-preserved habitats is common and the upstream parts of the gallery forests are commonly visited by chimpanzees for food consumption reasons.

This area is considered of high sensitivity for chimpanzees.

Figure 3.58 *Stage III nest observed in the protected island forest of “Boundou Soumata”*



Figure 3.59 *Chimpanzee's food leftovers seen in "N'dantari Ka Wailoubé"*



Note: according to the local guide, chimpanzees often come to this ancient village site for food consumption since there are many abandoned fruit trees available.

Figure 3.60 *Palm tree branches used by chimpanzees for sugar consumption observed in "Dideré Mouké (2)"*



Table 3.10 *Sensitivity assessment of habitats that will impacted by the resettlement zone and the access road*

Code	Habitat type	Description	Figure	Biodiversity sensitivity
RS01	Mixed savanna with cashew nut plantations	Mainly young cashew nut trees. Covers almost all resettlement footprint area. Includes scattered trees and bushes, fallow lands and thickets.	Figure 3.61	Low
RS02	Gallery forest	Degraded gallery forest along Balahounwol and Dakandouka rivers, dominated by palm trees.	Figure 3.62	Medium
RS03	Gallery forest	Community-protected and sacred headwater of "Boundou Thierno Oumar". Hunting not allowed. Very important for local communities.	Figure 3.63	High⁽¹⁾
RS04	Gallery forest	Well-preserved gallery forest of "Dideré Mouké (2)". It shares the name of PP17 because of their vicinities (the (2) was added to facilitate report comprehension). Palm tree branches used by chimpanzees were observed.	Figure 3.64	High
RS05	Gallery forest	Community-protected and sacred forest of "Wondiri Ka Wailoubé". Very important for local communities.	Figure 3.65	High
RS06	Wooded area	Wooded area around the headwater of "Detoun Wailoubé" (dries up in dry season). Surface water flows from upstream bowal during wet season.	Figure 3.66	Medium
RS07	Forest patch	Community-protected and sacred forest patch around the headwater of "Boundou Soumata". Very important for local communities (spirit). Chimpanzees nests observed on large <i>Erythrophleum guineensis</i> trees	Figure 3.67	High
RS08	Forest patch	Community--protected and sacred forest patch of "Bowal Soumata" (spirit). No headwater.	Figure 3.68	High
RS09	Forest patch	Community-protected and sacred dense forest patch of "Boundou Horé Ka Wailoubé" around a permanent headwater pond. Very important for local communities.	Figure 3.69	High
RS10	Forest patch	Ancient village of Beli Kindy today known as "N'dantari Wailoubé". Not protected but presence of a dense forest with large fruit trees. Chimpanzees nests and leftovers observed. Presence of an old cemetery.	Figure 3.70	High
RS11	Mixed savanna with cashew nut plantations	Along the future access road to the resettlement zone (existing track). Some small wooded patches observed.	Figure 3.71	Low
RS12	Wooded area	Large <i>Erythrophleum guineensis</i> along the access road	Figure 3.72	Medium
RS13	Grassland	Grassy savanna along the future access road between Beli Kindy Mosquée and the process plant	Figure 3.73	Low

Note: "**High**" sensitivities in bold are sites considered very important by local communities and therefore of conservation priority.

Figure 3.61 Mixed savanna with cashew nut plantations in the future resettlement zone (RS01)



Figure 3.62 Degraded gallery forest along the Dakandouka river (RS02)



Figure 3.63 Community-protected and sacred headwater of Boundou Thierno Oumar (RS03)



Figure 3.64 Well-preserved gallery forest of "Dideré Mouké (2)" (RS04)



Figure 3.65 Community-protected and sacred forest of “Wondiri Ka Wailoubé” (RS05)



Figure 3.66 Wooded area around the headwater of “Detoun Wailoubé” (RS06)



Figure 3.67 Community-protected and sacred forest of “Boundou Soumata” (RS07)



Figure 3.68 Community-protected and sacred forest of “Bowal Soumata” (RS08)



Figure 3.69 *Community-protected and sacred dense forest of "Boundou Horé Ka Wailoubé" (RS09)*



Figure 3.70 *Ancient village forest of "N'dantari Wailoubé" (RS10)*



Figure 3.71 Existing track along the future access road (RS11)



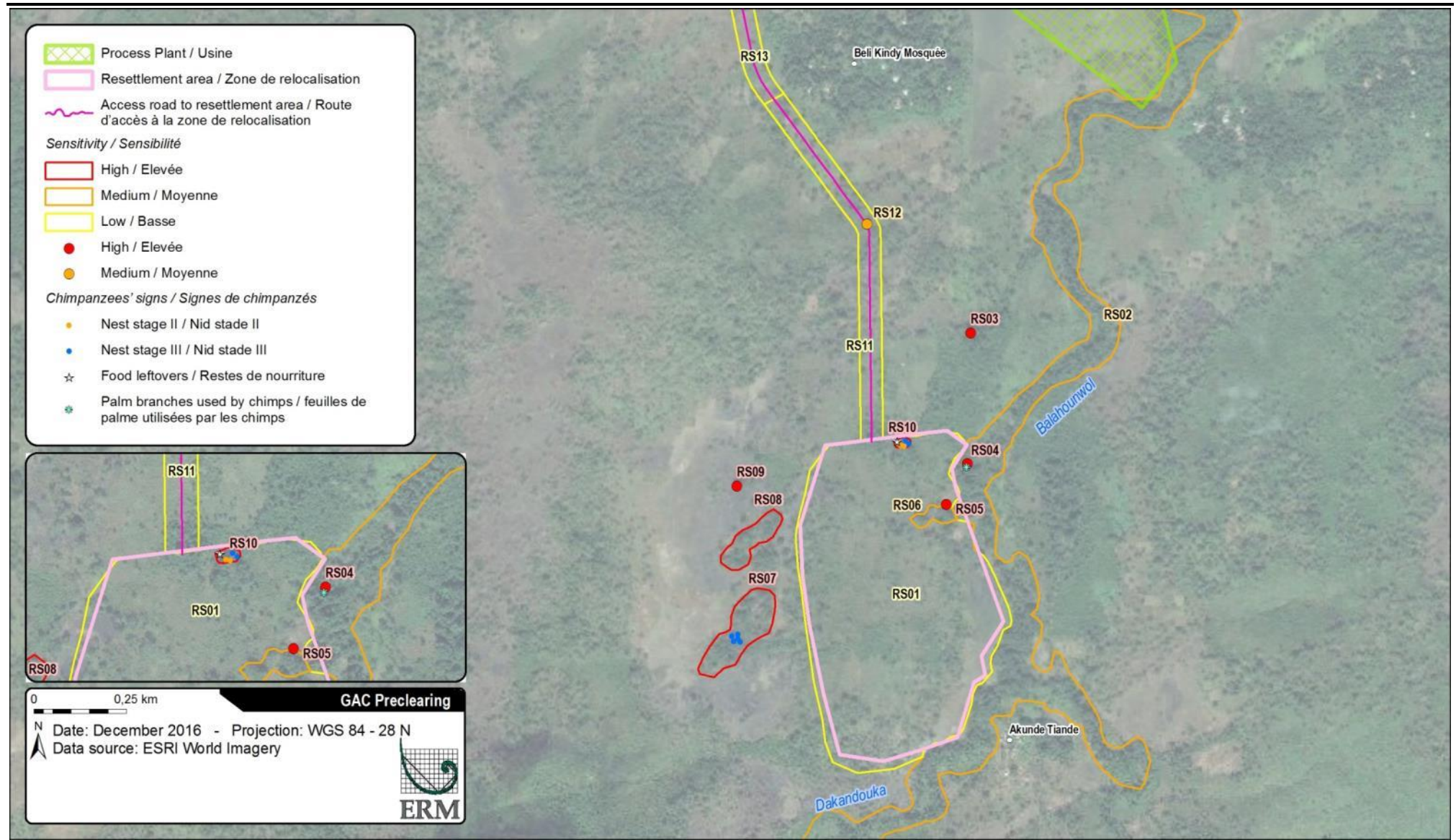
Figure 3.72 Large Erythrophleum guineensis along the access road (RS12)



Figure 3.73 Grassy savanna along the access road towards the process plant (RS13)



Figure 3.74 Map of the sensitivities identified around the resettlement zone and the access road (Area 5)



3.3.3 Fish biodiversity (process plant)

The results of fishing activities conducted in Pompowol river, Balahahouwol river and Boundou Beli Kindy are shown in Table 3.11. The detailed list of species is provided in Table 6.5 (Annex 1).

Table 3.11 Results of fishing activities conducted in the Tiouladiwol

St.	Tot. n° of ind.	N° of sp.	Most abundant species ⁽¹⁾	Species of concern (IUCN red list)
S04	160	15 fish + 1 crab + 1 shrimp	<i>Brycinus macrolepidotus</i> (119), <i>Marcusenius thomasi</i> (7), <i>Ctenopoma kingsleyae</i> , (6)	-
S05	164	20 fish	<i>Petrocephalus tennicauda</i> (84), <i>Paramphilius teugelsi</i> (30), <i>Brycinus macrolepidotus</i> (13), <i>Marcusenius thomasi</i> (10), <i>Schilbe micropogon</i> (5),	<i>Pamphilius teugelsi</i> (VU) + unidentified <i>Malapterurus sp.</i>
S06	94	6 fish + 1 shrimp	<i>Clarias buettikoferi</i> (54), <i>Hemichromis bimaculatus</i> (15), <i>Epiplatys bifasciatus</i> (14)	-

Note: st.=station; ind.=individuals; tot.=total; sp.=species; VU=vulnerable; More than 5 fished individuals

Similarly to what was said for the Tiouladiwol river (see Section 3.1.4), the most sensitive species collected is *Paramphilius teugelsi*, found in the Pompowol river.

Also, two unidentified *Malapterurus sp.* were collected and are likely to belong to one of the 3 species of this genus that are found in the Upper Guinea Province (UGP) - *M. barbatus*, *M. stiassnyae* or *M. teugelsi* – all of which are near threatened (NT) according to the IUCN red list.

3.3.4 Overview of high sensitivities identified in Area 4 and Area 5

High sensitivities identified in Area 4 and Area 5 are listed in Table 3.12.

Table 3.12 High sensitivities identified in Area 4 and Area 5

Code	Name	Description	Within Project footprint? ⁽¹⁾
PP02	-	Well-preserved gallery forest protected by local communities to avoid river drying up.	Inside (PL)
PP05	-	Forest patch protected by local people because of spirit presence.	Inside (PL)
PP06	Wendou Cité	Dense forest patch protected by local people to reject the spirits.	Inside (PL)
PP10	Boundou Beli Kindy	Protected gallery forest around permanent headwater pond, important for communities.	Edge (PL)
PP12	Boundou Beli Kindy (2)	Protected forest patch linked to the associated headwater.	Inside (PL)
PP16	Woundihoun Balahounwol	Protected gallery forest along Balahounwol.	Edge (PL)
PP17	Dideré Mouké	Protected and well-preserved gallery forest along Balahounwol.	Outside

Code	Name	Description	Within Project footprint? ⁽¹⁾
RS03	Boundou Thierno Oumar	Protected and sacred headwater very important for local communities.	Outside
RS04	Dideré Mouké (2)	Well-preserved gallery forest.	Edge (RZ)
RS05	Wondiri Ka Wailoubé	Protected and sacred forest very important for local communities.	Inside (RZ)
RS07	Boundou Soumata	Protected and sacred headwater very important for local communities.	Edge (RZ)
RS08	Bowal Soumata	Protected and sacred forest.	Edge (RZ)
RS09	Boundou Horé Ka Wailoubé	Protected and sacred headwater very important for local communities.	Edge (RZ)
RS10	N'dantari Wailoubé	Ancient village dense forest.	Inside (RZ)

(1) See Figure 3.57 and Figure 3.74. RZ=resettlement zone; PL=Plant. Edge=site located close to the project footprint and therefore subject to be impacted by site clearance.

3.4 AREA 6 - KAMSAR

3.4.1 GAC platform

Habitats

At the time of the field survey, the GAC platform in Kamsar had already almost entirely been cleared and backfilled with sand *circa* 2007-2008 (Figure 3.75 to Figure 3.77). Part of the original wetlands that occurred in the area was reclaimed by the deposition of sand to create the current GAC platform, which is formed by three pieces of land separated by watercourses (see Figure 2.2).

The site, however, remains located at the edge of a wide wetland where several habitats of interest still exist, such as mangrove forests, mudflats and rice fields.

Mangrove habitats surround most of the GAC platform (Figure 3.78). These are composed by two different formations, one dominated by *Rhizophora racemosa* occupying the deeper areas of the wetlands, and other dominated by the black mangrove (*Avicennia germinans*) usually accompanied by *Laguncularia racemosa* along the shallower areas. These mangrove habitats extend all along the wetland area interspersed by multiple watercourses.

In the coastal section of the GAC platform, other habitats limiting with mangroves were recorded, including rice fields at the south (Figure 3.79) and mudflats in the coastal intertidal zone to the west (Figure 3.80). In the central section, degraded habitats (formed by herbaceous vegetation and waterbodies) were recorded to the west, while the largest section of the GAC platform is limited by mangroves all around its perimeter with the exception of its northern side, that limits with the CBG railway.

The only area that was not cleared within the whole GAC platform at the moment of the site visit corresponds to the coastal strip of mangroves limiting

with the coastal section. These mangroves, however, appeared to be dead (Figure 3.80).

Figure 3.75 *General view of the cleared area in the coastal section of the GAC platform*



Figure 3.76 *General view of the cleared area in the inland section of the GAC platform*



Figure 3.77 Installation works in progress in the central section of the GAC platform



Figure 3.78 Mangrove habitats around the GAC platform



Figure 3.79 Rice fields south of the coastal section of the GAC platform



Figure 3.80 *Coastal strip of dead mangrove to be cleared and the mudflat in the background*



Fauna

As initially expected given the status of the works in the GAC platform in Kamsar, the records of fauna identified are mainly related to avifauna. A total of 25 species of birds were directly observed, including the hooded vulture (*Necrosyrtes monachus*), which is assessed as critically endangered (CR) by the IUCN red list. Most of the avifauna was observed feeding, resting or flying over the nearby habitats, especially the mangrove, the rice fields and the intertidal zone (mudflats) in the coast, confirming the importance of these habitats for birds in general.

Similarly, the West African crocodile (*Crocodylus suchus*) was reported by local people to be present within the mangrove surrounding the GAC platform, including within the watercourse dividing the coastal and central sections of the platform, where a bridge for the conveyor belt is planned. This crocodile species is not assessed by the IUCN (it was once considered a subspecies of the Nile Crocodile *Crocodylus niloticus*), but its presence in Guinea is rare. It is entirely protected in Guinea and assessed as endangered (EN) by the Guinean Monography on biodiversity.

Finally, local fishermen reported the sporadic presence of the manatee (*Trichechus senegalensis*) in the same area. This species is assessed as vulnerable (VU) by the IUCN.

3.4.2 *Invasive species*

Construction works carried out in past years – including land reclamation, vegetation and earth movements - resulted in the generation of a disturbed environment along the edges of the platform. Opportunistic plant species can

colonise this disturbed environment given their adaptability and fast growth rates compared to the growth rates of the previously present species.

This rapid colonization process can become a threat to native species and the wider habitat (mangrove and rice fields), as some of the newly established species are considered as invasive given their ecological behaviour. This can result in a retreat of mangrove habitats, leading to a reduction in mangrove surfaces, its important biodiversity and the ecosystem services this habitat provides.

In fact, two local invasive species and two exotic invasive species were recorded.

Exotic invasive species

Two exotic invasive species, considered as those that do not occur naturally in Guinea, were recorded in the GAC platform in Kamsar:

- *Acacia mangium* (Figure 3.81); and
- *Azadirachta indica* (Figure 3.82).

Both species are fast growing trees, respectively native from the South Pacific and the Indian subcontinent, and are known to be present in Guinea today, but mainly in terrestrial habitats.

These can impact mangrove habitats if their spread is not controlled. It is possible that they were introduced involuntarily during earth works at the time of platform development when importing soil from inland quarries. Once in flower, their invasive potential significantly increases.

The approximate distribution of these species along the edges of the GAC platform area is shown in *Figure 3.85*.

Figure 3.81 *Acacia mangium* - leaves and seeds



Figure 3.82 *Azadirachta indica*



Local invasive species

The two local species that behave as invasive are the following:

- *Imperata cylindrical* (Figure 3.83); and
- *Chromolaena odorata* (Figure 3.84).

These two species, naturally occurring in Guinea, tend to colonize disturbed areas. There is no need of active introduction from a foreign country as they can naturally reach the disturbed area, though their introduction together with the machinery operating in the platform area in the past cannot be discarded.

The approximate distribution of these species along the edges of the GAC platform area is shown in *Figure 3.85*.

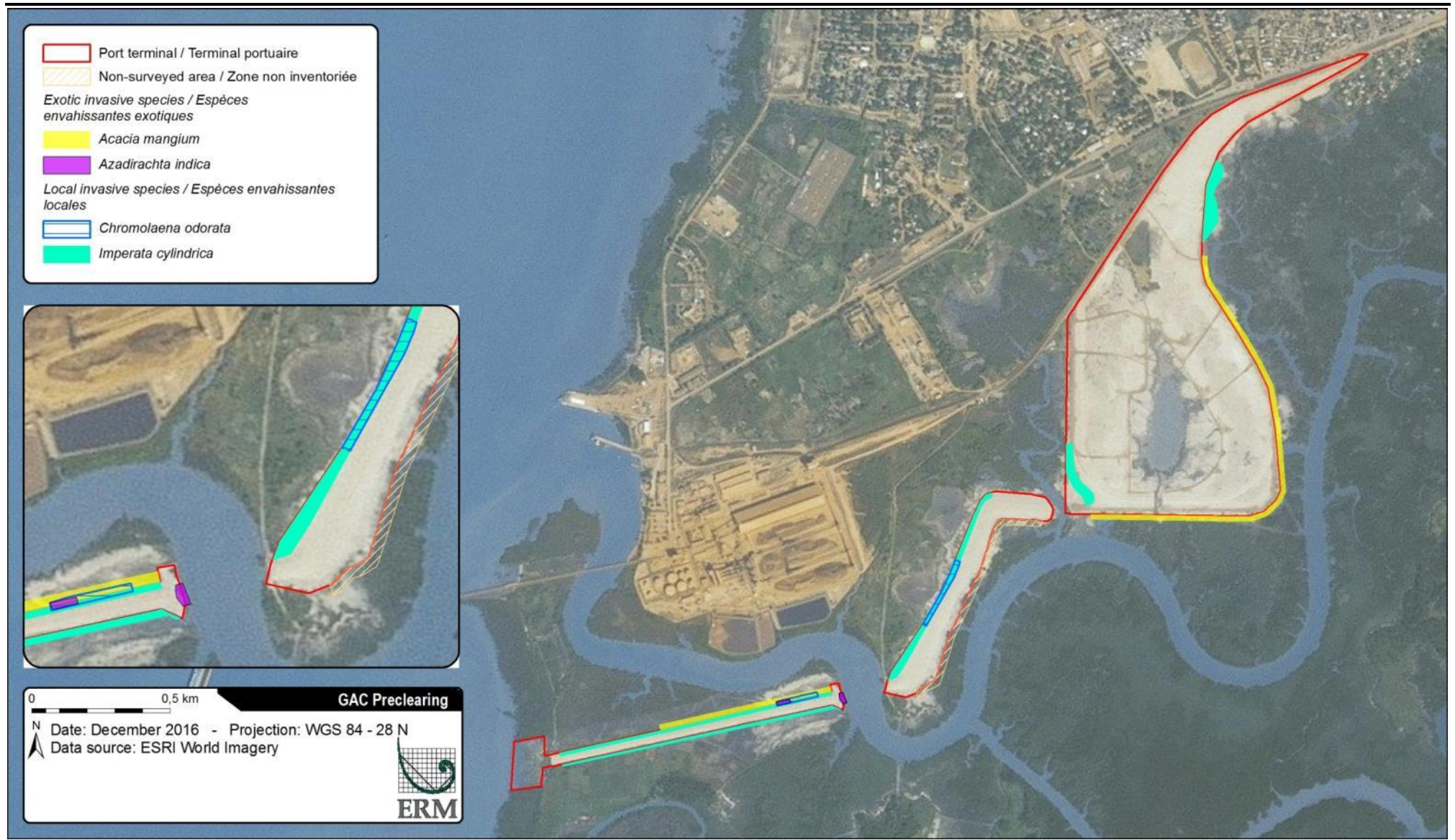
Figure 3.83 *Imperata cylindrica*



Figure 3.84 *Chromolaena odorata*



Figure 3.85 Map of the approximate distribution of invasive species on the edges of the GAC platform in Kamsar (Area 6)



Sensitivity assessment

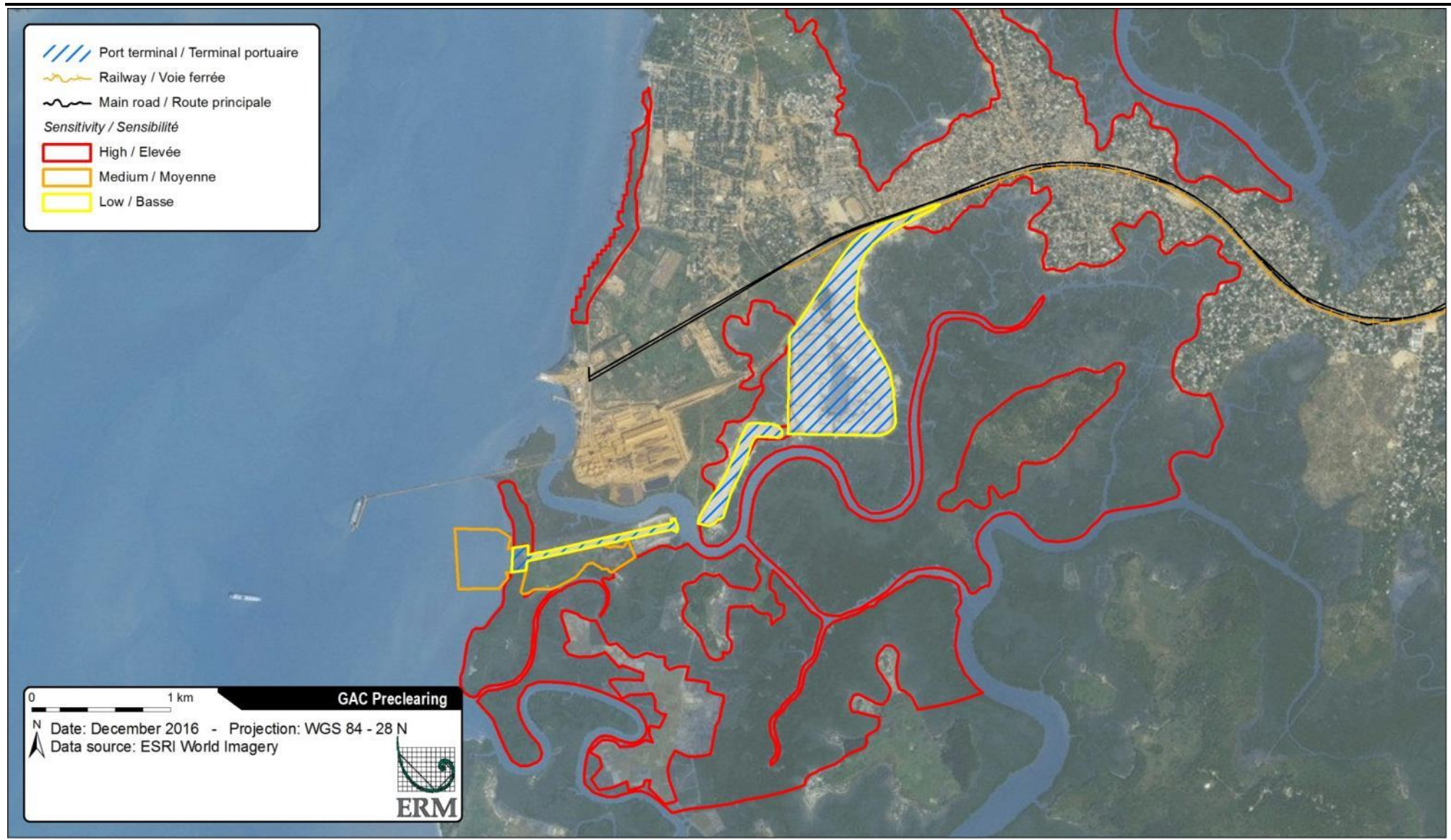
The main threats recorded during the visit are related to the invasive and opportunistic species that seem to be thriving due to the disturbance generated by construction works and associated earth movements. Hence a biodiversity sensitivity assessment of the habitats surrounding the GAC Platform has been performed, in spite of the overall modified nature of the area.

The results of this assessment are provided in *Table 3.13* and in *Figure 3.86*.

Table 3.13 *Sensitivity assessment of habitats that will be impacted by the GAC platform clearing works in Kamsar*

Code	Habitat type	Description	Figure	Biodiversity sensitivity
KA1	Industrial	Land reclaimed to the sea to create the GAC platform, where vegetation has already been cleared.	<i>Figure 3.76</i>	Low
KA2	Agricultural	Rice fields surrounding the GAC platform where avifauna feeds and rests mainly during high tide periods.	<i>Figure 3.79</i>	Medium
KA3	Mangrove	Mangrove habitats surrounding the GAC platform, including all watercourses. They host high levels of biodiversity and offer several ecosystem services to communities.	<i>Figure 3.78</i>	High
KA4	Mud flats	Located in the intertidal zone facing the GAC platform, they are a feeding habitat for birds in low tide periods.	<i>Figure 3.80</i>	Medium

Figure 3.86 Map of the sensitivities identified around GAC platform in Kamsar (Area 6)



3.4.3 *Overview of high sensitivities identified in Area 6*

High sensitivities identified in Area 6 are listed in *Table 3.14*.

Table 3.14 *High sensitivities identified in Area 6*

Code	Name	Description	Within Project footprint? ⁽¹⁾
KA3	-	Mangrove habitats all around the GAC Platform. High biodiversity and ecosystem services. Threats from invasive species.	Edge (GP)

(2) See Figure 3.86. GP=GAC platform. Edge=site located close to the project footprint and therefore subject to be impacted by site clearance.

4.1 SUMMARY OF MAIN FINDINGS

The surveys highlighted the presence of several biodiversity sensitivities (high, medium or low) within or close to the Project footprint, which have the potential to be impacted by site clearance and associated activities.

The identified high sensitivities are listed in *Table 3.5* (Area 1), *Table 3.8* (Area 2 and Area 3), *Table 3.12* (Area 4 and Area 5) and *Table 3.14* (Area 6).

The main findings of the survey campaign are summarized below:

- High biodiversity sensitivities are mainly discrete natural habitat areas which are of particular concern for their ecological value (e.g., forest patches, well-preserved gallery forests, large trees, confirmed or potential presence of sensitive species) and/or their cultural value to communities (e.g., sacred and protected forests/headwaters, presence of djinns/spirits).
- Numerous direct and indirect sightings of chimpanzees were recorded in the Tiouladiwol valley (Area 1) and around the resettlement zone (Area 5). These two areas are therefore considered of high sensitivity for this species.
- At least one fish species of conservation concern (*Paramphilius teugelsi*, VU) and the West African Dwarf Crocodile (*Osteolaemus tetraspis*, VU) were collected during the surveys in water courses, highlighting the importance of freshwater ecosystems in the area. Other sensitive freshwater species have the potential to be present or were recorded during previous studies in the area.

Lastly, the presence of four invasive species was recorded in the GAC platform in Kamsar, mainly in degraded areas affected by previous earth works. Two of these species are exotic invasive species and may negatively impact mangrove habitats in the area, with consequences on biodiversity and ecosystem services.

4.2 RECOMMENDATIONS

4.2.1 Mitigation hierarchy

In order to minimize the impacts of this Project on biodiversity and to be consistent with international best practices, the “mitigation hierarchy” should be applied to the greatest extent (see GAC’s biodiversity management plan – *Tatum-Hume et al., 2016*):

- 1) avoidance of the impact;
- 2) minimization of the impact;
- 3) rehabilitation/restoration of the habitat; and
- 4) offsetting.

Particular attention should be given to the identified “high” sensitivities, and whenever possible also to “medium” and “low” sensitivities.

4.2.2 *Measures applicable to all Project components and areas*

As specified in the mitigation measures of the wider GAC project (see SEIA Addendum, 2015), the following measures should be applied to all clearing activities:

- Minimize the clearing footprint to the greatest extent and delineate work areas to limit human/vehicular traffic to avoid disturbance on natural habitats (e.g., wetland areas PP09 and PP14).
- Reduce noise, dust and air quality emissions to the strict minimum. Implement dust abatement measures.
- Undertake clearing works under the supervision of at least one qualified biodiversity management specialist, who will be aware of all high sensitivities identified in the study area.
- Ensure local communities representative are present during clearing works to avoid that areas of cultural/spiritual/ecological value for communities are affected. If an area of local concern is affected, communities will have to be fully engaged in the discussion, clearing and compensation process.
- Raise environmental awareness to construction workers (GAC employees and subcontractors) on the importance of biodiversity-related issues and on the presence of high sensitivity sites to be prevented from clearing activities. Collection of natural resources will be forbidden for construction workers (e.g., hunting, fishing, collection of wood/plants).
- Whenever possible, the clearance of modified habitats should be preferred to natural habitats, and non-forested areas should be preferred to forested areas. The clearance of trees, and in particular large trees, should be avoided to the greatest extent.
- For all linear Project items (e.g., access roads, water pipelines, etc.), envisage bypassing / alternative routes to avoid high sensitivity areas (and whenever possible, medium sensitivity areas) along the planned routes.

4.2.3

Additional specific mitigation measures

Some specific measures should be applied to the topic of major biodiversity concern and are described below.

High sensitivities

The high sensitivities identified during the survey are listed in *Table 3.5* (Area 1), *Table 3.8* (Area 2 and Area 3), *Table 3.12* (Area 4 and Area 5) and *Table 3.14* (Area 6).

Whenever possible, high sensitivities will be prevented from clearing activities. If this is not possible, the impact will be minimized to the strict minimum. In particular:

- All high sensitivities located outside the Project footprint will be avoided and will not be impacted by Project clearing activities.
- Whenever possible, high sensitivities located along the edges of the Project footprint will be avoided. To do so, minor Project layout modifications could be envisaged.
- Whenever possible, high biodiversity sensitivities located within the Project footprint will be avoided. If this is not possible:
 - Clearing activities will be supervised by qualified biodiversity specialists who will estimate the biodiversity loss associated to the clearing activity.
 - Habitat loss will be considered as part of GAC's offsetting strategy and will be included in the biodiversity management plan. Local communities will be included in the decision-making process.
- On an annual basis, biodiversity monitoring should be implemented to verify the effectiveness of biodiversity management measures.

Additional site-specific recommendations are provided in *Table 4.1*.

Table 4.1 *Specific recommendation for the protection of high sensitivity sites*

Code	Name	Area	Project footprint?	Specific recommendations
AR05	Boundou Djolol	1	Inside	Deviation of access road to avoid the headwater and the water stream.
AR08	-	1	Inside	Minimization of clearing footprint.
WR03	Aidé Koba	1	Inside	Consider reducing the height of the water reservoir to prevent the site from flooding.
LT03	Panmehou	2	Inside	Deviation of water pipeline to avoid impacting the sacred cave.
LT07	-	2	Inside	Minimization of clearing footprint.
LT08	-	2	Outside	Full site protection.

Code	Name	Area	Project footprint?	Specific recommendations
PL00	-	3	Inside	Minimization of clearing footprint.
PL13	-	3	Edge	Deviation of water pipeline to avoid clearing the endangered tree.
PL22	Boundou Lengué	3	Inside	Deviation of water pipeline to avoid the houses.
PL24	-	3	Edge	Deviation of water pipeline to avoid clearing the tree.
PP02	-	4	Inside	Deviation of bridge location to avoid the protected site.
PP05	-	4	Inside	Full site protection (if possible). If not possible, agreement with local communities on how to clear it and compensate its loss.
PP06	Wendou Cité	4	Inside	Full site protection (if possible). If not possible, agreement with local communities on how to clear it and compensate its loss.
PP10	Boundou Beli Kindy	4	Edge	Modification of plant clearing footprint to fully protect the site.
PP12	Boundou Beli Kindy (2)	4	Inside	Full site protection (if possible). If not possible, agreement with local communities on how to clear it and compensate its loss.
PP16	Woundihoun Balahounwol	4	Edge	Full site protection (buffer zone between the plant and the gallery forest).
PP17	Dideré Mouké	4	Outside	Full site protection.
RS03	Boundou Thierno Oumar	5	Outside	Full site protection.
RS04	Dideré Mouké (2)	5	Edge	Full site protection.
RS05	Wondiri Ka Wailoubé	5	Inside	Full site protection (if possible).
RS07	Boundou Soumata	5	Edge	Full site protection.
RS08	Bowal Soumata	5	Edge	Full site protection.
RS09	Boundou Horé Ka Wailoubé	5	Edge	Full site protection.
RS10	N'dantari Wailoubé	5	Inside	Deviation of the access road junction point to ensure full site protection (if possible).
KA3	-	6	Edge	Removal of invasive species (see below) and no mangrove clearing unless strictly necessary.

Gallery forests and water courses

In order to protect the water courses - and their habitats - located within and in the vicinities of the Project footprint (Tiouladiwol, Tinguilinta, Pompowol, Balahounwol, Beli Kindy), the following will be implemented:

- Whenever possible, no clearing of gallery forest should be carried out and a buffer zone should be protected around all water courses (minimum 50 m on each side). The lost gallery forest will be considered as part of GAC's offsetting strategy and will be included in the biodiversity management plan.
- Control and avoid soil erosion and pollution discharge into the water courses (see the SEMP of SEIA Addendum, 2015).

- For river crossing construction works (e.g., bridges), maintain slope stability to avoid the creation of whirlpools and to prevent erosion. No construction remains should be left on the river shores and bottom.
- Annual freshwater ecosystem monitoring should be conducted, through:
 - qualitative assessments by a qualified freshwater specialist of all rivers affected by the Project; and
 - fishing activities with similar survey techniques and equivalent survey efforts to the ones conducted for the current study, in order to evaluate any potential fish biodiversity loss in relation to the Project. This will be included as part of the biodiversity management plan.

Chimpanzees

The two sensitive areas identified for chimpanzees are the area of the Tiouladiwol valley (Area 1) and the resettlement zone (Area 5). Considering the overall high sensitivity of the entire GAC concession for chimpanzees, the mobility of the species and the limited historical and geographical information collected on the particular populations recorded during the survey, a precautious concession-wide chimpanzee management approach is recommended, which will be implemented in GAC's biodiversity management plan.

At this stage, the following measures will be implemented to reduce Project impacts on chimpanzees:

- Whenever possible, and as already recommended in the SEIA Addendum (2015) and in GAC's Biodiversity Management Plan (*Tatum-Hume et al., 2016*), protect all potentially suitable nesting and foraging sites for chimpanzees, this is gallery forests, forest islands, wooded areas and large trees (including, but not limited to *Erythrophleum guineense*, *Parkia biglobosa*, *Parinari excelsa* and *Cola cordifolia*), as already discussed above (high sensitivity areas protection).
- Implement offsetting measures to compensate the loss of suitable habitats, mainly along the Tiouladiwol valley (in particular Aidé Koba), which will be updated and be included in GAC's biodiversity management plan.
- Carry out regular chimpanzee's monitoring around Area 1 and Area 5 with the support of local communities and qualified specialists to deepen the understanding of the species features in these two areas (population size, behaviour, movements, threats).

Lastly, it must be noted that the choice of i) obtaining water for the Project through the construction of a water reservoir over other water sources and ii) selecting the middle Tiouladiwol valley for its location stems from past feasibility studies which took into account a number of environmental and

social selection criteria (*SNC-Lavalin, 2005*). Additional feasibility studies are currently under way (in particular, the search for favourable locations for drilling new wells and associated groundwater pumping tests) to identify the most suitable water sources options for the Project. It is therefore recommended to:

- consider the adoption of other water sources options instead of the creation of a water reservoir in order to diminish the extent of habitat loss, in particular gallery forests (e.g., water storage within mine pits, groundwater, etc.);
- revisit the environmental and social selection criteria used for choosing the middle Tiouladiwol for the water reservoir and confirm they are still applicable today;
- if these criteria are not applicable anymore, consider the identification of potential alternative sites for the location of the water reservoir; and

A similar approach should be applied to the selection criteria used for the location of the resettlement zone.

For both the water reservoir and the resettlement zone, potential alternative locations will need to be subject to similar pre-clearing biodiversity surveys prior to any clearing works.

Invasive species

The four invasive species recorded in the GAC platform in Kamsar may negatively impact mangrove habitats in the area. The following measures are recommended:

- Remove these four (4) species as soon as possible, under the supervision of a qualified botanist.
- Priority should be given to the removal of the two invasive species (*Acacia mangium* and *Azadirachta indica*) since they are the ones with the highest invasive potential to the detriment of existing or previously existing local flora. Each plant of these two species found in the area, including their roots, should be removed to immediately stop their spreading. Particular attention should be given to the seeds of *Acacia mangium*, which were present during the survey (*Figure 3.81*) as if they fall around, the plant may grow again. Another option is to treat them with herbicides.
- With regards to the two (2) native invasive species, *Imperata cylindrical* can be removed by treating it with herbicides, while *Chromolaena odorata* should be cut similarly to what suggested for the exotic species described above.

- During future earth works at the GAC platform, make sure that stockpiles are protected from the wind and that only local plants are used for soil stabilization. This will prevent erosion and the potential spread of invasive species.
- A semi-annual monitoring supervised by a qualified botanist is recommended to identify the potential presence of invasive saplings regrowth to be removed.

Additional recommendations

The surveys highlighted the current pressure on natural habitats induced by ever-expanding cashew nut plantations in the study area. This farming practice is often done to the detriment of natural habitats, including wooded savannas and gallery forests, which are cleared by farmers to enhance crop productivity (e.g., “suffocating” tree technique).

Although this issue is a regional one (Boké area), and is not directly related to the clearing works scoped in this study, it is highly recommended to:

- consider the cashew nut plantations issue as a major biodiversity loss factor and therefore to be considered in GAC’s biodiversity management plan, community engagement strategy, community development plan, immigration management strategy, also considering GAC’s recently developed agricultural support strategy; and
- implement environmental awareness raising activities with communities on this issue in order to agree on improved and sustainable farming techniques (cashew nut and other crops) that can incorporate both environmental protection and economic benefits from agriculture.

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Websites

<http://www.iucnredlist.org/>

Table 6.1 Flora species inventoried during the surveys

Family	Species	Biological type	Local name (Poular)	Habitat types where observed	Abundance in the area	Local use	Other	Guinean status	IUCN status
Leguminosae-pap.	<i>Abrus precatorius</i>	Liana		Gallery forest	Quite common	Medical			
Leguminosae-mim.	<i>Acacia mangium</i>	Tree	Cassia	Shrubby/wooded savanna	Quite common	Wood			
Leguminosae-caes	<i>Azelia africana</i>	Tree	Lengué	Gallery forest	Rare	Wood		Endangered	VU
Leguminosae-mim.	<i>Albizia adianthifolia</i>	Tree	Maro-nai bandiala	Gallery forest	Quite common	Wood			LC
Leguminosae-mim.	<i>Albizia zigia</i>	Shrub	Maro-nai	Shrubby/wooded savanna	Very common	Wood			
Euphorbiaceae	<i>Alchornea cordifolia</i>	Liana	Garkassaki	Gallery forest	Quite common	Medical		Vulnerable	
Euphorbiaceae	<i>Alchornea floribunda</i>	Tree	Garkassaki thiangol	Gallery forest	Rare	Medical			
Sapindaceae	<i>Allophylus africanus</i>	Shrub	Koli- diowi	Fallow land	Very common	Wood			
Vitaceae	<i>Ampelocissus africana</i>	Liana	Laka	Gallery forest	Quite common	Medical			
Anacardiaceae	<i>Anacardium occidentale</i>	Shrub	Yalagué	Shrubby/wooded savanna	Very common	Wood			
Araceae	<i>Anchomanes difformis</i>	Herb	Togorou djina	Gallery forest	Rare	Medical			
Poaceae	<i>Andropogon gajanus</i>	Herb	Pouki	Grassy savanna	Very common				
Annonaceae	<i>Annona senegalensis</i>	Shrub	Doukounmè porto	Fallow land	Quite common	Wood			
Loganiaceae	<i>Anthocleista nobilis</i>	Tree	Bheydo-modjo	Gallery forest	Quite common	Wood			
Leguminosae-caes	<i>Anthonotha crassifolia</i>	Shrub	M'bouda	Fallow land / Thicket	Very common	Wood			
Euphorbiaceae	<i>Anthostema senegalensis</i>	Shrub	M'bouro	Gallery forest, Fallow land	Very common		Toxic		
Anisophyllaceae	<i>Anisophyllea laurina</i>	Tree	Kantin	Gallery forest, Fallow land	Very common	Wood			
Moraceae	<i>Arthocarpus communis</i>	Tree		Village forest	Rare	Food			
Avicenniaceae	<i>Avicenia germinans</i>	Shrub	Kanssi	Mangrove	Quite common	Wood			LC
Chrysobalanaceae	<i>Bafodeya benna</i>	Tree	Koura	Gallery forest, Fallow land	Quite common	Food			VU
Rubiaceae	<i>Bertiera spicata</i>	Shrub		Gallery forest	Quite common	Medical			
Bombacaceae	<i>Bombax costatum</i>	Tree	Loukoun	Wooded savanna	Rare	Wood		Endangered	
Euphorbiaceae	<i>Bridelia micrantha</i>	Shrub		Fallow land	Quite common	Medical			
Leguminosae-pap.	<i>Cajanus cajan</i>	Shrub	Gnébhè- bourouré	Fallow land	Quite common	Food			
Leguminosae-pap.	<i>Calopogonium mucunoides</i>	Liana	Delboi-bourouré	Gallery forest	Very common	Medical			
Meliaceae	<i>Carapa procera</i>	Tree	Gobi	Gallery forest	Rare	Wood		Vulnerable	
Leguminosae-caes	<i>Cassia alata</i>	Shrub	Senyenguel- thiangol	Gallery forest	Quite common	Medical			
Leguminosae-caes	<i>Cassia podocarpa</i>	Shrub	Senyenguel	Fallow land	Quite common	Medical		Endangered	
Leguminosae-caes	<i>Cassia sieberiana</i>	Shrub	Sindja	Wooded savanna, Fallow land	Very common	Medical		Vulnerable	
Bombacaceae	<i>Ceiba pentadra</i>	Shrub	Bantan	Village forest, Forest patch	Rare	Food			
Araceae	<i>Cercestis sp</i>	Herb		Gallery forest, Forest	Rare	Medical			LC
Moraceae	<i>Chlorophora excelsa</i>	Tree	Thinmè	Gallery forest, Forest	Quite common	Wood		Endangered	LC
Asteraceae	<i>Chromolaena odorata</i>	Herb		Fallow land	Very common		Invasive		
Vitaceae	<i>Cissus polyantha</i>	Liana	Delbi- bhodi	Gallery forest, Forest	Quite common	Medical			

Family	Species	Biological type	Local name (Poular)	Habitat types where observed	Abundance in the area	Local use	Other	Guinean status	IUCN status
Verbenaceae	<i>Clerodendron splendens</i>	Liana		Gallery forest, Forest	Rare	Medical			
Connaraceae	<i>Cnestis ferruginea</i>	Shrub	Tepé darolla	Wooded savanna, Fallow land	Very common	Medical			
Sterculiaceae	<i>Cola cordifolia</i>	Tree	Goumbanbé	Gallery forest, Forest	Quite common	Wood			
Sterculiaceae	<i>Cola nitida</i>	Tree	Goro	Gallery forest, Village forest	Quite common	Food			
Combretaceae	<i>Combretum afzelii</i>	Liana	Yayé safiri	Gallery forest	Rare	Medical			
Combretaceae	<i>Combretum micranthum</i>	Shrub	Kenkeliba	Shrub savanna, Fallow land	Quite common	Medical		Vulnerable	
Combretaceae	<i>Combretum lecardii</i>	Shrub		Shrub savanna, Fallow land	Quite common	Wood			
Zingiberaceae	<i>Costus afer</i>	Herb	Goguo- Thiangol	Gallery forest	Rare	Medical			
Rubiaceae	<i>Crossopteryx febrifuga</i>	Shrub	Belendé	Shrub savanna, Fallow land	Quite common	Wood			
Euphorbiaceae	<i>Croton hirtus</i>	Herb		Fallow land	Very common		Invasive		
Leguminosae-caes	<i>Cynometra vogelii</i>	Tree		Gallery forest	Quite common	Wood			
Cyperaceae	<i>Cyperus sp</i>	Herb		Grassy savanna	Very common		Invasive		
Leguminosae-caes	<i>Daniellia oliveri</i>	Shrub	Thiéké	Shrubby/ wooded savanna	Very common	Wood			
Leguminosae-caes	<i>Detarium senegalensis</i>	Shrub	Boto	Village forest	Rare	Food			
Leguminosae-caes	<i>Dialium guineense</i>	Shrub	Méko	Gallery forest, Fallow land	Very common	Food			
Leguminosae-caes	<i>Dialium pobeguinii</i>	Shrub	Méko-Thiangol	Gallery forest	Rare	Medical			
Leguminosae-mim	<i>Dichrostachys cinerea</i>	Liana	Boulè pété	Shrub savanna, Fallow land	Quite common	Medical			LC
Melastomataceae	<i>Dissotis tibulosa</i>	Herb		Gallery forest	Quite common	Medical			
Dioscoreaceae	<i>Dioscorea dumetorum</i>	Liana		Thicket	Quite common	Medical			
Ebenaceae	<i>Diospyros heudelotii</i>	Shrub	Siila pouti	Gallery forest	Rare	Medical			
Arecaceae	<i>Elaeis guineensis</i>	Shrub	Tougui	Gallery forest, Forest	Very common	Food		Vulnerable	
Leguminosae-pap.	<i>Erythrina senegalensis</i>	Shrub	Bothiola	Village forest	Quite common	Medical			LC
Leguminosae-caes	<i>Erythrophleum guineense</i>	Tree	Teli	Gallery forest, Forest	Very common	Wood			
Rutaceae	<i>Fagara leprieurii</i>	Tree	Boulé-barklen	Wooded savanna	Quite common	Medical			
Moraceae	<i>Ficus ingens</i>	Shrub	Thièwè	Shrub/ wooded savanna	Quite common	Medical			
Moraceae	<i>Ficus sur</i>	Shrub	Djibhè	Shrub/ wooded savanna	Quite common	Medical			
Rubiaceae	<i>Gardenia erubescens</i>	Shrub	Bossé	Shrub/ wooded savanna	Quite common	Medical			
Hypericaceae	<i>Harungana madagascariensis</i>	Shrub	Soungala	Gallery forest, Forest	Quite common	Medical		Endangered	
Malvaceae	<i>Hibiscus sterculiifolius</i>	Herb		Gallery forest, Forest	Quite common	Medical			
Apocynaceae	<i>Holarrhena floribunda</i>	Shrub	Endhanma	Wooded savanna, Fallow land	Very common	Wood			
Euphorbiaceae	<i>Hymenocardia acida</i>	Shrub	Pelitoro	Wooded savanna, Fallow land	Quite common	Medical		Vulnerable	
Icacinaceae	<i>Icacina senegalensis</i>	Herb	Siila	Fallow land	Quite common	Medical			
Poaceae	<i>Imperata cylindrica</i>	Herb		Fallow land	Very common		Invasive		
Convolvilaceae	<i>Ipomoea involucrata</i>	Liana		Gallery forest, Forest	Quite common	Medical			
Combretaceae	<i>Laguncularia racemosa</i>	Shrub		Mangrove	Quite common	Wood			LC
Apocynaceae	<i>Landolphia heudelotii</i>	Liana	Pooré lanmou	Gallery forest, Forest	Rare	Medical		Endangered	
Anacardiaceae	<i>Lannea velutina</i>	Shrub	Thiouko	Wooded savanna, Fallow land	Quite common	Medical			

Family	Species	Biological type	Local name (Poular)	Habitat types where observed	Abundance in the area	Local use	Other	Guinean status	IUCN status
Anacardiaceae	<i>Lannea acida</i>	Shrub	Thiouko	Wooded savanna, Fallow land	Quite common	Medical			
Leguminosae-caes	<i>Lecaniodiscus cupanioides</i>	Shrub	Thiouko	Shrubby savanna, Fallow land	Very common	Medical			
Rubiaceae	<i>Leptactina senegambica</i>	Shrub		Gallery forest, Forest	Rare	Medical			
Ochnaceae	<i>Lophira lanceolata</i>	Shrub	Malanga	Wooded savanna	Very common	Wood		Vulnerable	
Leguminosae-pap	<i>Lonchocarpus cyanescens</i>	Liana	N'gara	Gallery forest, Forest	Rare	Medical		Endangered	
Euphorbiaceae	<i>Macaranga heudelotii</i>	Shrub		Gallery forest, Forest	Rare	Medical			
Euphorbiaceae	<i>Margaritaria discoidea</i>	Shrub	Keri	Wooded savanna, Fallow land	Quite common	Wood			
Bignoniaceae	<i>Markhamia tomentosa</i>	Shrub	kafa wadou	Wooded savanna, Fallow land	Quite common	Wood			
Rubiaceae	<i>Morinda geminata</i>	Tree	Wanda	Gallery forest, Forest	Quite common	Wood			
Leguminosae-pap	<i>Mucuna pruriens</i>	Liana	Bagui	Gallery forest, Forest	Quite common	Medical			
Moraceae	<i>Myrianthus serratus</i>	Tree		Gallery forest	Quite common	Medical			
Chrysobalanaceae	<i>Neocarya macrophylla</i>	Tree		Sandy plains	Rare	Food			
Bignoniaceae	<i>Newbouldia laevis</i>	Shrub	Soukounden	Fallow land	Very common	medical			
Nymphaeaceae	<i>Nymphaea micrantha</i>	Herb		Gallery forest	Rare	Medical			LC
Poaceae	<i>Olyra latifolia</i>	Herb		Gallery forest	Quite common	Medical			
Melastomataceae	<i>Osbekia tubulosa</i>	Herb		Shrubby/wooded savanna	Quite common	Medical			
Poaceae	<i>Oxytenanthera abyssinica</i>	Herb	Kewé	Dense forest	Very common	Wood			
Chrysobalanaceae	<i>Parinari macrophylla</i>	Shrub	Koura- demou	Wooded savanna	Rare	Food			
Leguminosae-mim	<i>Parkia bicolor</i>	Tree	Nété thiangol	Gallery forest, Forest	Rare	Wood			LC
Commelinaceae	<i>Palisota barteri</i>	Shrub		Gallery forest, Forest	Quite common	Medical			
Leguminosae-mim	<i>Parkia biglobosa</i>	Tree	Nété	Shrubby/wooded savanna	Quite common	Food		Vulnerable	
Leguminosae-mim.	<i>Pericopsis laxiflora</i>	Shrub		Shrubby/wooded savanna	Very common	Wood			
Leguminosae-caes	<i>Piliostigma thonningii</i>	Shrub	Barké	Shrubby/wooded savanna	Very common	Wood			
Leguminosae-mim.	<i>Prosopis africana</i>	Tree	Thiélen	Shrubby/wooded savanna	Very common	Wood			
Leguminosae-pap	<i>Pterocarpus erinaceus</i>	Shrub	Bani	Shrubby/wooded savanna	Very common	Wood			
Leguminosae-pap	<i>Pterocarpus santalinoides</i>	Tree	Gnégou	Shrubby/wooded savanna	Rare	Medical			LR
Apocynaceae	<i>Rauvolfia vomitoria</i>	Shrub		Fallow land	Quite common	Medical			
Rhizophoraceae	<i>Rhizophora mangle</i>	Shrub		Mangrove	Very common	Wood			LC
Rhizophoraceae	<i>Rhizophora racemosa</i>	Shrub		Mangrove	Very common	Wood			LC
Poaceae	<i>Rottboellia cf exaltata</i>	Herb		Fallow land, Grassy savanna	Very common				
Celastraceae	<i>Salacia debilis</i>	Shrub		Fallow land	Very common	Wood			
Rubiaceae	<i>Sarcocephalus exculentus</i>	Shrub	Doundouké	Fallow land, Gallery forest	Very common	Wood			
Rubiaceae	<i>Sarcocephalus pobeguini</i>	Tree	Poopo	Gallery forest	Rare	Medical		Endangered	
Smilacaceae	<i>Smilax anceps</i>	Liana	Goli-goli	Fallow land, Grassy savanna	Quite common	Medical			
Anacardiaceae	<i>Sorindeia juglandifolia</i>	Shrub	Kanssi bomba	Fallow land, Gallery forest	Quite common	Wood			
Loganiaceae	<i>Spigelia anthelmia</i>	Herb		Fallow land, Grassy savanna	Rare	Medical			
Anacardiaceae	<i>Spondias mombin</i>	Shrub	Thialé	Fallow land, Gallery forest	Rare	Food		Endangered	

Family	Species	Biological type	Local name (Poular)	Habitat types where observed	Abundance in the area	Local use	Other	Guinean status	IUCN status
Sterculiaceae	<i>Sterculia tragacantha</i>	Shrub	Thiapelegué	Fallow land, Gallery forest	Quite common	Medical			
Myrtaceae	<i>Syzygium guineense</i>	Tree	Kadjo	Shrubby/wooded savanna	Rare	Medical			
Combretaceae	<i>Terminalia glaucescens</i>	Shrub	Bori	Shrubby/wooded savanna	Quite common	Wood			
Dileniaceae	<i>Tetracera potatoria</i>	Liana		Shrubby/wooded savanna	Quite common	Medical			
Anacardiaceae	<i>Trichoscypha smeathmannii</i>	Tree		Gallery forest	Rare	Medical			
Meliaceae	<i>Turraeanthus africana</i>	Tree		Gallery forest	Rare	Medical			
Euphorbiaceae	<i>Uapaca heudelotii</i>	Tree	Yalagué-thiangol	Gallery forest	Rare	Wood			
Malvaceae	<i>Urena lobata</i>	Herb		Fallow land, Gallery forest	Quite common	Medical			
Annonaceae	<i>Uvaria chamae</i>	Shrub	Boylé	Shrubby/wooded savanna	Very common	Wood			
Hypericaceae	<i>Vismia guineensis</i>	Shrub	Soungala	Shrubby/wooded savanna	Quite common	Wood			
Verbenaceae	<i>Vitex doniana</i>	Shrub		Shrubby/wooded savanna	Very common	Medical		Endangered	
Apocynaceae	<i>Voacanga africana</i>	Shrub	Dopé thiaka	Village forest	Quite common	Wood			
Apocynaceae	<i>Voacanga thouarsii</i>	Tree		Gallery forest	Rare	Wood			
Annonaceae	<i>Xylopia aethiopica</i>	Tree	Guilè	Gallery forest	Rare	Medical		Endangered	

Table 6.2 *Herpetofauna species inventoried during the surveys*

Family	Species	Common name	Local name (Poular)	Habitat types where observed	Abundance in the area	Local use	Protection in Guinea	Guinean status	IUCN status
Reptiles									
Agamidae	<i>Agama boensis</i>	-	Palla ndankè	Shrubby savanna	Very common	-			
Crocodylidae	<i>Crocodilus suchus</i>	West African crocodile	Nôra	Mangrove	rare	Food	Fully protected	Endangered	
Scincidae	<i>Panaspis tristaoi</i>	-	Pallanai	Forest patch	Rare	-			
Colubridae	<i>Grayia smithi</i>	Smith's African water snake	Boddi n'dian	Forest patch (headwater)	Rare	-			
Colubridae	<i>Afronatrix anoscopus</i>	African brown water snake	Boddi n'dian	Forest patch (headwater)	Rare	-			LC
Crocodylidae	<i>Osteolaemus tetraspis</i>	African dwarf crocodile	Nôra	Forest patch (headwater)	Rare	Food	Fully protected	Endangered	VU
Varanidae	<i>Varanus niloticus</i>	Nile monitor	Sagari	Plaine	Very common	Food	Partially protected	Vulnerable	
Scincidae	<i>Trachylepis perrototi</i>	-	Palla moulukou	Modified habitat	Quite common	-			DD
Agamidae	<i>Agama agama</i>	-	Palla ndakké	Settlement	Very common	-			
Scincidae	<i>Trachylepis affini</i>	Senegal mabuya	Palla nai	Modified habitat	Very common	-			
Amphibians									
Ptychadenidae	<i>Ptychadena mascareniensis</i>	Mascarene grass frog	Toti	Gallery forest	Quite common	-			
Ptychadenidae	<i>Ptychadena superciliaris</i>	Sierra Leone grassland frog	Toti	Gallery forest	Quite common	-			
Dicroglossidae	<i>Hoplobatrachus occipitalis</i>	African Groove-crowned frog	Toti	Gallery forest	Quite common	-			LC
Pipidae	<i>Pseudhymenochirus merlini</i>	-	Toti	Gallery forest	Rare	-			LC
Hyperolidae	<i>Hyperolius sp.</i>	-	Toti	Modified habitat	Rare	-			
Hyperolidae	<i>Hyperolius lamottei</i>	Lamotte's Reed Frog	Toti	Modified habitat	Quite common	-			LC

Table 6.3 Mammals species inventoried during the surveys

Family	Species	Common name	Local name	Habitat types where observed	Abundance in the area	Local use	Protection in Guinea	Guinean status	IUCN status
Cercopithecidae	<i>Erythrocebus patas</i>	Patas monkey	Abendé woulén	Wooded savanna	Rare	Food, Medical			LC
Hominidae	<i>Pan troglodytes verus</i>	Western chimpanzee	Ademou	Gallery forest, Wooded savanna	Common		Fully protected		CR
Leporidae	<i>Lepus saxatilis</i>	Scrub hare	Boumbi	Bowal	Common	Food, Medical			LC
Leporidae	<i>Lepus sp.</i>	Hare	Boumbi	Bowal	Common	Food, Medical			LC
Herpestidae	<i>Atilax paludinosus</i>	Marsh mongoose	A'yentanè	Grassy/shrubby savanna, Bowal	Common	Food, Medical			LC
Herpestidae	<i>Mangouste sp.</i>	Mongoose	A'yentanè	Wooded savanna	Common	Food, Medical			LC
Bovidae	<i>Cephalophus maxwelli</i>	Maxwell's duiker	Wöre	Shrubby savanna	Rare	Food, Handicraft		Endangered	LC
Bovidae	<i>Tragelaphus scriptus</i>	Bushbuck	Watchèck	Gallery forest, Bowal, Grassy/wooded savanna	Common	Food, Handicraft			LC
Bovidae	<i>Cephalophus dorsalis</i>	Bay duiker	Tawoul	Wooded savanna	Rare	Food, Handicraft		Endangered	LC
Bovidae	<i>Cephalophus rufilatus</i>	Red-flanked duiker	Wöre	Wooded savanna	Rare	Food, Handicraft		Endangered	LC
Canidae	<i>Canis adustus</i>	Side-striped jackal		Gallery forest, Grassy savanna, Plantation	Common	Sale			LC
Suidae	<i>Phacochoerus africanus</i>	Common warthog	Atchiope	Bowal, Fallow land, Wooded savanna	Common	Food, Trade		Endangered	LC
Suidae	<i>Potamochoerus porcus</i>	Red river hog	Agnanda	Wooded/shrub savanna	Common	Food, Trade		Endangered	LC
Viverridae	<i>Genetta sp.</i>	Genet		Bowal	Common	Sale			LC
Sciuridae	<i>Xerus rutilus</i>	Unstriped ground squirrel	Aroban	Cashew nut plantation, Gallery forest	Common	Food			LC
Sciuridae	<i>Heliosciurus gambianus</i>	Gambian sun squirrel	Aroban	Gallery forest	Rare	Food			LC
Tryonomidae	<i>Thryonomys swinderianus</i>	Greater cane rat	Wire	Grassy savanna	Common	Food			LC

Table 6.4 Bird species inventoried during the surveys

Family	Species	Common name	Migratory status	Abundance in the area	Guinean status	IUCN status
Phalacrocoracidae	<i>Microcarbo africanus</i>	Long-tailed cormorant	Resident	Common		LC
Ardeidae	<i>Bubulcus ibis</i>	Cattle egret	Resident	Common	Annex 1	LC
Ardeidae	<i>Egretta gularis</i>	Western reef-egret	Resident	Locally common	Annex 1	LC
Ardeidae	<i>Egretta garzetta</i>	Little egret	Pan-African/Palearctic migratory	Common	Annex 1	LC
Ardeidae	<i>Ardea cinerea</i>	Grey heron	Resident	Common	Annex 1	LC
Ardeidae	<i>Ardea melanocephala</i>	Black-headed heron	Resident / Pan-African migratory	Common	Annex 1	LC
Ardeidae	<i>Ardea intermedia</i>	Intermediate egret	Resident / Pan-African migratory	Common		LC
Scopidae	<i>Scopus umbretta</i>	Hamerkop	Resident	Quite common		LC
Ciconiidae	<i>Ciconia episcopus</i>	Asian woollyneck	Resident / Pan-African migratory	Common	Annex 1	LC
Accipitridae	<i>Milvus migrans</i>	Back kite	Pan-African migratory	Common		LC
Accipitridae	<i>Necrosyrtes monachus</i>	Hooded vulture	Resident	Common	Annex 1	CR
Accipitridae	<i>Gyps africanus</i>	White-backed vulture	Resident	Common	Annex 1	CR
Accipitridae	<i>Gypohierax angolensis</i>	Palm-nut vulture	Resident	Locally common		LC
Accipitridae	<i>Accipiter badius</i>	Shikra	Resident / Pan-African migratory	Common		LC
Accipitridae	<i>Buteo auguralis</i>	Red-necked buzzard	Resident	Common		LC
Accipitridae	<i>Polyboroides typus</i>	African harrier-hawk	Resident	Common		LC
Accipitridae	<i>Kaupifalco monogrammicus</i>	Lizard buzzard	Resident	Quite rare		LC
Phasianidae	<i>Ptilopachus petrosus</i>	Stone partridge	Resident	Locally common		LC
Phasianidae	<i>Francolinus bicalcaratus</i>	Double-spurred francolin	Resident	Common		LC
Rallidae	<i>Amaurornis flavirostra</i>	Black crane	Resident	Common		LC
Charadriidae	<i>Vanellus senegallus</i>	Wattled lapwing	Resident / Pan-African migratory	Common		LC
Charadriidae	<i>Vanellus spinosus</i>	Spur-winged lapwing	Palearctic migratory	Common		LC
Scolopacidae	<i>Numenius phaeopus</i>	Whimbrel	Palearctic migratory	Common		LC
Scolopacidae	<i>Tringa totanus</i>	Common redshank	Palearctic migratory	Common		LC
Scolopacidae	<i>Tringa nebularia</i>	Common greenshank	Palearctic migratory	Common		LC
Scolopacidae	<i>Actitis hypoleucos</i>	Common sandpiper	Palearctic migratory	Common		LC
Columbidae	<i>Turtur afer</i>	Blue-spotted wood-dove	Resident	Common		LC
Columbidae	<i>Streptopelia semitorquata</i>	Red-eyed dove	Resident	Common		LC
Columbidae	<i>Streptopelia vinacea</i>	Vinaceous dove	Resident / Pan-African migratory	Common		LC
Columbidae	<i>Streptopelia senegalensis</i>	Laughing dove	Resident	Common		LC
Pteroclididae	<i>Pterocles quadricinctus</i>	Four-banded sandgrouse	Resident / Pan-African migratory	Locally common		LC
Psittacidae	<i>Poicephalus senegalus</i>	Senegal parrot	Resident	Common		LC
Musophagidae	<i>Tauraco persa</i>	Green turaco	Resident	Common		LC
Cuculidae	<i>Oxylophus levaillantii</i>	Levaillant's cuckoo	Pan-African migratory	Quite common		LC

Family	Species	Common name	Migratory status	Abundance in the area	Guinean status	IUCN status
Cuculidae	<i>Ceuthmochares aereus</i>	Chattering yellowbill	Resident	Common		LC
Cuculidae	<i>Centropus senegalensis</i>	Senegal coucal	Resident	Common		LC
Apodidae	<i>Cypsiurus parvus</i>	African palm-swift	Resident	Common		LC
Apodidae	<i>Apus apus</i>	Common swift	Palaearctic migratory	Common		LC
Apodidae	<i>Halcyon chelicuti</i>	Striped kingfisher	Resident	Common		LC
Apodidae	<i>Halcyon leucocephala</i>	Grey-headed kingfisher	Resident	Common		LC
Apodidae	<i>Ceryle rudis</i>	Pied kingfisher	Resident	Common		LC
Meropidae	<i>Merops albicollis</i>	White-throated bee-eater	Pan-African migratory	Quite common		LC
Coraciidae	<i>Coracias cyanogaster</i>	Blue-bellied roller	Resident / Pan-African migratory	Quite common		LC
Coraciidae	<i>Coracias abyssinicus</i>	Abyssinian roller	Pan-African migratory	Quite common		LC
Coraciidae	<i>Eurytomus glaucurus</i>	Broad-billed roller	Pan-African migratory	Quite common		LC
Bucerotidae	<i>Tockus fasciatus</i>	Congo pied hornbill	Resident	Common	Annex 1	LC
Bucerotidae	<i>Tockus nasutus</i>	African grey hornbill	Pan-African migratory / Resident	Common	Annex 1	LC
Capitonidae	<i>Pogoniulus chrysoconus</i>	Yellow-fronted tinkerbird	Resident	Common		LC
Capitonidae	<i>Pogoniulus bilineatus</i>	Yellow-rumped tinkerbird	Resident	Common		LC
Indicatoridae	<i>Indicator indicator</i>	Greater honeyguide	Resident	Locally common		LC
Hirundinidae	<i>Psalidoprocne obscura</i>	Fanti saw-wing	Resident / Pan-African migratory	Common		LC
Hirundinidae	<i>Hirundo lucida</i>	Red-chested swallow	Resident / Pan-African migratory	Locally common		LC
Motacillidae	<i>Anthus leucophrys</i>	Plain-backed pipit	Resident	Locally common		LC
Motacillidae	<i>Anthus trivialis</i>	Tree pipit	Palaearctic migratory	Common		LC
Motacillidae	<i>Macronyx croceus</i>	Yellow-throated longclaw	Resident	Locally common		LC
Pycnonotidae	<i>Andropadus virens</i>	Little greenbul	Resident	Common		LC
Pycnonotidae	<i>Chlorocichla simplex</i>	Simple greenbul	Resident	Locally common		LC
Pycnonotidae	<i>Pyrrhurus scandens</i>	Leaf-love	Resident	Locally common		LC
Pycnonotidae	<i>Pycnonotus barbatus</i>	Common bulbul	Resident	Common		LC
Turdidae	<i>Turdus pelios</i>	African thrush	Resident	Common		LC
Sylviidae	<i>Cisticola cantans</i>	Singing cisticola	Resident	Common		LC
Sylviidae	<i>Cisticola lateralis</i>	Whistling cisticola	Resident	Common		LC
Sylviidae	<i>Camaroptera brachyura</i>	Bleating camaroptera	Resident	Common		LC
Sylviidae	<i>Eremomela pusilla</i>	Senegal eremomela	Resident	Common		LC
Sylviidae	<i>Hylia prasina</i>	Green Hylia	Resident	Common		LC
Muscicapidae	<i>Melaenornis pallidus</i>	Pale flycatcher	Resident	Locally common		LC
Muscicapidae	<i>Melaenornis edolioides</i>	Northern black-flycatcher	Resident	Quite common		LC
Oriolidae	<i>Oriolus auratus</i>	African golden oriole	Pan-African migratory	Locally common		LC
Oriolidae	<i>Oriolus brachyrhynchus</i>	Western oriole	Resident	Common		LC
Corvidae	<i>Corvus albus</i>	Pierre crow	Resident	Common		LC
Sturnidae	<i>Lamprotonis splendidus</i>	Splendid starling	Resident	Common		LC

Family	Species	Common name	Migratory status	Abundance in the area	Guinean status	IUCN status
Monarchidae	<i>Terpsiphone rufoventer</i>	Red-bellied paradise-flycatcher	Resident	Common		LC
Platysteiridae	<i>Platysteira cyanea</i>	Brown-throated wattle-eye	Resident	Common		LC
Platysteiridae	<i>Bias musicus</i>	Black-and-white shrike-flycatcher	Resident	Common		LC
Timaliidae	<i>Illadopsis puveli</i>	Puvel's illadopsis	Resident	Quite common		LC
Timaliidae	<i>Turdoides reinwardtii</i>	Blackcap babbler	Resident	Quite common		LC
Nectariniidae	<i>Hedydipna collaris</i>	Collared sunbird	Resident	Common		LC
Nectariniidae	<i>Cinnyris pulchellus</i>	Beautiful sunbird	Resident / Pan-African migratory	Common		LC
Nectariniidae	<i>Cinnyris cupreus</i>	Copper sunbird	Resident	Common		LC
Laniidae	<i>Corvinella corvina</i>	Yellow-billed shrike	Resident	Locally common		LC
Malaconotidae	<i>Malaconotus blanchoti</i>	Grey-headed bush-shrike	Resident	Quite common		LC
Malaconotidae	<i>Malaconotus sulfurepectus</i>	Orange-breasted bush-shrike	Resident	Common		LC
Malaconotidae	<i>Tchagra senegalus</i>	Black-crowned tchagra	Resident	Common		LC
Malaconotidae	<i>Dryoscopus gambensis</i>	Northern puffback	Resident	Quite common		LC
Malaconotidae	<i>Laniarius turatii</i>	Turati's boubou	Resident	Common		LC
Malaconotidae	<i>Laniarius barbarus</i>	Yellow-crowned gonolek	Resident	Common		LC
Dicruridae	<i>Dicrurus adsimilis</i>	Fork-tailed drongo	Resident	Quite common		LC
Sturnidae	<i>Lamprotornis splendidus</i>	Splendid starling	Resident / Pan-African migratory	Common		LC
Passeridae	<i>Passer griseus</i>	Northern grey-headed sparrow	Resident	Common		LC
Ploceidae	<i>Ploceus cucullatus</i>	Village weaver	Resident	Common		LC
Ploceidae	<i>Ploceus nigricollis</i>	Black-necked weaver	Resident	Common		LC
Ploceidae	<i>Quelea erythropus</i>	Red-headed quelea	Pan-African migratory	Locally common		LC
Ploceidae	<i>Euplectes hordeaceus</i>	Black-winged bishop	Resident	Locally common		LC
Ploceidae	<i>Euplectes macroura</i>	Yellow-mantled widowbird	Resident	Common		LC
Estrildidae	<i>Uraeginthus bengalus</i>	Red-cheeked cordon-bleu	Resident	Common		LC
Estrildidae	<i>Estrilda melpoda</i>	Orange-cheeked waxbill	Resident	Common		LC
Estrildidae	<i>Lagonosticta senegala</i>	Red-billed firefinch	Resident	Common	Annex 1	LC
Estrildidae	<i>Spermestes cucullata</i>	Bronze mannikin	Resident	Common		LC
Viduidae	<i>Vidua interjecta</i>	Exclamatory paradise-whydah	Resident	Common		LC

Table 6.5 Fish species inventoried during the surveys

Family	Species	Local name (L=Landouma, P=Poular)	Fishing stations where species collected and abundance						Locally eaten ?	Identification issue ?	IUCN status
			Lower Tiouladiwol	Middle Tiouladiwol	Upper Tiouladiwol	Balahounwol	Pompowol	Beli Kindy			
Clariidae	<i>Clarias buettikoferi</i>	Konkonkori (L), Manago (P)	Quite common			Rare		Very common	Yes		LC
Clariidae	<i>Clarias salae</i>	Manago (P), Agbatt (L)		Rare					Yes		LC
Clariidae	<i>Clarias gariepinnis</i>	Manago (P), Agbatt (L)						Rare	Yes		LC
Clariidae	<i>Heterobranchus bidorsalis</i>	Mouki (P)					Rare		Yes		
Clariidae	<i>Clarias laviceps dialonensis</i>	Manago (P), Agbatt (L)		Rare					Yes		NA
Notopteridae	<i>Papirocranus afer</i>	Lampara/Kafawi (P), Afak (L)	Rare	Rare					Yes		LC
Mormiridae	<i>Petrocephalus tennicauda</i>	Doumboum (P), Barafoulen (L)	Rare	Rare		Rare	Very common		Yes		LC
Mormiridae	<i>Marcusenius thomasi</i>	Abalafourou (L)		Quite common		Quite common	Quite common		Yes		LC
Mormiridae	<i>Mormyrops anguilloides</i>	Doumboum (L)				Rare	Rare		Yes		LC
Mormiridae	<i>Brienomyrus brachyisteus</i>	Doumboum (L)	Quite common	Very common			Rare		Yes		LC
Anabantidae	<i>Ctenopoma kingsleyae</i>	Djambarawoulen (L)	Quite common	Quite common		Very common	Rare		Yes		
Claroteidae	<i>Chrysichthys nigrodigitatus</i>	Kokonkori (L)	Quite common				Rare		Yes		LC
Claroteidae	<i>Chrysichthys maurus</i>	Kokonkori (L)		Rare			Rare		Yes		LC
Claroteidae	<i>Chrysichthys auratus</i>	Kokonkori (L)				Rare			Yes		LC
Claroteidae	<i>Chrysichthys teugelsi</i>	Kokonkori (L)	Rare						Yes		LC
Schilbeidae	<i>Schilbe micropogon</i>	Kakoumalanga (L)					Quite common		Yes		LC
Channidae	<i>Parachana obscura</i>	Tekka kouthè (P), Kondongom(L)					Rare		Yes		
Amphiliidae	<i>Paramphilius teugelsi</i>	Kalimoudou (L)	Very common				Very common		Yes		VU
Hepsetidae	<i>Hepsetus odoe</i>	Sanka (P)				Rare			Yes		LC

Family	Species	Local name (L=Landouma, P=Poular)	Fishing stations where species collected and abundance						Locally eaten ?	Identification issue ?	IUCN status
			Lower Tiouladiwol	Middle Tiouladiwol	Upper Tiouladiwol	Balahounwol	Pompowol	Beli Kindy			
Cyprinidae	<i>Barbus pobeguini</i>	Tela (P), Kafoulin(L)			Very common			Rare	Yes		LC
Cyprinidae	<i>Barbus raimbaulti</i>	Tela (P), Kafoulin(L)			Very common				Yes		LC
Cyprinidae	<i>Barbus macrops</i>	Tela (P), Kafoulin(L)	Rare	Rare	Very common			Rare	Yes		LC
Mochokidae	<i>Synodontis waterloti</i>	Atchoumoun (L)	Rare			Rare	Rare		Yes		LC
Alestidae	<i>Brycinus macrolepidotus</i>	Saran (P), Thialoline (L)				Very common	Very common		Yes		LC
Aplocheilidae	<i>Epiplatys bifasciatus</i>	Kondongom (L)		Rare	Rare	Rare		Very common	Yes		LC
Aplocheilidae	<i>Epilatus fasciolatus</i>	Kondongom (L)	Very common						Yes		LC
Aplocheilidae	<i>Scriptaphyosemion geryi</i>	Kondongom (L)			Rare	Rare			Yes		LC
Polypteridae	<i>Polypterus palmas</i>	Karakassa (P), Kanseguel (L)		Rare		Rare			Yes		
Aplocheilidae	<i>Polypterus senegalus</i>	Karakassa (P), Kanseguel (L)				Rare	Rare		Yes		NA
Eleopidae	<i>Elops lacerta</i>						Rare		Yes		LC
Mastacembelidae	<i>Aecthiomastacembelus liberiensis</i>	Mbilirimbororo (P), Sandouloumané (L)					Rare		Yes		LC
Malapteruridae	<i>Malapterurus sp.</i>	Mirimiri (P), Ddombanok (L)					Rare			Yes	
Malapteruridae	<i>Malapterurus electricus</i>	Mirimiri (P), Ddombanok (L)	Rare			Rare	Rare				LC
Cichlidae	<i>Hemichromis fasciatus</i>	Maron (P)	Rare	Rare		Rare	Rare		Yes		LC
Cichlidae	<i>Hemichromis bimaculatus</i>	Maron (P)		Rare		Rare		Very common	Yes		LC
Poeciliidae	<i>Poropanchas normani</i>	Kondongom (L)				Rare			PM		LC
-	<i>Unidentified shrimp</i>	Sanfou (P)				Rare		Rare	Yes	Yes	NE/D D
-	<i>Unidentified crab</i>	Guèguèrè (P), Guémba (L)	Rare	Rare	Rare		Rare		PM	Yes	LC

ANNEX 2 - AERIAL SURVEY REPORT (SYLVATROP, 2017)

See stand-alone report provided in a separate document.