TILENGA PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Volume III

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13 – Terrestrial Vegetation

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13 Terrestrial Vegetation

13.1 Introduction

This chapter of the Environmental and Social Impact Assessment (ESIA) sets out the baseline conditions and impact assessment relating to terrestrial vegetation. It identifies the relevant sensitive receptors within the Project's Area of Influence (AoI) and in the assessment considers the potential for these receptors to be impacted by Project activities. The approach to the assessment follows the recommendations of the International Finance Corporation (IFC) Performance Standard 6 (PS6): Biodiversity Conservation and Sustainable Management of Living Natural Resources and other applicable standards.

This chapter firstly provides a description of the approach to the study. The scoping process that was undertaken is briefly described, during which receptors were initially identified through an analysis of available survey data and a review of local, national and international requirements and standards, and potential impacts identified.

This chapter also describes the spatial and temporal boundaries used in the assessment for terrestrial vegetation and the baseline conditions within these areas. Methods and sources of data collection are described and the guidelines used for undertaking the assessment, particularly in terms of identifying receptors and defining 'significance', are presented.

The chapter describes the existing baseline conditions within the area of study, including vegetation types, Critical Habitat and other habitat categories and the recorded (or likely presence of) priority plant species. For this assessment priority species comprise species associated with Critical Habitat (i.e. Critical Habitat Qualifying Species (CHQS)) and other species of conservation concern that have been identified).

This assessment is therefore based on review of previous studies and the results of fieldwork undertaken directly for the Tilenga ESIA by the ESIA team. Identified receptors are evaluated in terms of their level of conservation concern, as these features comprise the key receptors that this chapter will consider.

The assessment considers Project embedded mitigation measures and then presents in general terms the potential impacts, both direct and indirect, on the identified receptors, in order to demonstrate that all of the likely impacts on Terrestrial Vegetation and associated receptors have been adequately considered.

Taking agreed additional mitigation measures for direct and indirect impacts into account, the *residual* impacts on priority receptors identified as being of conservation concern are evaluated. This is important because these are the actual likely impacts of the Project that can be predicted at this stage.

Based on the assessment of residual impacts further mitigation may be required in line with the overall commitment for this project to comply with the requirements of IFC PS6, to ensure no net loss of natural habitat / biodiversity gain of critical habitat that is lost or compromised by the project, even after all additional mitigation is taken into account. This is particularly relevant for indirect impacts.

The outline for the agreed and further mitigation is included within the ESMP Mitigation Checklist and discussed in ***Chapter 23: Environmental and Social Management Plan (ESMP)***. Note that the potential for cumulative impacts with other projects in the surrounding area is considered separately in ***Chapter 21: Cumulative Impact Assessment***.

This Terrestrial Vegetation chapter demonstrates how the Project has adhered to the 'mitigation hierarchy' as defined in IFC PS6, i.e. that impacts should be avoided, minimised and restored, or offset if necessary, with priority given to the actions which are earliest in the hierarchy and consequently least disruptive to the receptor. An important aspect of the ESIA process is the Project design, which is essential if the impacts are to be assessed properly. As part of the design through the early stages of Project development and latterly through the Front End Engineering Design (FEED) process, alternatives were considered and decisions were taken that resulted in avoidance of some potential impacts completely. To achieve avoidance a number of surveys were undertaken to identify features of conservation concern within the Project Footprint and surrounding areas and all efforts were undertaken to avoid these features, where this was feasible.

The Project design and the process of consideration of alternatives are discussed in ***Chapter 4: Project Description and Alternatives*** of this ESIA. This is an important issue because avoidance is an early and significant step in the mitigation hierarchy as required by the IFC Performance Standards.

When avoidance of potential impacts has not been possible, measures to reduce them to an acceptable level and to restore and/or enhance biodiversity will be implemented. Compensatory actions, such as habitat creation, are only considered if these measures do not result in a reasonable expectation of no net loss of biodiversity.

Given the complexity in predicting Project impacts on biodiversity over such a large area and over the long-term, the Project Proponents will adopt a practice of adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the outcome of monitoring. Long-term monitoring of agreed indicators will also be required to ensure that the identified requirements for no net loss / biodiversity gain (for Natural Habitat / Critical Habitat respectively, as per PS6) and fulfilment of all defined management objectives have been achieved.

13.2 Scoping

In accordance with Section 19 of the National Environment Act Cap 153 and Regulation 3 of the Environmental Impact Assessment Regulations, 1998, an ESIA is required before commencement of this Project. As part of this process, Regulation 10 of the Environmental Impact Assessment Regulations, 1998, requires that the Terms of Reference (ToR) for ESIA are prepared by the proponent in consultation with NEMA and the lead agency (through a process known as 'Scoping').

The objective of scoping was to identify the potentially significant impacts on all receptors, including terrestrial vegetation, in order to develop an agreed focus for the subsequent impact assessment.

The Scoping report summarised background information regarding vegetation and flora receptors associated with the Project, based on information available at that time. This comprised mainly information based on the EA1 and EA2 Environmental Baseline Study (EBS) reports as well as other ESIAs that had been prepared for individual exploration drilling sites or the seismic surveys for example. Reference was also made to on-going and planned studies, the main findings of which, now available, are discussed in the baseline section below.

As noted, in presenting available ecological information, an objective of the Scoping report was to set out ToR for the ESIA with regard to future survey and assessment.

The ToR also mentions that this section of the assessment would discuss protected areas, such as the Murchison Falls National Park (MFNP), Central Forest Reserves (CFRs) and Wildlife Reserves (WR) as receptors in their own right. In addition, other important receptors such as Critical Habitat (or more specifically areas where CHQS are present) would be described, where these have been defined.

Potential impacts on terrestrial vegetation identified in the Scoping report are summarised in Table 13-1. It is worth noting that the Project phasing and identified list of potential impacts have evolved during the completion of this ESIA and consequently build and expand on those originally identified in Table 13-1 during the Scoping phase.

Table 13-1: Potential Terrestrial Vegetation Impacts identified in the Scoping Report

Potential Impact	Potential Cause	Potential Sensitivity	Phase
Potential impacts on terrestrial habitats (e.g. Loss of habitat or fragmentation).	Site preparation and construction activities including vegetation clearance.	Habitats in the Project Area, including protected areas likely to comprise areas supporting Critical Habitats (e.g. MFNP, the Murchison Falls – Nile Delta Ramsar site, Bugungu Wildlife Reserve and Budongo Forest).	Construction and Operation
Potential impacts on priority vegetation.	Site preparation and construction activities including dust from vehicle movements, vegetation clearance and operation of Project's components.	Flora, in particular endemic or threatened species (IUCN Red Data lists), priority plant species, and those sensitive to changes in environmental conditions.	Construction Operation Decommissioning
Potential increase in presence of invasive species.	Site clearance, vegetation removal and importation of materials during construction / decommissioning. Colonisation of disturbed land during operation of the Project's facilities.	Existing native vegetation and wildlife within the Project Area and surrounding area accessible to wildlife.	Construction Operation Decommissioning
Potential impact on priority species.	Site preparation and construction activities including vegetation clearance.	Habitats in the Project Area, including protected areas likely to comprise Critical Habitats (e.g. MFNP, the Murchison Falls – Nile Delta Ramsar site, Bugungu Wildlife Reserve and Budongo Forest).	Construction and Operation
Potential indirect impacts due to in-migration, induced access. This may include introduction or spread of invasive or alien species.	Increase in presence and movements of personnel and numbers of people supplying/ supporting personnel.	Critical Habitat & Natural Habitats and other priority species that may be vulnerable to increased human presence and exploitation, or competition from invasive species.	Construction and Operation

In addition to terrestrial vegetation, the Scoping process also identified the potential impacts on terrestrial wildlife (see ***Chapter 14: Terrestrial Wildlife***) and on aquatic life (see ***Chapter 15: Aquatic Life***) that could occur as a result of the construction, operation and decommissioning of the Project.

13.3 Legislative and Policy Framework

This Section summarises the main legislation and standards pertaining to terrestrial vegetation receptors. These include those applicable to environmental protection issues in Uganda, relevant international conventions and agreements and the provisions of recognised environmental standards and guidelines. For the purposes of this study, a consistent set of standards is required to frame the interpretation of the results of field surveys, where appropriate.

The Constitution of the Republic of Uganda (1995), sets out the concepts of sustainable development and environmental rights, specifically National Objective XXVII (Ref. 13-1) relating to sustainable development, the natural environment, energy policy and national parks; and National Objective XIII relating to protection of important natural resources, including land, water, wetlands, minerals, oil, fauna and flora on behalf of the people of Uganda.

The National Environment Act Cap 153 (1995) (Ref. 13-2) describes the principles of environmental management and the rights to a decent environment; institutional arrangements; environmental planning, environmental regulations, environmental standards; environmental restoration orders and environmental easements; records, inspection and analysis; financial provisions; offences; judicial proceedings and international obligations. It also includes schedules relating to what should be considered for ESIA. Section 19 (6) (j) of the Act specifically points out the need for an ESIA for 'exploration for the production of petroleum in any form'.

The Wildlife Policy (2014) (Ref. 13-3) recognises that wildlife is a key socio-economic resource for Uganda, and outlines the status and threats to wildlife in Uganda. The policy also defines the protected areas in Uganda and their conservation importance.

The requirements of other international conventions relevant to protection of wildlife within Uganda are generally covered by existing legislation mentioned above.

It should be noted that a consistent set of standards are generally required to frame the discussion of the results of field surveys and/or assessments. However, in the context of terrestrial vegetation surveys there are no 'standards' as such to compare results against and therefore the legislation identified above is presented mainly to put this element of the assessment into legislative context. Table 13-2 below provides an overview of the key legislation and guidance applicable to the Project relevant to terrestrial vegetation.

Table 13-2: Legislation and Guidance

Legislation/ Guidelines/ Standard	Key Provisions/ Requirements	Application to the ESIA and limitations
The Wildlife Policy (2014). (Ref 13-3)	Outlines the status and threats to wildlife in Uganda and defines the protected areas in Uganda and their conservation importance.	Refers to protected areas used to define scope of surveys.
Uganda Wildlife Act, Cap 200 (2000). (Ref 13-6)	Designed to protect wildlife resources and enable derivation of benefits.	Identifies restrictions on collection of species from the wild.
Prohibition of the Burning of Grass Act (Cap. 33). (2000) (Ref 13-53)	Act sets out that the burning of grass by any person is prohibited in all areas of Uganda, except under authority and under the supervision of specified public officers.	Relates to legal management of grassland areas.
The National Forestry and Tree Planting Act (2003). (Ref 13-7)	Provides for the conservation, sustainable management and development of forests for the benefit of the people of Uganda.	Framework for conservation of forests, including formation of the National Forest Authority (NFA). Important because forests and the trees they contain are regarded as receptors in the ESIA.
The National Forestry and Tree Planting Regulations (2016). (Ref 13-8)	Statutory instrument related to The National Forestry and Tree Planting Act (2003)	Lists NFA Reserved Species that represent potential receptor species in the assessment.
The National Environment (Wetlands, River Banks And Lake Shores Management) Regulations, No. 3 (2000) (Ref 13.54)	Provides for the conservation and wise use of wetlands and their resources in Uganda, ensuring water catchment conservation, control of pollution, flood control, sustainable use of wetlands for ecological and tourist purposes.	Defines protection of wetland habitats in Uganda
Uganda Wildlife (Murchison Falls National Park) Bylaws-S.I 200-3 (Ref 13.55)	Sets out bylaws for prohibited activities within MFNP.	Defines prohibited activities within MFNP.

Legislation/ Guidelines/ Standard	Key Provisions/ Requirements	Application to the ESIA and limitations
UWA operational guidelines for oil and gas exploration and production in wildlife protected areas, January 2014 (Ref 13.56)	Sets out guidelines to oil companies working within the protected areas to minimise impacts from their activities.	Objectives of the guidelines are to minimize long and short - term negative impacts of oil and gas developments on the integrity of protected areas and associated ecological processes and on tourism; to regulate activities of oil companies within protected areas; and to enhance awareness and appreciation of conservation among the oil companies. Has applicability to development of mitigation measures although these relate to minimisation of impacts rather than avoidance or offsetting.
The ESIA Guidelines published by NEMA in 1997 (and Energy Sector EIA Guidelines in 2004). (Ref 13-4, Ref 13-5)	Define the ESIA process and procedures to be undertaken.	General requirements for good practice in baseline data collection.
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) – UNESCO (1971). (Ref 13-9)	Defines criteria for the designation of Ramsar sites and is convention to which the Ugandan Government is a signatory.	General controls on activities in the Victoria Nile Ramsar Site.
Convention on Biological Diversity (CBD) – United Nations (1993). (Ref 13-10)	International convention to which the Ugandan Government is a signatory agreeing to protect biological diversity.	Identifies restrictions on collection of species from the wild.
Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) – United Nations Education Scientific Organisation (UNESCO) (1972). (Ref 13-11	International convention to which the Ugandan Government is a signatory agreeing to protect biological diversity and World Heritage Sites.	Refers to protected areas used to define scope for surveys.
African Convention on the Conservation of Nature and Natural Resources – Organisation of African Unity (OAU) (1968). (Ref 13-12)	International convention to which the Ugandan Government is a signatory relating to protection of natural resources.	Identifies restrictions on collection of species from the wild and the damage to habitats.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1975). (Ref 13-13)	International convention to which the Ugandan Government is a signatory agreeing to prevent or control trade in certain endangered species.	Identifies restrictions on collection of species from the wild.
IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. (Ref 13-14)	Requirement for integrated assessment to identify (i) the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement; and (iii) the client's management of environmental and social performance throughout the life of the Project.	This Performance Standard sets the overall approach to undertaking the ESIA for the Project.
IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. (Ref 13-15)	Protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.	Identification of potential impacts on qualifying features related to and which define modified, natural and Critical Habitat, as well as legally protected and internationally recognised areas. Protection and conservation of biodiversity through implementation of the mitigation hierarchy.

Legislation/ Guidelines/ Standard	Key Provisions/ Requirements	Application to the ESIA and limitations
IFC EHS Guidelines for Onshore Oil and Gas Development (2007/2017)	Includes information relevant to seismic exploration, exploration and production drilling, development and production activities, transport activities including flowlines and pipelines, other facilities including pump stations, metering stations, pigging stations, compressor stations and storage facilities, ancillary and support operations, and decommissioning.	Directly applicable to the impacts associated with the Project and therefore to inform the ESIA. This guideline was published in 2007 but a new version is currently in draft with the second round of consultations undertaken April-May 2017. The final version has not yet been published.
Cross Sector Biodiversity Initiative (CSBI) Cross Sector Guide for Implementing the Mitigation Hierarchy (2015)	Provides guidance on the mitigation hierarchy in relation to biodiversity and ecosystem services. It describes a sequence of four key actions – 'avoid', 'minimise', 'restore' & 'offset' and provides a best practice approach for sustainable management is a guide through the practical implementation of the mitigation hierarchy.	Identifying and agreeing mitigation is crucial to defining the residual impacts of the Project. The principles of the mitigation hierarchy have been followed in the Project design and will inform the development of further mitigation as identified through this impact assessment.
TEP Uganda Biodiversity Charter (2013). (Ref 13-16)	Defines TEP Uganda's biodiversity objectives.	Requirement for protection of biodiversity and implementation of appropriate mitigation.
Murchison Falls National Park, Karuma Wildlife Reserve & Bugungu Wildlife Reserve (Murchison Falls Protected Area) General Management Plan (2012-2022)	Sets out the management objectives for the MFPA until 2022. The GMP has been structured into different programs including; Resource Conservation and Management, Monitoring and Research, Community Conservation, Tourism Development and Park Operations.	Ten of the well pads plus associated roads and flowlines are located within the MFNP. Development of mitigation needs to take management objectives into account. There may also be indirect impacts on the Bugungu wildlife reserve.
Forest Management Plan for Budongo Central Forest Reserves (Budongo, Siba, Biiso, Kitigo, Busaju and Kaniyo-Pabidi Blocks) 2011–2021 (2012), Ministry of Water and Environment	The Management Plan has been prepared to ensure that the Budongo Central Forest Reserve is sustainably managed, with high quality forest related products and services supplied to Government, local communities, the private sector and the international community on a sustainable basis.	Objectives are to: Enhance biodiversity conservation of the Budongo Forest Resource Increase supply of timber and non-timber forest products for local and national requirements. Integrate communities in the management of Budongo CFR and their livelihoods improved. Improve stock levels through gap and enrichment planting in the forest. Enhance Budongo CFR ecological systems capacity to sequester carbon and provide other environmental services. Budongo CFR is actively managed by NFA. Tourism is an important feature of Budongo CFR. Main threats include illegal logging activities, habitat clearance and poaching, including from the chimpanzee population. Current threats to the Budongo CFR may be exacerbated by population changes in the vicinity,

Legislation/ Guidelines/ Standard	Key Provisions/ Requirements	Application to the ESIA and limitations
		induced by this Project.
The National Forest Plan 2011/12 – 2021/22. Ministry Of Water And Environment Directorate Of Environmental Affairs. January 2013	The National Forest Plan (NFP) is a sector-wide national instrument for managing and utilising the forestry resources in Uganda. The strategic objectives are to: 1. Increase economic productivity and employment through forest production, processing and service industries; 2. Raise incomes for households through forest-based initiatives; 3. Restore and improve ecosystem services derived from sustainably managed forest resources.	General overview of how forests are to be managed. Key strategies for restoration and conservation of natural forests comprise: 1. Restore / rehabilitate degraded and deforested natural forests in CFRs and wildlife conservation areas 2. Promote the restoration / rehabilitation of natural forests on private and communal lands 3. Restore / rehabilitate water catchment areas and fragile ecosystems (bare hills, river banks, lakeshores, wetlands) 4. Build capacity for community based natural resource/forest management (CBNRM) and collaborative forest management (CFM) 5. Promote the development of natural forest related enterprises 6. Promote conservation of biodiversity in priority forest reserves and wildlife conservation areas 7. Promote management of important biodiversity corridors on private and communal land.

13.4 Spatial and Temporal Boundaries

13.4.1 Spatial Boundaries

In undertaking an ESIA it is essential to define clearly the scope and parameters of the study. For an ecological impact assessment it is particularly important to understand all the elements of the development including associated infrastructure that would not exist unless the Project was developed, their location and what activities will take place at those locations and over what timescale.

Once these elements and activities are fully understood and located, it will then be possible to identify potentially significant receptors and to define potential direct impacts on those receptors within or close to the Project footprint. It will also be possible to define potential indirect impacts on receptors that may be situated at distance from the main Project activities. Such indirect impacts may be caused by induced changes, such as population and/or socio-economic changes affecting natural resources outwith the main Project area, although these impacts may be difficult to quantify or define accurately.

For the purposes of this assessment the Project Area covers the entire area of CA-1, EA-1A and LA-2 (North) and is defined to include terrestrial and aquatic habitats that may be affected by changes during the different phases of the Project. Two spatial boundaries are considered for the purpose of this ESIA (and displayed on Figure 13-1):

- The Primary Study Area comprises the actual footprint of the Project's infrastructure, including well pads, the Central Processing Facility (CPF)/Industrial area, flow lines, camps, access roads, etc., as set out in ***Chapter 4: Project Description and Alternatives*** including a buffer of up to 500m around the infrastructure and any features of importance for biodiversity that are crossed by this infrastructure. This is referred to as the Project Area and therefore includes MFNP, the Murchison Falls-Albert Delta Wetland System Ramsar site and the areas south of the Victoria Nile; and

- The Secondary Study Area comprises locations outside of the Primary Study Area but which may be affected by indirect or induced impacts associated with the Project. This is referred to as the Project AoI, where it is considered that, even though it extends some distance from the Project Area and so there will not be any direct impacts, there may still be some impacts on sensitive receptors (such as protected areas and species associated with them). The AoI therefore includes locations where there may be indirect (induced) impacts, such as increased pressures on biodiversity e.g. from changes in local human populations associated with the Project. Furthermore, the secondary area contain areas where elements such as the Tilenga feeder pipeline and refinery will be placed, as well as some associated Project infrastructure, such as new critical oil roads constructed by others. It is considered that areas that lie outside of the AoI are not likely to be subject to direct or indirect impacts caused by the Project. The dashed line across Lake Albert indicates that it is considered that the Project is not likely to impact the southern part of the lake but acknowledges that there is connectivity across the whole waterbody.

13.4.2 Temporal Boundaries

The proposed timescales for the Project are set out in ***Chapter 4: Project Description and Alternatives***. Impacts associated with Site Preparation and Enabling Works, Construction and Pre-Commissioning and Decommissioning phases may be different from those that may occur during Commissioning and Operations phase, although this may be difficult to define precisely as different phases will overlap for several years after commencement of Commissioning and Operations Phase (for example drilling will continue at some well pads when others are already operational).

The majority of site clearance, preparatory works, building of new roads, laying of pipelines and construction of well pads and the Industrial area will occur during Site Preparation and Enabling Works and Construction and Pre-Commissioning phases. The Commissioning and Operations phase will include on-going extraction of oil as well as maintenance of infrastructure. Decommissioning will comprise the final phase of the Project, and activities will be similar to those of Construction and Pre-Commissioning Phase, in terms of earthworks and changes vegetation. The timescales and activities are discussed in ***Chapter 4: Project Description and Alternatives*** of this ESIA. Long-term environmental planning and management will take any potential future impacts into account in determining and prioritising mitigation in good time in relation to the Project.

It should be acknowledged that impacts on flora and habitats may occur as a result of direct losses and also to indirect impacts due to induced and other factors. If these are not adequately identified and mitigated the impacts on flora and habitats may outlast the lifetime of the Project. The assessment therefore identifies the impacts of this Project, some of which may still be evident after the Project is completed, unless mitigated adequately.

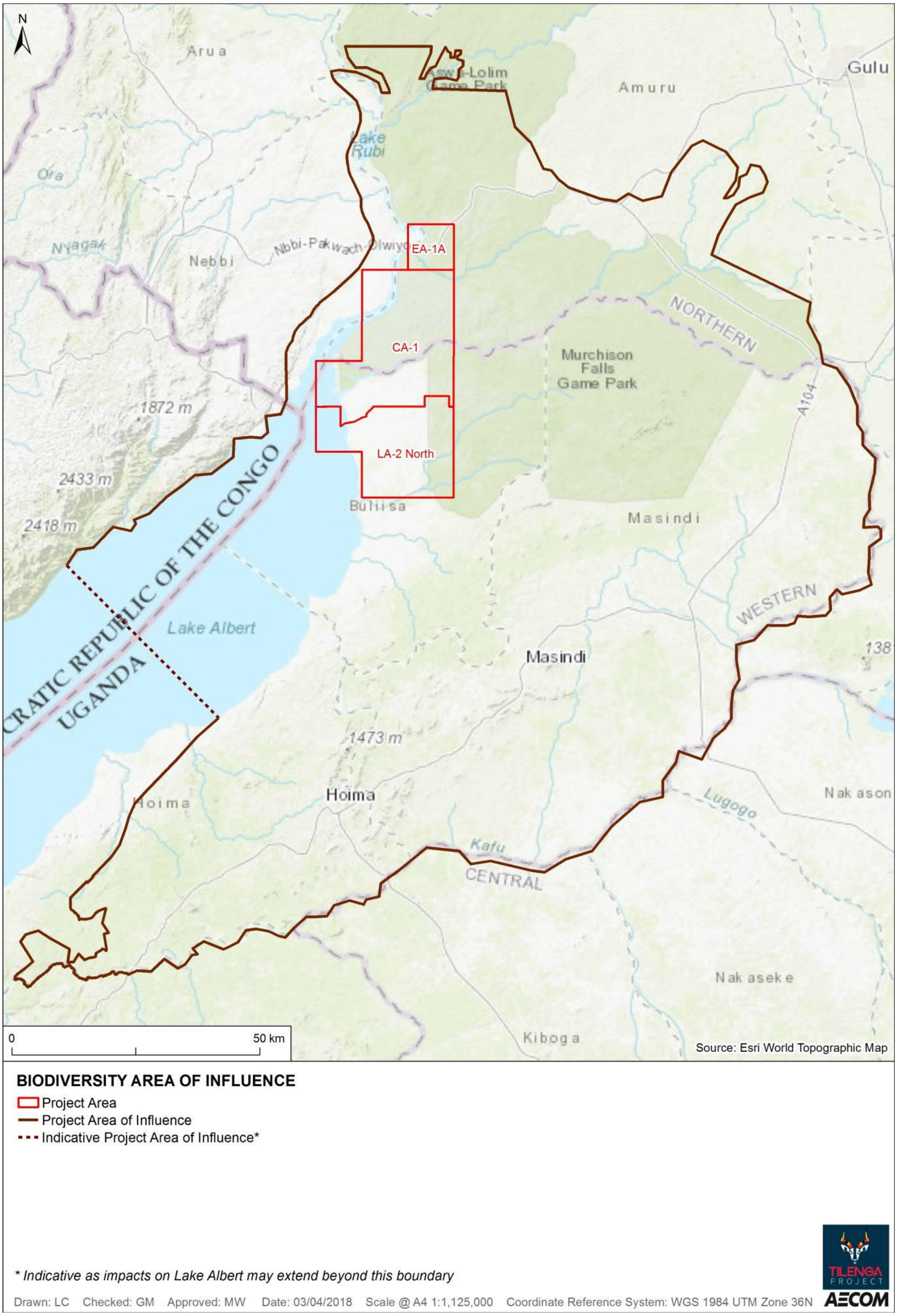

Figure 13-1: Project Area and Biodiversity Area of Influence

13.5 Baseline Data Collection

13.5.1 Introduction

The baseline element of this chapter is based on two types of data, comprising the desk study review of previous study reports and reviews ("secondary data"), and field surveys ("primary data") directed by the findings of the desk study activities. The latter element comprises field work undertaken directly for the Project by the Tilenga ESIA team.

In this way the baseline and the assessment can focus on those species that are present or are likely to be present as receptors that will be directly or indirectly impacted by the Project.

The approaches to undertaking the desk study, the field work and the ecological impact assessment, with regard to Terrestrial Vegetation, are summarised below.

13.5.2 Desk Study – Secondary Data

A full review of previous studies was undertaken for this assessment, primarily as part of the Scoping Report / ToR (Ref 13.17) discussed above, and also during internal gap analysis. A full documentary review was also undertaken as part of the Environmental Baseline Study for EA1 in 2015 (Ref 13.18). In addition, a recent gap-analysis prepared by WCS (Ref 13.57) was reviewed.

For the documentary review and gap analysis the objective was to review the available information supplied by TEP Uganda, TUOP and from elsewhere, to help inform the assessment of environmental impact within the Project AoI and to identify data gaps and justify requirements for additional studies to inform the baseline and assessment. Available reports (more than 150 sources were listed relating to all aspects of biodiversity) were reviewed to gain an understanding of the data and the information available for the assessment and the gaps. Gap assessment identified additional information considered necessary to complete the Project baseline characterisation.

The principal reports, relevant to terrestrial vegetation, which were reviewed as part of the baseline data collection exercise, are summarised in Table 13-3 below.

Table 13-3: Secondary Data Sources

Document Title	Date of Info	Terrestrial Vegetation Assessment-Relevant Content
Environmental Baseline in Exploration Area 2 Review Report, Volumes 1 – 3 (AECOM)	2013	Summarises the findings of the first part of the Phase 1 Environmental Baseline Study (EBS) for Exploration Area 2 (EA-2). The study purpose was to identify and characterise important biodiversity that might be affected by development in the vicinity of EA-2, both as a result of impacts resulting from oil-related activity within it, and from any development of offsets. In addition, this report identifies important biodiversity and gaps in Critical Habitat Assessment (CHA) and informs the scope of a CHA of Block EA-2 and the detailed updated land cover land use analysis across the development undertaken by TUOP/WCS.
AECOM Block EA-1 Environmental Baseline Study (EBS) (Ref. 13-18).	2015	Includes detailed survey over two seasons in 2014 mainly within the MFNP, but also south of the Victoria Nile within EA-1 (Buliisa area), for mammals, birds, herpetofauna and invertebrates. The study focussed on vegetation mapping for the block based on satellite imagery, previous mapping and extensive ground-truthing surveys. The presence of plant species of conservation concern were recorded but did not form the main focus of the work done on terrestrial vegetation. As the locations of Project infrastructure were not known at that time, survey points were selected to provide a general coverage of vegetation types north of the Victoria Nile (with and adjacent to the MFNP), west of the Albert Nile and south of the Victoria Nile, mainly in the MFNP but also within the south Nile area within block EA-1. These findings are

Document Title	Date of Info	Terrestrial Vegetation Assessment-Relevant Content
		published in separate stand-alone report.
Environmental Sensitivity Atlas for the Albertine Graben (NEMA, 2010)	2009	The Atlas identifies those areas that may need special consideration in the event of an oil spill within the Albertine Graben area. It contains information on the physical environment (geology, soils, surface and ground waters), receptors such as forest reserves, biodiversity and species of special importance, socio-economics like fishing, agriculture etc., coastal features and bathymetry of Lake Albert and the climate of the area.
Phase 2 Biodiversity Study Land cover Mapping For The Albertine Rift Oil Development Basin, Exploration Areas EA-1-3 (TUOP/WCS)	2016	This report summarises land cover/land uses over blocks EA-1 to EA-3, expanding work done within EA-2. Objectives were to create a map that support the following tasks: 1. Assist in the delineation of Critical Habitat and understand the biodiversity associated with different land cover types, including species distribution. 2. Provide a basis for mapping modified and natural habitat, species distribution thereby informing the placement of infrastructure, identification of opportunities for conservation gain and potential Critical Habitat. 3. Provide a basis for monitoring land cover change. This includes creating a land cover classification with nested tiers to ensure compatibility with broader land cover maps (e.g. the NFA biomass series) as well as with finer scale biotope or vegetation association classes (specifically with Langdale-Brown *et al.* 1964). 4. Ground-truthing to ensure that observed differences detected on the imagery relate to distinct difference on the ground and use expert knowledge of the area in question to ensure that results are dependable.
Buliisa Development Pre-Project ENVID Report (RGL)	April 2015	Report on Buliisa Development Environmental Impact Identification (ENVID) workshop held in the Total offices in October 2014. Mentions some potential biodiversity receptors.
Diversity and distribution of vascular plants in Uganda's important bird areas. Ph.D. thesis, University of Copenhagen/ Makerere University, (Kalema, J., 2005)	2005	The thesis provides flora recorded from Murchison Falls National Park. Compares MFNP with some of the protected areas in Uganda and points out the areas of floral uniqueness of the park.
Strategic Environmental Assessment (SEA) of oil and gas activities in the Albertine Graben, Uganda, FINAL SEA report (PEPD and NEMA, 2013)	2013	An Albertine Graben-wide report that gives very brief and general overviews of wetland flora, aquatic fauna, specifically on fish, and identifies data gaps on these regarding biodiversity, economic valuation, temporal and spatial hydrodynamics data. It also gives a general overview of the terrestrial flora and fauna as well as protected and sensitive sites in the Albertine Graben. The report provides only limited data for Lake Albert and general and mostly outdated information for aquatic flora and fauna.
The IUCN Red List website www.iucnredlist.org/	Last update: 2017	The International Union for Conservation of Nature (IUCN) aims to identify threatened and endangered species around the world. A recently introduced search tool allows identification of threatened species according to different criteria (location, species group and habitat). The site provides a list of threatened animal species and

Document Title	Date of Info	Terrestrial Vegetation Assessment-Relevant Content
		vegetation species of conservation concern. The Red List is constantly being updated but there are clear situations where species are data deficient (DD) and which therefore may not be accurately identified on the list, even though they are significant species, either because data concerning threats to them are not well recorded or because they may be locally rather than globally threatened.
The National Biodiversity Data Bank. (NBDB) website	Last update: unknown.	The National Biodiversity Data Bank (NBDB) aims to provide data and information on the country's biodiversity to scientists, conservationists, researchers, policy makers and other parties interested in the conservation and sustainable use of biological resources. The Biodiversity unit is based in the Makerere University Institute of Environment and Natural Resources (MUIENR) that acts as a central repository for biodiversity information within Uganda. The NBDB web site provides datasets related to plants, birds, mammals, amphibians, reptiles, insects & fish. Since 2000, biennial reports on the "State of Uganda's Biodiversity" are published by NBDB and to complement NEMA's "State of the Environment" reports. Specific request can be made to the MUIENR for data available on the web site. The biennial reports present general data and indices at country level, thus no specific data related to the Project area are available. http://nbdb.mak.ac.ug/
State of the environment report for Uganda, (NEMA, 2017)	2010	The report presents environmental, social and economic issues in the country and the state of the environment through an assessment of the major natural resources: land resources; atmospheric resources; freshwater and aquatic resources; biodiversity resources; energy resources; and environmental vulnerability. In the concluding remarks, the report proposes future outlooks and policy options to address the identified challenges.
Uganda biodiversity and tropical forest assessment, (USAID Uganda, 2006)	2006	Apart from providing a general overview of the main biodiversity features in Uganda, the document highlights the main threats to conservation of natural areas. It also addresses: Ugandan legislation for the environment and biodiversity; institutional frameworks for the protection of the environment; and websites for environmental information.
The Biodiversity Of The Albertine Rift. Plumptre, A.J., Behangana, M., Ndomba, E., Davenport, T., Kahindo, C., Kityo, R. Ssegawa, P., Eilu, G., Nkuutu, D. & Owiunji, I.	2003	Albertine Rift Technical Reports No. 3. Seven taxa were reviewed in this report: mammals, birds, reptiles, amphibians, butterflies, plants and fish. The data for the terrestrial vertebrates and the plants were used to rank sites for conservation priority, where these taxa will act as surrogates of total biodiversity given that it is impossible to survey all possible taxa as most are poorly collected. The report demonstrates that for endemic species each of these taxa is a good predictor of the others and for the most part this holds for total species richness.
Uganda's Forests, functions and classification, (NFA, 2005)	2005	The document presents information on the Forest Reserves in Uganda, their functions and, accordingly, their classification. Policies related to forest management are provided, together with a trend of the conservation status.
Murchison Falls – Albert Delta Wetland System Ramsar - Information sheet, (Byaruhanga, A. and Kigoolo, S., 2005	2005	The physical and ecological features of the Ramsar Site are described at a general level. A description of the social and cultural characteristics of the wetland site is also provided. Provides information on the Ramsar Site in general but is not site specific.

Document Title	Date of Info	Terrestrial Vegetation Assessment-Relevant Content
Conservation checklist of the trees of Uganda. Royal Botanic Gardens, Kew, England (Kalema, J. & Beentje, H.J. 2012)	2012	The book provides conservation status of trees found in Uganda, using standard IUCN criteria, their distribution in Uganda and beyond. It also provides the species of trees that are range-restricted species as well as the Uganda endemics. It provides currents names to Uganda's tree flora and a checklist of trees of conservation concern. List of species of trees of particular conservation concern whose range extends into or may be restricted in Block EA-1 or MFNP. Over 820 species of trees are assessed; these include those that occur in Block EA-1. Points out the main threats to conservation of trees in Uganda. The report points out the vegetation types in Uganda that support the highest numbers of tree species. Lists *Dalbergia melanoxylon* and *Vitellaria paradoxa* (also known from MFNP) as being Threatened globally and in Uganda.
The effects of oil and gas exploration in the Albertine Rift region on biodiversity; A case of protected areas (Murchison Falls National Park) Review report Prepared for Nature Uganda (Kityo, R.M., 2011)	2011	A general overview of the oil exploration activities at the time, the known levels of biodiversity, highlights some potential impacts on biodiversity as a result of the industry and makes suggestions for advocacy actions to mitigate the impacts. The report has summary figures on the species richness of parks in the Albertine Rift area including MFNP, graphs population trends of some species of large mammals in MFNP from aerial counts, lists important protected areas. http://www.natureuganda.org/downloads /
Albertine rift conservation status report Albertine Rift Conservation Series No 1, (Kanyamibwa, S., 2013)	2013	Highlights the challenges for conservation and what conservation and policy actions are needed. Contains summary overviews on biodiversity status and trends on large mammals in general and a special focus on gorillas and chimpanzees, birds, amphibians and plants. www.researchgate.net
Vegetation change induced by elephants and fire in Murchison Falls National Park, Uganda. Ecology 42(4) ,752-766, (Buechner, H.K. and Dawkins, H.C., 1961)	1961	The paper presents evidence for hypotheses about the causes of the vegetation changes and the probable future vegetation under prevailing pressures. The paper showed that the luxuriant wooded grasslands, *Terminalia* woodlands, *Cynometra* rainforests, and riparian forests were in the process of conversion to treeless grassland through the combined action of elephants and fire. Field observations were combined with analysis of aerial photographs taken in 1932 and 1956 which photographs showed 55-59% reduction in trees with crown diameters greater than 9 m. The paper shows that none of the living trees was free from scars resulting from debarking by elephants, and nearly all were in a low state of vigour. Grassland vegetation characterised by *Hyparrhenia filipendula, Brachiaria brisantha,* and *Andropogan canaliculatus* increased in distribution following the destruction of woodlands. The basic cause of the conspicuous, rapid changes in vegetation was attributed to an extraordinary increase in the population of elephants. http://www.jstor.org/stable/pdfplus/1933504.pdf?acceptTC=true&jpdConfirm=true
The biodiversity of the Murchison Falls Conservation Area. Kampala: MUIENR, (Pomeroy, D. (compiler), 2002).	2002	Highlights the importance of MFCA for conservation of biodiversity. The report has extensive lists of species of plants, birds and mammals recorded in different survey areas from which all data were collected.

Document Title	Date of Info	Terrestrial Vegetation Assessment-Relevant Content
Biodiversity and vegetation types in MFNP, (Kabesime, E., and Pomeroy, D., 1997)	1997	Highlights species of plants that dominated in the various Langdale Brown *et al.* (1964) vegetation classification categories.
UWA MIST Database	Mid 1980s onward	Database contains records of mammals, poachers, poaching activities, fires, etc. recorded by rangers out on routine monitoring patrols. Records are georeferenced.
Useful trees and shrubs for Uganda: Technical Handbook No 10. Regional Soil Conservation Unit, RSCU/SIDA, Kenya, (Katende, A.B., et al, 1995)	1995	Presents a checklist of trees considered by the authors as useful, provides key features for their identification and describes their use. Presents some information on their occurrence in the country.
The vegetation of Uganda and its bearing on land uses. Entebbe: Uganda Government Printer, (Langdale-Brown, I., et al., 1964)	1964	Describes and maps the vegetation types and communities of the country recognising 26 major vegetation types and many more subtypes within each of these.
The Vegetation of Africa, (White, F., 1998)	1998	Describes and maps the different vegetation cover categories for Africa with some finer detail resolved for country levels The maps are at 1:5,000,000 scale. The classification of vegetation used differed in many ways from that generally used previously. The main features were: (a) vegetation, in the first instance, should be classified solely on the plants themselves without reference to the physical environment; (b) the physiognomic features which in conventional classifications are inadequate; (c) a chorological system that provided both the basis of an objective framework within which the vegetation could be described, and a method of expressing the entire physiognomy of regional vegetation types. http://www.creaf.uab.es/MIRAMON/mmr/examples/miombo/docs/database/white/index.htm
Phase 2 Biodiversity Study, Biodiversity Survey Volume 3 WCS (2017) (Ref 13.26)	Surveys between Oct 2014 & July 2015	Using the land-cover map digitised by WCS, and information on features of the Lake Albert lakeshore highlighted by field surveys, a number of representative sampling sites in Block 2 were identified based on the major habitat types' e.g. marginal and floating vegetation, rocky areas, lagoons, river mouths, sand/or muddy bottoms. Surveys were undertaken as follows: • First field campaign (October - December 2014) • Second field campaign (January 2015 to March 2015) • Third field campaign (May – July 2015) The survey covered plants as well as amphibians, reptiles, butterflies, dragonflies, large and small mammals. Although the survey recorded did not include CA-1 and LA-2 (north) directly these data were useful for ecological context and identification of Critical Habitat to inform the ESIA.

Document Title	Date of Info	Terrestrial Vegetation Assessment-Relevant Content
WCS & eCountability, (2016). Phase 2 Biodiversity Study: Volume 4, Land-Cover Mapping for the Albertine Rift Oil Development Basin, Exploration Areas EA-1-3 Ref 13.42	2017	Summarising land cover/land uses over blocks EA-1 to EA-3 (now known as EA-1A, CA-1, LA-2 and KFDP), expanding work done within LA-2. The objective of this study was to update landcover mapping that did not only contain standard land cover classes, but also differentiated between distinct vegetation classes over the entire Lake Albert Development Basin and the surrounding areas. A new land cover classification approach was applied to facilitate the land cover analysis as defined in Annex 1 to that report.
WCS, Implementation of Avoidance Gap Analysis for Research on Critical Habitat Species, May 2017	2017	This report presents information and data currently known on each species; details results of an analysis of gaps in all available data and information based on the CHA Interpretation and Recommendations report (TBC and FFI 2017); summarises additional surveys required to fill the gaps identified above; provides details of the additional survey and analysis requirements to enable reliable avoidance and mitigation of impacts; and where appropriate, suggests the type of monitoring that should be carried out. The six Landscape Contexts identified by TBC/FFI are referred to in order to assess gaps in knowledge and provide proposals for further research. Assessment revealed that taxa have variable data availability. Data availability for the same taxa also varied between the landscape contexts. Guidance is provided on appropriate means of data collection and analysis.
WCS (2015) Biodiversity Surveys of Murchison Falls Protected Area. (Ref. 13-30)	2015	Summarises the findings of a biodiversity survey of Murchison Falls Protected Area (MFPA - including Murchison Falls National Park, Bugungu and Karuma Wildlife Reserves). As well as surveys for animals includes plant surveys based on circular nested plots on transects.
WCS & eCountability, (2016). Nationally Threatened Species for Uganda: National Red List for Uganda	2016	This list identifies and lists Ugandan species considered to be threatened at a national level and is extremely useful in determining sensitivity of receptor species.
TBC and FFI (2017) Critical Habitat Assessment: Results and Interpretation	2017	Report on behalf of Total E&P Uganda, Block EA-1, EA-1A and EA-2 North (now known as CA-1, EA-1A and LA-2 North, respectively). Identified and refined Critical Habitat Qualifying Species (CHQS) and other features covering all PS6 criteria. Defines Landscape Context indicating presence and sensitivity of CHQS and other criteria.
WCS (2017) Habitat quality and condition of vegetation within the Murchison-Semliki Landscape. Nangendo, G., Ayebare, S., Grantham, H., Nampindo, S., Kirunda, B., Nsubuga, P. & Plumptre, A.J.	2017	This report presents the results of an assessment of the habitat quality and condition of vegetation within the Murchison-Semliki (M-S) Landscape. The purpose of this assessment is to map the habitat quality and condition in the region where oil exploration and development is ongoing, to improve planning for avoidance of environmental impacts as well as moving towards quantifying mitigation measures and potential offsets. A good quality habitat is defined as a relatively intact habitat that is species rich and mature, providing the resources the species needs to survive and successfully reproduce. It is measured using species richness and vegetation structure as well as patch size and fragmentation metrics. This was then applied within suitable habitat for CHQS where there are sufficient observations to assess habitat preference for a species. Results were classified into good, medium

Document Title	Date of Info	Terrestrial Vegetation Assessment-Relevant Content
		and poor quality habitat for these species across the M-S landscape. As a general observation, the best habitat quality occurred where the patches of habitat were large and within protected areas.
WCS (2017) Critical Habitat Species Habitat associations and preferences (September 2017) Final Report (Ref. 13-20).	2017	This report analyses the habitat associations for 167 Critical Habitat Qualifying Species (CHQS) and other priority species. Habitat association is assessed for 23 plant species that have at least one occurrence record in the report. However, the main focus of the report relates to animal species, although the report states that only five species were considered to have sufficient data to be able to map their habitat associations and preferences accurately, using a phytosociological map created covering CA-1 and the northern part of LA-2.

Relevant information from these and other studies have been used to inform the baseline and impact assessment described later in this chapter.

13.5.3 Gap Analysis

As can be seen from Table 13-3 above, a considerable body of work has been created to map landcover and vegetation types and to determine the distribution of priority species. The principle vegetation mapping work commissioned is the 2017 study by WCS & eCountability (Ref 13.42) which maps in detail the vegetation types within MFNP and the entire Albertine Rift oil development landscape. The study presents a hierarchical vegetation classification system which is developed to six levels from the general ecosystem group (Level 1), through functional landscape level classes (Level 3), which is the level illustrated in Figure 13-5 of this report, down to a detailed level of phytosociological classification and biotopes. In this regard the vegetation mapping is very well developed and there are no significant gaps with regard to this aspect of the data. The only requirement is that this data will be kept up to date to monitor landscape changes in future.

With regard to information on priority plants, information on species distribution has been derived from studies undertaken in preparation for this assessment. However, although the information we have available is sufficient to complete the assessment, it is generally the case that the more studies that can be done the more information these will be with regard to distribution and likely trends for each priority species.

The main studies that covered plant species distribution were those undertaken by WCS, principally Refs 13.26 & 13.30. These studies relied on transects at set intervals over a wide area to record presence of species. Clearly the more transects done and the closer together they are the more data can be collected. However, these studies did provide information on general distribution of priority species and identified their potential presence within the AoI.

Although comprehensive, in general the available data is not sufficient to inform completely most species' population, distribution and habitat preferences, which therefore has a bearing on understanding the sensitivity, resilience and possible threats to those species. This is particularly the case for most plant priority plant species (for example *Afzelia africana* and *Khaya senegalensis*) and therefore further work to establish this data is likely to be required (see Ref 13.57).

However, for the purposes of this ESIA there is information sufficient to determine the sensitivity of priority species for this assessment (taking the precautionary principle into account) and also it is known that certain species are likely to be present within the Project AoI. The previous studies therefore provided information on what species might be expected and should have been looked for during the field surveys of the proposed development sites within the Project Area (see section 13.5.4 below).

13.5.4 Ecological surveys – Primary Data

13.5.4.1 Principal Field Reports

A large number of field studies have been undertaken over the years within the AoI, particularly within the MFNP. Many of these were undertaken for specific projects such as exploration well sites and for the seismic surveys that were carried out as part of the oil exploration activities within the Project Area. Other surveys have had a more general remit covering a wider geographical area within the AoI.

In addition, a number of ecological surveys have been commissioned by the Proponent specifically in relation to the Project ESIA. The principal field studies relating to terrestrial vegetation comprise the following:

- Tilenga ESIA (2017) – FEED: Avoidance Survey Report (Ref. 13-27). This survey was undertaken as part of the FEED process and was intended as the first stage in the mitigation hierarchy. Surveys were undertaken at each proposed well pad as well as at the Nile pipeline crossing points (north and south) and the Water Abstraction Station (WAS) on Lake Albert. For most sites, the survey covered each site (e.g. well-pad) boundary defined at that time plus a buffer area of 500m by 500m, although a number of sites inside the MFNP were surveyed within a wider buffer (1000m x 1000m). Surveys were based on 30 x 30 m quadrats, while all plants (woody and non-woody) were recorded in 5 x 5 m plots consistently nested in the north-eastern corner of the bigger plot. A minimum of five plots were surveyed within each buffer zone (more in the larger buffer sites). Within each quadrat a record was made of type of habitat, abundance (percentage cover) of all recorded woody species, habitat condition, identification of the dominant woody species, species conservation concern (avoidance features) and invasive species. The surveys were also used primarily to identify avoidance features within and close to the specific footprint of Project infrastructure. The study also served to indicate where the more specialist surveys should be focused, as it was evident that not all surveys would be useful at all of the sites. Some information on habitat condition was also collected. These findings are available in a separate stand-alone report;
- Tilenga ESIA (2017) – FEED: Avoidance Survey Report for Flow Lines (Ref. 13-28). Continued on from the previous study but focused on flowlines between well pads with the same methods used;
- Tilenga ESIA Baseline Study (2016/2017), undertaken specifically for this ESIA. This study is the most recent set of surveys undertaken within the main Project area. It built on the findings of the avoidance studies and included surveys for flora (as well as for mammals, invertebrates, birds and herpetiles) within and immediately around the footprint of selected Project sites. The terrestrial vegetation focus was on identifying plant species of conservation concern within the context of vegetation type. As before, the survey covered a buffer area of 500m by 500m. Surveys were based on 30 x 30 m quadrats, while all plants (woody and non-woody) were recorded in 5 x 5 m plots consistently nested in the left top corner of the bigger plot. A minimum of five plots were surveyed within each buffer zone. Within each quadrat a record was made of type of habitat, abundance (percentage cover) of all recorded woody species, habitat condition, identification of the dominant woody species, species conservation concern (avoidance features) and invasive species. Survey work for flora was undertaken in March/April and June/July 2017, technically representing wet and dry seasons respectively. However, it should be noted that for these 'wet' and 'dry' seasons, it was still very dry in the period typically associated with the 'wet' season (March/April) and the rains came late in the period typically associated with the 'dry' season (June/July). The results from these surveys are presented in Appendix N.1; and
- AWE (2017) Early Works Project Brief Baseline Study. Air Water Earth (AWE) Ltd conducted a baseline study of the existing terrestrial vegetation at ten sites within the Project Area in July 2017 (Industrial Area, new roads N2; upgrade roads A1, A2, A3, A4, B1, B2, and the Bugungu airstrip extension). Biodiversity field surveys were performed at each site to identify and characterise potentially sensitive receptors and species of conservation concern. Transect lines were

established to guide the surveys; and the Langdale-Brown *et al.* (1964) (Ref. 13.25) vegetation maps were used to examine the vegetation types within the study areas. Site specific vegetation descriptions and classifications were determined based on species dominance and floral features at each sampling site.

The detailed field methods used for the avoidance studies are described in each report. The findings from these studies have been used to construct an overview of baseline conditions within the Project Area and the AoI.

13.5.4.2 Baseline Study

Prior to commencing site surveys, information on site location, vegetation types present in each survey area and the proposed disposition of infrastructure, such as the proposed well pad position(s), access roads and flow lines, was reviewed. The vegetation mapping reviewed was based on the latest mapping prepared by WCS. GPS data marking the centre of each site and a buffer (generally a 500m radius for well-pads and other sites, with a 50m buffer either side for flow lines and access tracks) were uploaded to GPS units for use in the field. A map of the main project components subject is presented Figure 13-2.

The aim was to survey all sites where Project-related infrastructure would be placed within the defined Project area. All sites were subject to a site walkover where avoidance features were recorded.

The reason for surveying the sites with a buffer around them was that the locations of infrastructure were at that time not finalised, and therefore the well pad or other development could potentially be placed anywhere within the defined buffer, taking into account micro-scale avoidance features as required. However, it is also important to understand potential receptors and consequently impacts close to the well pad footprint, including loss of connectivity to or between micro-habitats.

Vegetation types within the buffer zones were identified and confirmed based on phytosociological categories based on previous mapping prepared by WCS. For consistency with regard to the data collected, the same survey protocols used by WCS, following adaptation. Criteria for habitat quality were developed and agreed early prior to the survey campaign building on the existing matrix used during the CHA. For the vegetation surveys, each site was subject to a general walkover as noted, and then surveyed using nested plots.

In addition to vegetation mapping and identification of micro-habitats within the site, the survey also identified other features of interest. These features comprised seasonal wetlands, eroded areas, gullies, termite mounds, evidence of nesting birds, signs of animal species, kob leks, opportunistic sightings, presence of rare or invasive plant species, presence and use of the features by animals, and micro-habitats that might have the potential to support priority species.

For most sites, survey comprised an initial avoidance survey between November 2016 and January 2017. This was supplemented by a further two site visits where more detailed surveys were undertaken. The survey report for the detailed surveys is included in Appendix N.1 of this ESIA report and mapping for all elements of the Project subject to avoidance surveys is included in Appendix N.2.

The detailed survey characterised the vegetation within defined plots based on the dominant woody and non-woody floristic composition and landscape features observed in the general area at the site. The top three dominant species for both woody and non-woody species were recorded and any priority species were recorded. Other common species of plants at the site and their percentage cover were also estimated and habitat condition was recorded.

The detailed surveys recorded very few priority plant species in the sites surveyed: no range-restricted species were found and only one threatened species (*Milicia excelsa*) at the southern HDD pipeline crossing point was recorded. However, various invasive plant species were noted and these were recorded at both sides of the Victoria Nile Ferry crossing point, at Bugungu Airstrip and also at both sides of the HDD pipeline crossing point.

‘Fact sheets’ providing a general overview of the baseline conditions for each key Project component site are included in Appendix B.

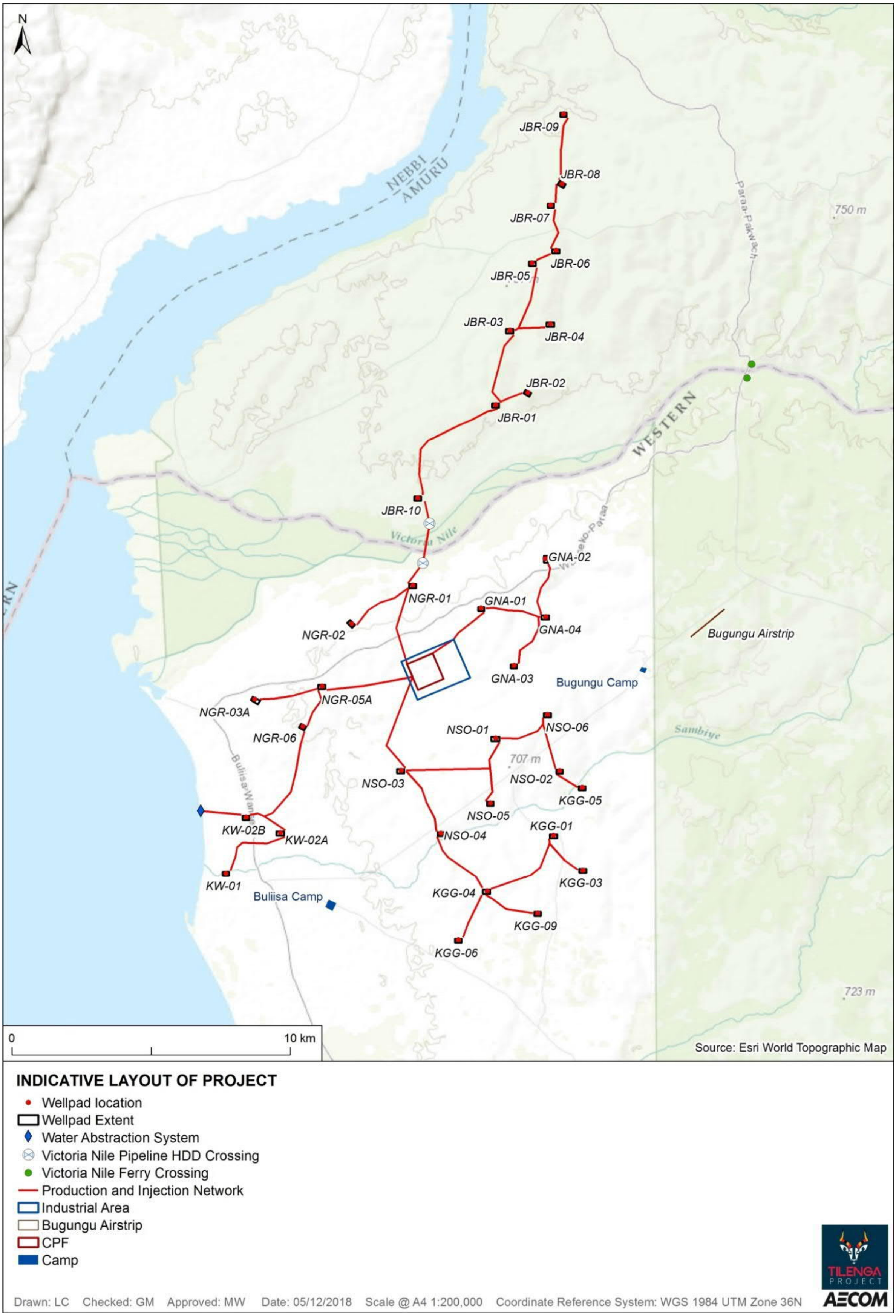

Figure 13-2: Project Footprint

13.6 Baseline Characteristics

13.6.1 Objective

The objective of this section is to present concisely existing data and information regarding vegetation and flora in the Primary Study Area and wider Project AoI. This is in order to ensure that there is an appropriate baseline for the assessment of impacts on habitats, flora and ecosystems, by identifying and defining the potential receptors that may be affected by the proposed Project activities. This has been undertaken through review of information on designations, vegetation mapping studies and species lists derived from previous studies, published sources and known databases.

Having identified the potential receptors, habitats, flora or the wider ecosystems of which these components form part, this data (supplemented by field surveys as necessary) have been used to identify the receptors of value, which then informs the impact assessment through the identification of potential impacts on those receptors, the development of appropriate mitigation measures and the determination of residual impacts of the Project. The baseline section therefore provides:

- A general overview of the Project Area and Project AoI, providing context for the more detailed characterisation that follows;
- A description of the CHA Landscape Context areas;
- Characterisation of ecosystems and habitats (vegetation types) present within the Project AoI, focussing on those within the Project Area;
- Identification of flora species that are considered as priority species and therefore receptors for this assessment; and
- Details of areas of conservation interest within the Project AoI (Protected Areas).

13.6.2 Overview of the Biodiversity in the Project AoI

The JBR Field, which occupies 20% of CA-1 east of the Albert Nile, lies within the MFNP, which hosts a range of emblematic wildlife and attracts national and international tourism.

MFNP is the largest and the second-most visited national park in Uganda. However, there are other protected areas in the Project AoI such as Bugungu Wildlife Reserve (WR) and Budongo CFR. The Murchison Falls Protected Area (MFPA) includes these three areas and therefore comprises a diverse array of protected sites throughout the region which form important biodiversity corridors, represent biodiversity hotspot areas for tourism, and are also of recreational importance.

The oil fields in the development area located north of Victoria Nile are entirely located within the MFNP. However, most of the well pads south of the Victoria Nile are located in a populated area with dispersed dwellings, grazing land and crops.

Using the definitions set out in IFC PS6, there are three main category of habitat in the Project AoI. These comprise Natural, Transitional (Natural) or Modified, where:

- Natural habitat refers to habitat with a low level of on-going disturbance or anthropogenic modification (e.g. within the MFNP);
- Transitional habitat refers to natural habitat that has a high level of on-going disturbance or anthropogenic modification but which could be reversed quite quickly if that pressure was reduced or removed (for example over-grazed grassland) (i.e. a Natural habitat transiting into a Modified habitat); and
- Modified habitat includes areas that have been radically changed such as cultivated land or settlements.

The Project Area is therefore extensive and is divided between the western part of the MFNP, north of the Victoria Nile, comprising natural habitat, and large areas of transitional and modified habitat south of the river, as well as some transitional, modified and natural habitat adjacent to Lake Albert.

However, based on the CHA undertaken (Ref 13.19), all of the habitats within the Project's AoI comprise Critical Habitat.

Elements of the Project Area have previously been subject to field study, particularly as part of ESIAs prepared for exploratory wells and seismic operations. In addition, there are numerous high level reviews of biodiversity within the region, which provide useful background information on vegetation cover, plant species presence and distribution as well as relative importance/sensitive of species (e.g. CHQS).

However, in terms of more detailed work over the Project Area, that is of most relevance to the current Project, various ecological field studies (as included in Table 13-3) in recent years have been undertaken with the objective of trying to understand, at a landscape level, the ecological characteristics of the region, such as land cover and vegetation types and their associations with plant species of conservation concern. All of these studies provide extremely useful (and up-to-date) background information on the distribution and dynamics of biodiversity elements within the region.

Furthermore, these studies clearly identify those species and habitats of particular conservation concern, especially those species and assemblages that represent criteria for defining Critical Habitat within the framework of IFC PS6, which forms a focus for the ESIA.

13.6.3 Critical Habitat Assessment landscape contexts

The CHA identified six Landscape Contexts that illustrate a landscape-scale view of potential Project interactions with all of the CHQS. Table 13-4 summarises how each of the defined Landscape Contexts is anticipated to interact with the Project.

Table 13-4: CHA Landscape Contexts – Project Interactions

Context	Name	Description	Interaction with Project Footprint
A	**MFPA**	**Grassland and woodland within the MFPA and to its north**. Contains extensive areas of Moist Combretum Savanna and *Hyparrhenia* Grass Savanna, and a concentration of Vulnerable species in Bugungu Wildlife Reserve. Context A is linked ecologically with Context B, but the management issues in each are different.	Well pads, flow lines and roads in CA-1 and EA-1A north of the Nile, and to a smaller extent well pads, flowlines and roads elsewhere in CA-1 and LA-2
B	**Savanna corridor**	**Grassland and open wooded or scrub habitats** along a **weakly-protected savanna corridor** that runs approximately north-south along and below the escarpment. Contains Natural Habitat and transitional habitat, with areas of Moist Combretum Savanna and a concentration of Vulnerable species along the escarpment. Context A is linked ecologically with Context B, but the management issues in each are different.	Well pads, flow lines and roads, CPF and the Tilenga Feeder pipeline towards the refinery (and EACOP) in Modified and mainly unprotected Natural (including transitional) Habitat) around Buliisa, between the Nile and Bugungu Wildlife Reserve. Indirect impacts on this Landscape Context may also occur.
C	**Lake Albert, rivers and wetlands**	**Lake Albert** and **fringing wetlands**, including the Murchison Falls-Albert Delta Wetland System Ramsar Site and Waiga/Waisoke River floodplain, as well as many other smaller rivers and swamps: Contains a concentration of Vulnerable species in the Murchison Falls-Albert Delta Wetlands System Ramsar Site.	Victoria Nile Ferry Crossing; Victoria Nile HDD Crossing; Lake WAS Indirect impacts on this Landscape Context may occur.
D	***Tropical high forest***	**Forest** and **forest fragments** and **corridors**, including the large Central Forest Reserves of Budongo and Bugoma; smaller fragments, including Wambabya, between and around these; and gulley/riparian forests along rivers and streams running down to Lake Albert.	No Project footprint anticipated and no direct impacts are expected, although indirect impacts may occur.

Context	Name	Description	Interaction with Project Footprint
E	***Nebbi***	Unprotected **savanna habitats** in **Nebbi District (**West Nile sub-region), including areas of two threatened ecosystems. This context also potentially contains Critical Habitat for a globally and nationally threatened cycad species.	No Project footprint anticipated and indirect impacts are probably unlikely.
F	**Mixed land-scape**	This is a 'catch all' context that covers mixed habitats landscape-wide, including agriculture. Two landscape species, African Elephant and Chimpanzee, are wide-ranging across several ecosystems and in Modified Habitat.	All Project infrastructure is located within this Landscape Context as are all associated facilities. Direct and indirect impacts are possible.

However, it should be noted that even where there are no Project elements directly interacting with all Landscape Contexts it is possible that there will be indirect impacts that do affect such Landscape Context. The CHA Landscape Contexts are shown on Figure 13-3.

The AoI covers a combination of natural, modified and transitional habitat as already described. Natural habitat represents areas within the boundary of the MFNP and other protected areas. South of the Nile, around Buliisa district, habitats are generally modified in eastern areas up to the boundary of the MFNP with more transitional habitats to the west.

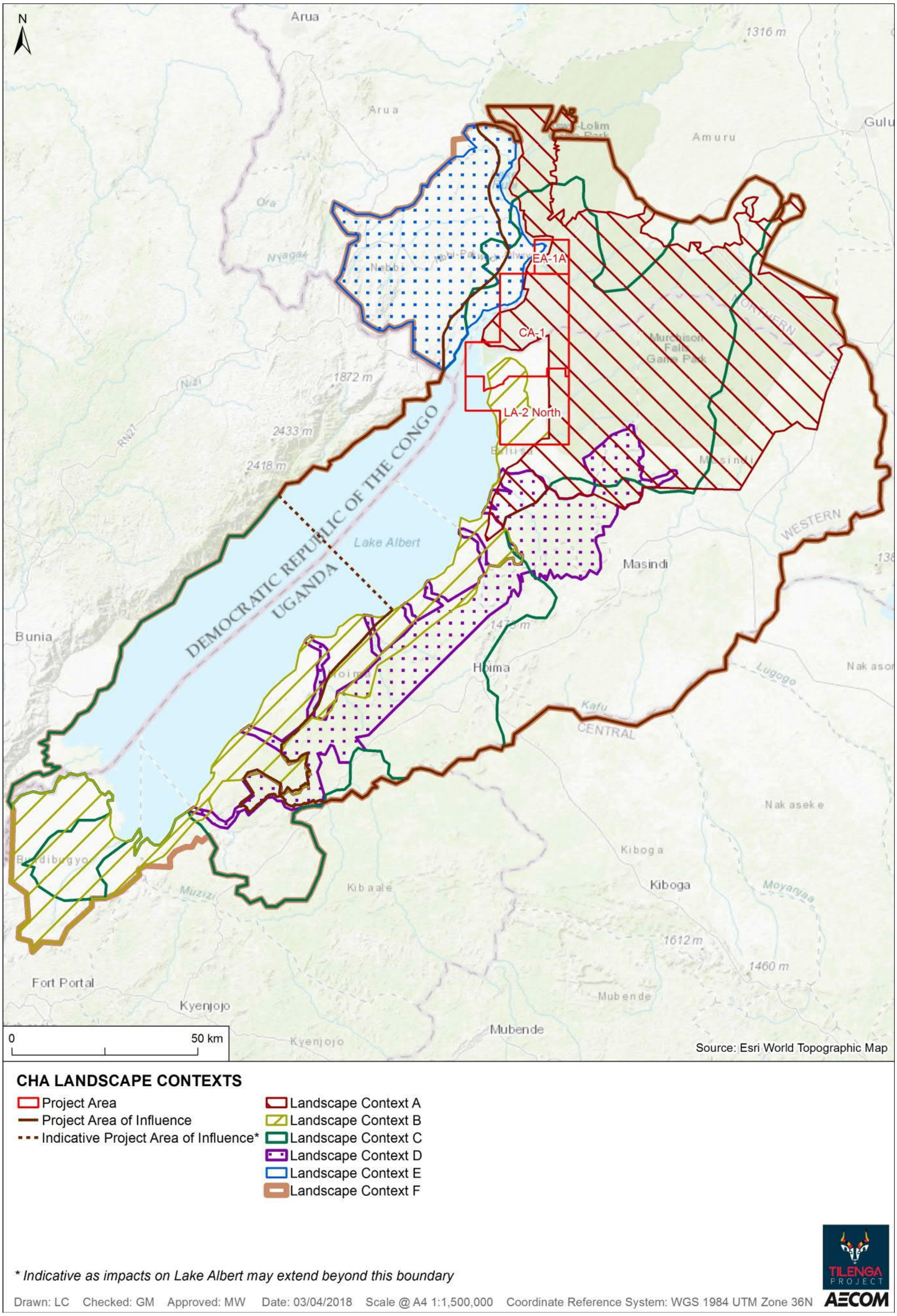

Figure 13-3: Landscape Contexts

13.6.4 Landscape receptors

The Landscape Contexts are defined by criteria comprising species and features indicated in IFC PS6. The CHA Criteria 1 to 3 refer to species of conservation concern and these are discussed later in this chapter. Criteria 4 and 5 relate to habitats, and the following have been identified:

13.6.4.1 Criterion 4: Highly threatened and/or unique ecosystems

Seven ecosystems defined as Endangered or Vulnerable are identified in the CHA studies, as defined in Table 13-5 below. Of these, the Project Footprint will only directly impact *Hyparrhenia* Grass Savanna habitat, (landscape context A), which is concentrated in and around the Project footprint (see Figure 13-4). However, there may be indirect impacts on the other ecosystems.

Table 13-5: Ecosystem Receptors

Vegetation receptor name	Classification basis	Description	General location	Rationale for inclusion as priority receptor
Dry Acacia Savanna	PS6, Criterion 4, EN Ecosystem	Dry savanna type within MFNP with predominantly acacia trees.	Located generally west of the Nile (Nebbi district) CHA Landscape Context E	PS6, Criterion 4, EN Ecosystem.
Forest/Savanna Mosaic	PS6, Criterion 4, EN Ecosystem	Savanna and forest remnants.	Scattered generally outside of protected areas to the south of the Project area below and above the escarpment. CHA Landscape Contexts D & F	PS6, Criterion 4, EN Ecosystem
Moist Acacia Savanna	PS6, Criterion 4, EN Ecosystem	Scattered savanna fragments with acacia	Generally found in areas east of Masindi. CHA Landscape Context F	PS6, Criterion 4, EN Ecosystem
Moist Combretum Savanna	PS6, Criterion 4, EN Ecosystem	Band of extensive savanna with Combretum	Eastern MFNP, extending down through Bugungu WR and through areas of forest/savanna mosaic along the escarpment. CHA Landscape Contexts A, D & F	PS6, Criterion 4, EN Ecosystem
Butyrospermum Savanna	PS6, Criterion 4, VU Ecosystem	Savanna with Butyrospermum trees	Located generally west of the Nile (Nebbi district) CHA Landscape Context E	PS6, Criterion 4, VU Ecosystem
Palm Savanna (Borassus palms)	PS6, Criterion 4, VU Ecosystem	Savanna with Borassus	Found in Semliki area (south end of Lake Albert) and in scattered areas east of Masindi. CHA Landscape Contexts B & F	PS6, Criterion 4, VU Ecosystem

Vegetation receptor name	Classification basis	Description	General location	Rationale for inclusion as priority receptor
Hyparrhenia Grass Savanna.	PS6, Criterion 4, VU Ecosystem	Open savanna dominated by *Hyparrhenia* with few trees	Main savanna type within the western MFNP and extending down the savanna corridor close to the Lake Albert shore. CHA Landscape Contexts A & B	PS6, Criterion 4, VU Ecosystem

13.6.4.2 Criterion 5: Key evolutionary processes

In addition, in the Project landscape, this criterion is likely to apply to Lake Albert and its associated fringing wetlands (including the Murchison Falls-Albert Delta Wetland System Ramsar site), because it has a significant level of endemism in fish and invertebrate species. Lake Albert and associated wetlands are also Critical Habitat-qualifying under Criterion 1 to 3.

For the purposes of this assessment Criterion 5 is not defined as a distinct receptor because it correlates to other identified receptors already included in the assessment.

13.6.4.3 Natural Habitats

In addition to specific Criteria relating to landscape, IF PS6 also emphasises the importance of Natural Habitats, contrasting this with Modified Habitats (i.e. habitats that have been significantly changed due to human action, for example cultivation). The identification of Natural Habitats is important because IFC PS6 requires that loss or degradation of such habitat be match by actions that achieve a ‘no net loss’ of Natural Habitat.

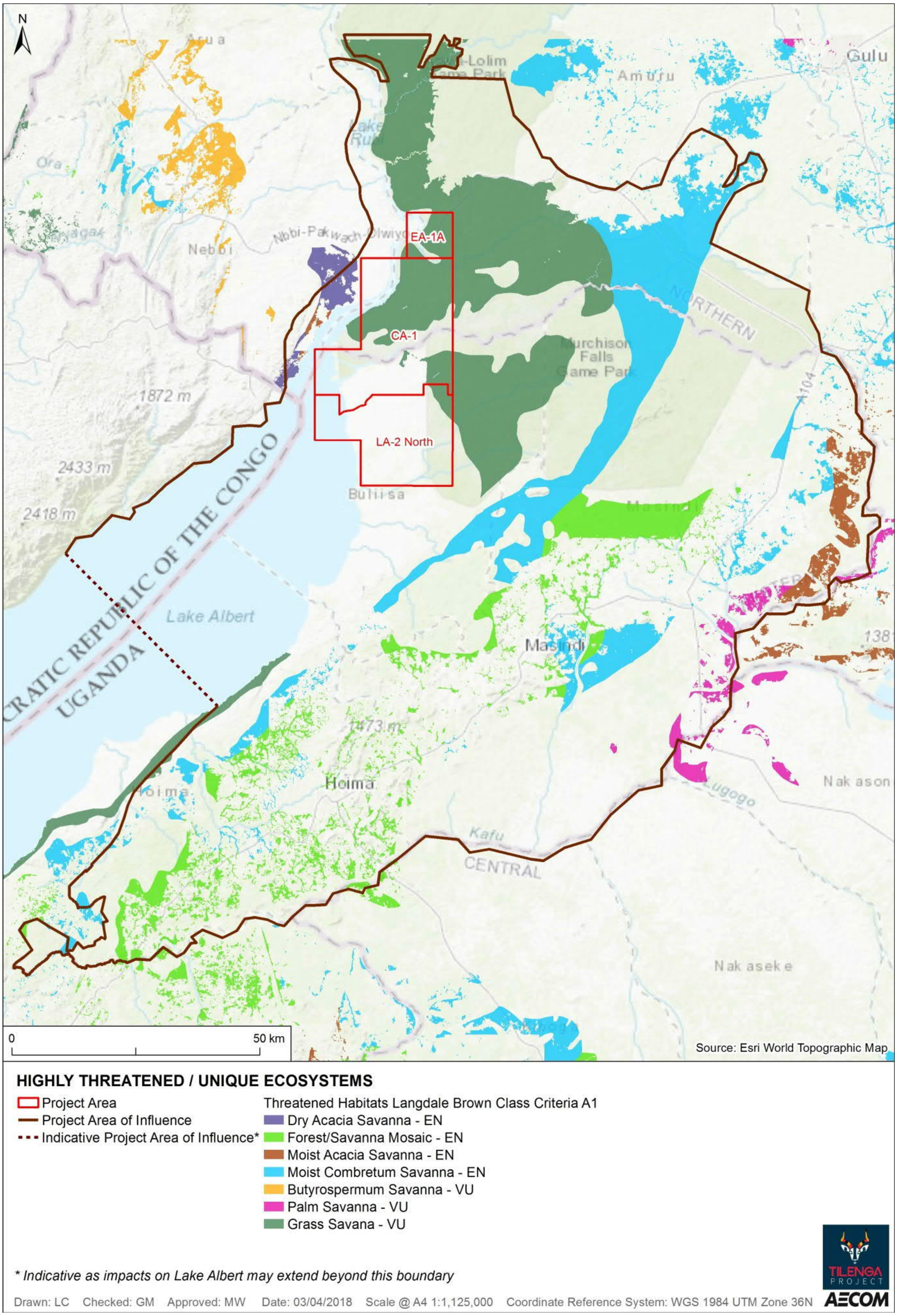

Figure 13-4: Highly Threatened/Unique Ecosystems

13.6.5 Vegetation receptors

Within the context of general landcover and landscape contexts, vegetation types and the habitats they represent vary in their sensitivity and importance.

Vegetation can be classified at different scales and according to different criteria, although the different classes do not necessarily form a nested hierarchy due to different methods of classification. Table 13-6 below defines the different vegetation / habitat classifications considered in this assessment and their relevance for the impact assessment.

Based on the above table, which provides a rationale for inclusion in the assessment, the priority vegetation receptors are described in Table 13-6 below.

Table 13-6: Definition of Vegetation Receptors

Scale / classification system	Description	Relevance for impact assessment	Source	Priority receptor for IA?
Ecosystem	Defines as a system that includes all living organisms (biotic factors) in an area as well as its physical environment (abiotic factors) functioning together as a unit.	Priority of species present in the Project AoI that may be impacted by the Project are associated with different ecosystems. In addition, certain threatened ecosystems can be regarded as receptors in their own right.	Defined in Critical Habitat Assessment Ref 13.19	**Yes** Ecosystems qualifying as Critical Habitat under PS6 Criterion 4 are priority receptors.
Functional vegetation type	High level description of landcover based on general composition and functionality.	Used at scoping and baseline survey planning stage to prioritise and target fieldwork.	Equivalent to Level 2 of the landcover hierarchy defined in Annex 1 to Ref. 13.24.	**No** High level classification and therefore insufficient detail.
Landcover class	These landcover classes comprise further detailed subdivision of the generalised functional vegetation type. Some of these will represent receptors in their own right where they comprise natural or Critical Habitat.	Impacts on Natural and Critical Habitat need to be considered in a PS6 compliant ESIA. In addition, certain priority species are likely to be associated with landcover classes (preferred habitat).	Equivalent to Level 3 of the landcover hierarchy defined in Annex 1 to Ref. 13.24. See also Ref. 13.20	**Yes** Landcover classes qualifying as PS6 Natural or Transitional Habitat are regarded as priority receptors.
Phyto-sociological categories	Detailed vegetation types based on analysis of species composition, generally based on the main woody and herbaceous species present.	Too detailed (and too numerous) to represent distinct receptors for the assessment.	Equivalent to Level 4 of the landcover hierarchy defined in Annex 1 to Ref. 13.24.	**No** Not considered receptors in their own right. However, analysis of impacts important for assessing impacts to priority species receptors associated with particular phytosociological categories.

13.6.5.1 Priority vegetation receptors

As noted above Landcover classes defined as Natural or Transitional habitat have been defined as priority receptors. Table 13-7 below sets out the various vegetation classes present within the Project Area in order to define how much of each vegetation type will be lost as a result of the Project. This has been done by overlaying the footprint of Project components onto the vegetation mapping (Ref 13.24), where for the purpose of this exercise the Project components comprise:

- Industrial Area;
- Water Abstraction Station;
- Well pads – Maximum extent;
- Buliisa camp;
- Bugungu camp;
- Tangi camp;
- Borrow pits;
- Masindi Traffic/Transit check point;
- Bugungu Airstrip;
- Flowlines – 30m Right of Way (RoW); and
- Roads – 15m to 50m RoW depending on which road it is.

In all cases, where vegetation is lost this is compared to the total area of that vegetation/landcover type contained within the boundary of MFPA plus the area within the CA-1 / LA-2 North block where extends beyond the boundary of MFPA. As well as the total areas in hectares the percentage of each vegetation/landcover type lost is indicated. In addition, the total amounts of Modified and Transitional and Natural Habitat lost are calculated, based on the following landcover types:

- Modified Habitat: Built Up Area (BU);
- Transitional Habitat: Bare Soil (Rural) (IR3); Large Scale Farming (AG1); Small Scale Farming (AG2); and
- Natural Habitat: All other landcover classes.

Finally, the areas of preferred habitats for five species (elephant, giraffe, hartebeest, lion and kob, as defined in Ref. 13.29) are shown at the end of the table.

Table 13-7: Quantified Impacts on Landcover Classes

Land cover class	Total Area (ha) of Landcover Class	Area (ha) With Development	Percentage Lost (%)
Bare Soil (rural) IR3	2,788	15.8	0.57
Built-up Areas BU	1,131	76.1	6.72
Burnt Area	142	0	0.00
Bushlands SH2 (L-B T)	49,496	413.3	0.84
Closed Moist Woodlands WO1	158,013	19.8	0.01
Cyperus Papyrus Swamp WE11 (L-BX1)	5,306	1.9	0.04
Dry Grassland GR2	105,191	208.5	0.20

Land cover class	Total Area (ha) of Landcover Class	Area (ha) With Development	Percentage Lost (%)
Dry Thickets SH4 (L-B V)	104	0	0.00
Dry Wooded Grassland WG2	11,368	24	0.21
Large-scale Farming AG1	33	0	0.00
Medium altitude moist semi-deciduous Forests FO3 (L-B D)	748	0	0.00
Moist Grassland GR1 (L-B Q)	16,338	0	0.00
Moist Wooded Grassland WG1	5,707	0	0.00
Open Moist Woodlands WO1	38,153	84.3	0.22
Palm Savanna GR3 (Dense)	2,352	0	0.00
Palm Savanna GR3 (Open)	3,365	0.06	0.002
Permanent Rivers PR	10,521	1.07	0.01
Small-scale Farming AG2	16,915	314.2	1.86
Standing Waters SW (L-B WW)	6,604	0	0.00
Swamps WE1 (L-B X)	11,208	3	0.03
TOTAL	**445,485**	**1162.2**	**0.26**

Modified, Transitional & Natural Habitats	Total Area (ha) of Landcover Class	Area (ha) with development	Percentage Lost (%)
Modified Habitat	1,131	76.1	6.72
Transitional Habitat	19,735	330.0	1.67
Natural Habitat	424,619	756.2	0.18

Preferred Habitats	Total Area (ha) of Landcover Class	Area (ha) with development	Percentage Lost (%)
Elephant preferred area	6,005	36.5	0.61
Giraffe preferred area	11,900	38.0	0.32
Hartebeest preferred area	2,230	8.6	0.39
Lion preferred area	5,213	10.9	0.21
Kob preferred area	6,382	1.9	0.03

Murchison Falls National Park	Total Area (ha) of Landcover Class	Area (ha) with development	Percentage Lost (%)
Total area covered by MFNP	**394,026**	**269.52**	**0.07**

Landcover classes are described in detail in Appendix 1 of (Ref 13.24) WCS & eCountability, Phase 2 Biodiversity Study: Volume 4, Land-Cover Mapping for the Albertine Rift Oil Development Basin, Exploration Areas EA-1-3 (2017). As noted, landcover types within the Project AoI are shown on Figure 13-5, which is based on data from Ref 13.24.

13.6.6 Priority flora species

In this assessment flora species are considered to be priority receptors for assessment if they:

1. *Qualify under PS6 Critical Habitat criteria 1 or 2 based on their global status; and/or*
2. *Qualify as priority species under criterion 1e based on the Ugandan Red List assessment (Ref 13.22); and/or*
3. *Are listed as Reserved Species in Uganda in Schedule 8 to the National Forestry and Tree Planting Regulations (Ugandan Government, 2016);*

In terms of the assessment of Terrestrial Vegetation, we are particularly interested in which plant species are likely to be present in the Project Area and which are likely to represent receptors that could be affected by the Project, both directly and indirectly.

The main sources for determining the likely presence, status and likely distribution of flora of conservation concern are the Uganda Red List (Ref 13.22), and/or the IUCN Red List (Ref 13.48) and the findings of the CHA (see Refs 13.19 and 13.23).

These reports are based on a wide variety of previous field studies, include extensive field work by WCS (see Refs. 13.26 and 13.30) but their end result is to identity what species are likely to be present and where they are likely to be present, in terms of geographical range and general habitat type. Desk based studies like this were supplemented by field surveys undertaken for the ESIA which looked for these species in and close to the places where infrastructure would be placed and recorded and mapped examples where found.

Therefore, of the various surveys, the MFNP is quite well studied and certainly within the area where the Project will take place this has been subject to numerous detailed surveys over the past few years. These studies, as identified in the CHA, indicate that there are two priority plant species (trees) within the MFNP and the locations of individual trees within the Project Footprint have been mapped.

Table 13-7 therefore lists the plant species that were identified in the CHA, based on the various PS6 Criteria, as follows (adapted from Ref 13.19), and provides information on current knowledge about the species. Of particular interest is where they are likely to be encountered and therefore the table indicates which Landscape Context(s) they are known to be associated with. For completeness, all PS6 Criteria are shown in the table even though for some of these no plant species are listed.

The reports by WCS & eCountability 2016 (Ref. 13.23) and TBC & FFI 2017 (Ref 13.19) should be referred to for a fuller explanation of Critical Habitat criteria. In addition, there are several other plant species of conservation concern that are not Critical Habitat-qualifying according to the criteria set out in PS6, but are still considered to be of importance and therefore are potential receptors. These include species listed in Schedule 8 to the National Forestry and Tree Planting Regulations (Ugandan Government, 2016). These have been added to Table 13-8 below.

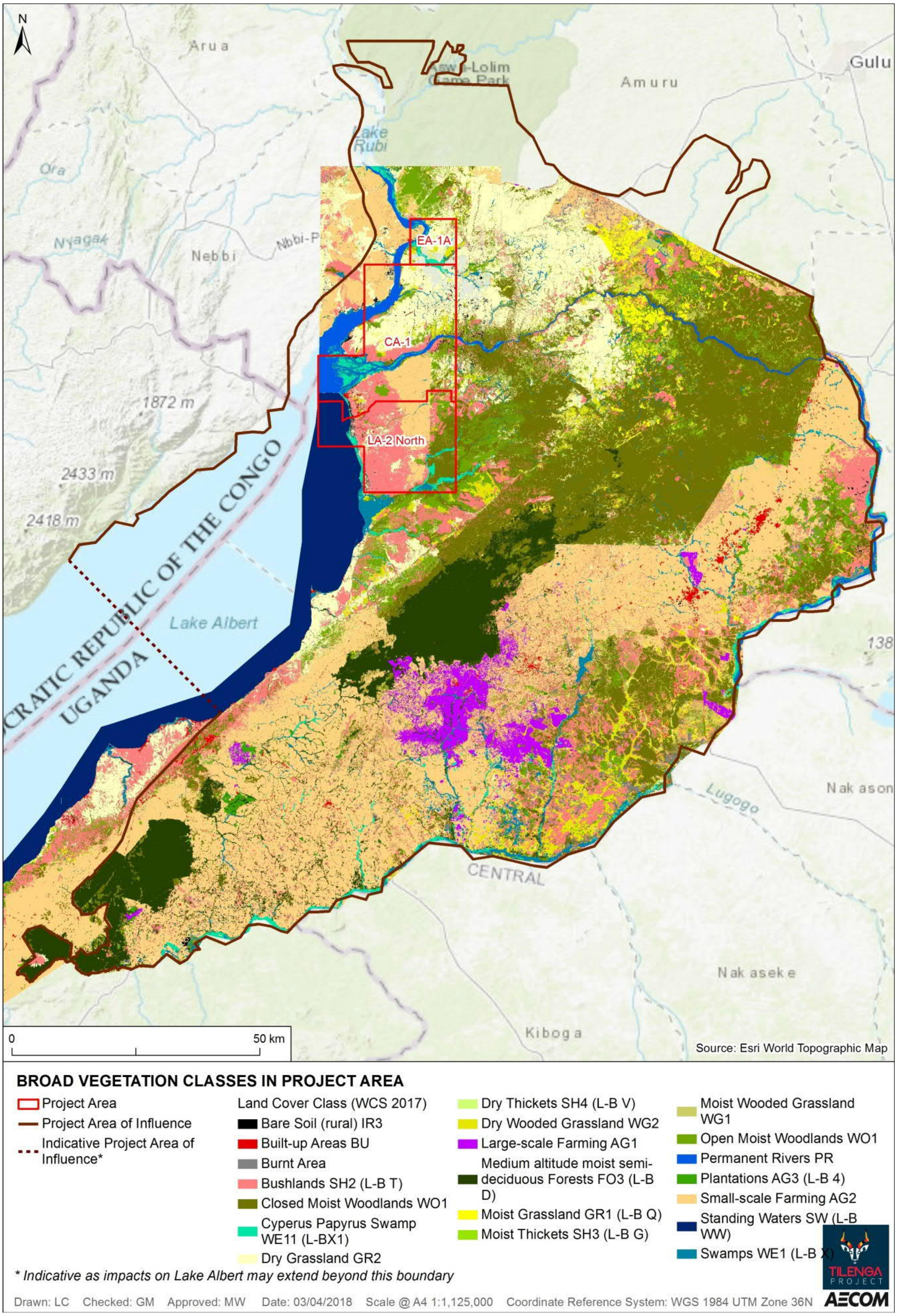

Figure 13-5: Landcover Types in Project Area

Table 13-8: List of priority flora receptors

Species	Form	IUCN	Uganda Red List	PS6 Criterion[1]	NFA Reserve Species	Landscape Context	General Location & Data Quality
Criterion 1, Tier 1 Critically Endangered and Endangered Species*							
Afrothismia winkleri	Parasitic plant	CR[2]	EN[3]	1ab	No	D	Very rarely seen parasitic plant - only two records in Uganda from Budongo and Bugoma forests. Only known from 5 localities in Cameroon and Uganda and fewer than 16 individuals globally.
Brazzeia longipedicellata	Woody plant	EN	EN	1ab	No	D	Known only from Budongo FR and Bwindi in Uganda. In very low numbers where it occurs and less than 1000 mature individuals in either Bwindi or Budongo.
Dialium excelsum	Flowering plant - legume	EN	VU[4]	1b	No	D	Only occurs in the Albertine Graben in DRC and Uganda in these forests: Semuliki National Park, Kibale National Park, Budongo Forest Reserve, Bugoma Forest Reserve, Kasyoha Kitomi Forest Reserve, Itwara Forest Reserve, Wambabya Forest Reserve, Karuma Wildlife Reserve.
Uvariodendron magnificum	Small tree	EN	VU	1b	No	D	This tree species is known from four collections from two localities, both in southwestern Uganda. In Uganda occurs on the Sesse Islands, in Bwindi Impenetrable Forest, Kasyoha Katomi Forest Reserve, Maramagambo and Budongo Forest. It is a small tree, confined to rainforests, where it is usually found near streams and is known only from Budongo Forest Reserve in this landscape.

[1] See Ref-13.15. See end of this table for definitions of PS6 criteria.
[2] CR: Critically Endangered
[3] EN: Endangered
[4] VU : Vulnerable

Species	Form	IUCN	Uganda Red List	PS6 Criterion[1]	NFA Reserve Species	Landscape Context	General Location & Data Quality
Psilotrichum axilliflorum	Flowering plant	EN	VU	1b, 2b	No	D	Known from less than 5 sites in the DRC and Uganda, one of which is in Budongo. The estimated area of occupancy is <500km2. This now qualifies it as a Tier 1 species, under Criterion 1(b) and 2(b).
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species							
Encephalartos macrostrobilus	Cycad	EN	EN	1c	No	E	Endemic species of cycad recorded in West Nile Region
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-Qualifying Species recorded in the Project Footprint							
Afzelia africana	Tree	VU	EN	1e	Yes	A	Known as the Afzelia or Beyo, it is a widespread species of the semi-deciduous forest and Sudano-Guinean savannas up to the southern border of the Sahel. In Uganda this tree is found in MFNP and in remaining wooded grassland in West Nile. Uganda could have as much as 5% of the global population although numbers have declined rapidly in recent years.
Khaya senegalensis	Tree	VU	EN	1e	Yes	A	Known as African Mahogany, the species is found in MFNP, Acholi sub-region, including East Madi Wildlife Reserve and West Nile sub-region. Up to 25% of the global population could occur in Uganda. The species is widespread in high-rainfall savannah woodland.
Nationally-threatened Tier 2 Critical Habitat-Qualifying Species thought likely to occur in/near to the Project footprint							
No plant species are listed in this category.							
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient							
Albizia ferruginea	Tree	VU	EN	1e	No	D	Present in Woodland and drier forest: including MFNP, Budongo and Bugoma and Wambabya. Also in the connecting forests of Kibale, Semuliki and Itwara. Albizias grow in dry, semi-deciduous forests.
Antrocaryon micraster	Woody plant	VU	CR	1e	No	D	Formerly known from Budongo (no recent

Species	Form	IUCN	Uganda Red List	PS6 Criterion[1]	NFA Reserve Species	Landscape Context	General Location & Data Quality
				possible			records).
Brachylaena hullensis	Hardwood tree	NT[5]	CR	1e possible	No	D	Status in AoI uncertain – known from Nile forest near Jinj but also recorded in MFNP. Believed to be very rare or even extinct from the wild in Uganda.
Chytranthus atroviolaceus	Tree	N/E[6]	EN	1e	No	D	Confined to Budongo Forest Reserve, Bugoma Forest Reserve.
Cordia millenii	Tree	LC[7]	EN	1e	Yes	D	Present in most closed forests and secondary formations in western Uganda, south of Budongo (except Rwenzori, Bwindi and Mgahinga).
Encephalartos septentrionalis	cycad	NT	EN	1e	No	E	West Nile region. Precise distribution information is lacking but not considered to be endemic.
Entandrophragma angolense	Tree	VU	EN	1e	Yes	D	Known as Budongo Mahogany. Found in western forests from MFNP south to Kalinzu Forest Reserve, including Budongo and Bugungu. Generally found in rainforest and forest edge and Uganda could have 5% of the global population.
Entandrophragma cylindricum	Tree (sapele)	VU	EN	1e	Yes	D	Sapele. Found in Budongo Forest Reserve, Bugoma Forest Reserve, Wambabya Forest Reserve, Karuma Forest Reserve. Uganda could have 5% of the global population.
Entandrophragma utile	Tree	VU	EN	1e	Yes	D	Sipo Mahogany. Found in moist semi-deciduous forest. Limited information. Known from Budongo and Bugoma Forests. Uganda could have 5% of the global population.

[5] NT: Near Threatened
[6] NE: Not Evaluated
[7] LC: Least Concern

Species	Form	IUCN	Uganda Red List	PS6 Criterion[1]	NFA Reserve Species	Landscape Context	General Location & Data Quality
Guarea cedrata	Tree	VU	EN	1e, 2b	No	D	Found in semi-deciduous forest, moist evergreen forest including Budongo Forest Reserve, Bugoma Forest Reserve, Wambabya Forest Reserve.
Holarrhena floribunda	Tree	N/E	CR	1e	No	D	A forest edge species, only known from Budongo Forest Reserve and Kaniyo-Pabidi Forest Reserve. There may be fewer than 50 individuals present in Uganda, most of which are in Budongo.
Irvingia gabonensis	Wild mango tree	NT	EN	1e	No	D	Wild Mango. Tropical evergreen forest of Budongo Forest Reserve, Bugoma Forest Reserve and in the connecting forests of Kibale, Semuliki and Itwara.
Khaya anthotheca	Tree, mahogany	VU	EN	1e	Yes	D	African or White Mahogany. Mainly found in evergreen forest in MFNP, Budongo Forest Reserve, Bugoma Forest Reserve, Bugungu Forest Reserve and Wambabya.
Khaya grandifoliola	Tree	VU	EN	1e	Yes	D	West Nile sub-region, MFNP, Bugungu WR, Bugoma, Budongo, and Wambabya Forest Reserves. Not considered to be endemic.
Lovoa swynnertonii	Tree	NT	EN	1e	Yes	D	Brown Mahogany. MFNP, Bugoma and Budongo Forest Reserves. Also in the connecting forests of Kibale, Semuliki and Itwara. Murchison-Semullki Forests also with Itwara and Kibale. Uganda could have 20% of the global population.
Lovoa trichilioides	Tree	VU	EN	1e	Yes	D	Africa Walnut. Bugoma, Bugungu and Wambabya Forest Reserves.
Milicia excelsa	Tree	NT	EN	1e	Yes	D F	Iroko tree (also Mvule, Muvule). Limited information. Known from MFPA, Budongo and Bugoma. Also Kagombe in Hoima District. Also in Mbira and Kasyoha-kitomi. The species is widely distributed outside protected areas in central, eastern and northern Uganda.

Species	Form	IUCN	Uganda Red List	PS6 Criterion[1]	NFA Reserve Species	Landscape Context	General Location & Data Quality
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species							
Restricted range species for which there are species point location records in the Project AoI.							
Afrothismia winkleri	Parasitic plant	CR	EN	1ab	No	D	Very rarely seen parasitic plant - only two records in Uganda from Budongo and Bugoma forests. Only known from 5 localities in Cameroon and Uganda and fewer than 16 individuals globally.
Brazzeia longipedicellata	Woody plant	EN	EN	1ab	No	D	Known only from Budongo FR and Bwindi in Uganda. In very low numbers where it occurs and less than 1000 mature individuals in either Bwindi or Budongo.
Citropsis articulata	Tree	VU	NE	2b (Tier 2)	No	D	Budongo and Bugoma Forest Reserves but is considered to be a widely distributed Albertine Graben endemic.
Efulensia montana	liana	VU	NE	Possibly 2b (Tier 2)	No	D	Budongo and Bugoma Forest Reserves, Karuma Wildlife Reserve and MFNP. Only occurs in the Albertine Graben in DRC and Uganda.
Guarea cedrata	Tree	VU	EN	1e, 2b	No	D	Found in semi-deciduous forest, moist evergreen forest including Budongo Forest Reserve, Bugoma Forest Reserve, Wambabya Forest Reserve.
Millettialacus alberti	Flowering plant – legume	VU	N/A[8]	2b (Tier 2)	No	D	Recorded in Budongo Forest Reserve.
Uvariodendron magnificum	Small tree	EN	VU	1b	No	D	This tree species is known from four collections from two localities, both in southwestern Uganda. In Uganda occurs on the Sesse Islands, in Bwindi Impenetrable Forest, Kasyoha Katomi Forest Reserve, Maramagambo and Budongo Forest. It is a small tree, confined to rainforests, where it is

[8] N/A: Not Applicable

Species	Form	IUCN	Uganda Red List	PS6 Criterion[1]	NFA Reserve Species	Landscape Context	General Location & Data Quality
							usually found near streams and is known only from Budongo Forest Reserve in this landscape.
Other NFA Reserve Species							
Albizia spp.	Tree	N/E	-	-	Yes	A	Mugavu / Red Nongo *[A. coriaria & A. grandibracteata]*
Aningeria altissima	Tree	N/E	-	-	Yes	D F	Osan
Aningeria adolfifriederici	Tree	N/E	-	-	Yes	D	Mwiruni
Canarium schweinfurthii	Tree	N/E	-	-	Yes	D	Canarium, Incense Tree
Dalbergia melanoxylon	Tree	NT	VU	Criterion 1, Tier 2, 1e	Yes	A D F	African Blackwood, Ebony. Recorded in Budongo Forest Reserve, Bugoma Forest Reserve, Maramagambo Forest Reserve, West Nile sub---region, Bugungu Wildlife Reserve, Buliisa District (community land).
Erythrophleum guineense	Tree	N/E	-	-	Yes	D	Sasswood Ordeal
Fagara (all species)	Tree	N/E	-	-	Yes	D	East African Satinwood
Faurea saligna	Tree	N/E	-	-	Yes	D	Faurea
Ficalhoa laurifolia	Tree	N/E	-	-	Yes	D	-
Ficus spp.	Tree	LC	-	-	Yes	D F	Fig
Hallea rubrostipulata	Tree	N/E	-	-	Yes	D	Abura
Juniperus procera	Tree	LC	-	-	Yes	D	Cedar, African Pencil Cedar
Maesopsis eminii	Tree	N/E	-	-	Yes	D	Musizi
Mangifera indica	Tree	DD[9]	-	-	Yes	D F	Mango
Mildraediodemdron excelsum	Tree	N/E	-	-	Yes	D	Muyati
Morsus lactea	Tree	N/E	-	-	Yes	D	Uganda Mulberry

[9] Data Deficient

Species	Form	IUCN	Uganda Red List	PS6 Criterion[1]	NFA Reserve Species	Landscape Context	General Location & Data Quality
Newtonia buchanani	Tree	N/E	-	-	Yes	D	Muchenche
Ocotea usambarensis	Tree	N/E	-	-	Yes	D	East African Camphorwood
Olea hochstetteri	Tree	N/E	-	-	Yes	D	East African Olive, Muscharagi
Olea welwitschii	Tree	N/E	-	-	Yes	D	Elgon Olive
Osyris spp.	Tree	N/E	-	-	Yes	D	Sandalwood
Piptadeniastrum africanum	Tree	N/E	-	-	Yes	D	Abgoin
Podocarupus (all species)	Tree	N/E	-	-	Yes	D	Podo
Prunus africana	Tree	VU	-	-	Yes	D	Red Stinkwood, African Almond, African Cherry. Synonym for *Pygeum africanum.*
Pygeum africanum	Tree	VU	-	-	Yes	D	African Almond, African Cherry, Red Stinkwood, Mueri. Synonym for *Prunus africana*
Symphonia globulifera	Tree	N/E	-	-	Yes	D	Symphonia
Vittaleria paradoxa	Tree	N/E	-	-	Yes	D	Shea Nut Tree
Warbugia ugandensis	Tree	N/E	-	-	Yes	D	Kenya Green Heart

It should be noted that most of the NFA species are present in forests and corridors (Landscape Context D), with only a few such as *Afzelia africana* and *Khaya senegalensis* being associated with the MFCA (Landscape Context A). One species (*Encephalartos septentrionalis* (a cycad) is associated with Landscape Context E, in the West Nile Region (Nebbi)) although it is likely that the Project will not directly affect this Landscape Context.

***Definitions of Critical Habitat Criteria 1 – 3**

Full definitions of IFC PS6 Criteria and the system of Tiers within each Criterion is given in the Guidance Notes to PS6, paras. GN71 to GN97 [Ref 13.15]. See also TBC & FFI [Ref. 13.19]

Criteria	Tier 1	Tier 2
1. Critically Endangered (CR)/ Endangered (EN) Species	(a) Habitat required to sustain ≥ 10 percent of the global population of a CR or EN species/subspecies where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. (b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	(c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally- important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species/ subspecies. (d) Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. (e) As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.

Species	Form	IUCN	Uganda Red List	PS6 Criterion[1]	NFA Reserve Species	Landscape Context	General Location & Data Quality
2. Endemic/ Restricted Range Species	Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species (e.g., a single-site endemic).		(b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgment.				
3. Migratory/ Congregatory Species	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle where that habitat could be considered a discrete management unit for that species.		(b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment. (c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at ≥5 percent of the global population for both terrestrial and marine species. (e) Source sites that contribute ≥ 1 percent of the global population of recruits.				
4: Highly Threatened and/or Unique Ecosystems	Highly threatened or unique ecosystems are those (i) that are at risk of significantly decreasing in area or quality; (ii) with a small spatial extent; and/or (iii) containing unique assemblages of species including assemblages or concentrations of biome-restricted species.						
5: Key Evolutionary Processes	(i) The physical features of a landscape that might be associated with particular evolutionary processes; and/or (ii) subpopulations of species that are phylogenetically or morphogenetically distinct and may be of special conservation concern given their distinct evolutionary history.						

13.6.7 Protected area receptors

Within PS6 protected areas are included as a criterion for defining Critical Habitat. There are a large number of protected areas within the AOI and these are shown on Table 13-9 and shown on Figure 13-5.

Table 13-9: Protected and Internationally Recognised Areas in the Albertine Rift

Protected Area	Category	IUCN criteria	Designation
Murchison Falls	National Park	II[10]	National
	Important Bird Area	A1[11], A3[12], A4i[13]	International
	KBA	-	International
Murchison Falls-Albert Delta Wetland System	Ramsar Wetland/ Important Bird Area	-	International
Karuma	Wildlife Reserve	-	National
Bugungu	Wildlife Reserve	III	National
Budongo	Forest Reserve	-	National
	Important Bird Area	A1, A3	International
	KBA	-	International
Bugoma	Forest Reserve		National
	Important Bird Area	A1, A3	International
	KBA	-	International
Bujawe	Forest Reserve	-	National
Hoima	Forest Reserve	-	National
Kabwoya	Wildlife Reserve	III[14]	National
Kaiso Tonya	Community Wildlife Management Area	IV[15]	National
Kasongoire	Forest Reserve	-	National
Kijubya	Forest Reserve	-	National
Kyahaiguru	Forest Reserve	-	National
Kyamugongo	Forest Reserve	-	National
Maseege	Forest Reserve	-	National
Mukihani	Forest Reserve	-	National
Nyabyeya	Forest Reserve	-	National
Nyamakere	Forest Reserve	-	National
Rwensama	Forest Reserve	-	National
Wambabya	Forest Reserve	-	National
Toro-Semliki	Wildlife Reserve	III	National

[10] IUCN Protected Area Category II: National Park
[11] IUCN Important Bird Area Category A1: Globally threatened species
[12] IUCN Important Bird Area Category A3: Biome-restricted species
[13] IUCN Important Bird Area Category A4i: Congregations of waterbirds
[14] IUCN Protected Area Category III: Natural Monument or Feature
[15] IUCN Category IV: Habitat / Species Management Area

Protected Area	Category	IUCN criteria	Designation
Rwengara	Community Wildlife Management Area	VI[16]	National
Semliki reserves	Important Bird Area	A1	International
Kibeka	Forest Reserve	-	National
Kaduku	Forest Reserve	-	National
Masindi Port	Forest Reserve	-	National
Kigulya Hill	Forest Reserve	-	National
Masindi	Forest Reserve	-	National
Kirebe	Forest Reserve	-	National
Kasokwa	Forest Reserve	-	National
Sirisiri	Forest Reserve	-	National
Nyakunyu	Forest Reserve	-	National
Kitonya Hill	Forest Reserve	-	National
Fumbya	Forest Reserve	-	National
Nsekuro Hill	Forest Reserve	-	National
Musoma	Forest Reserve	-	National
Kandanda - Ngobya	Forest Reserve	-	National
Ibamba	Forest Reserve	-	National
Kahurukobwire	Forest Reserve	-	National

Of the protected areas listed in the table above, the following are present in the Project AoI closest to where Project activities will take place and are considered most likely to be at risk of impacts (direct or indirect) from the Project. These are considered priority receptors for this assessment:

- MFNP (with Karuma);
- Bugungu Wildlife Reserve;
- Budongo Forest Reserve (including Maseege);
- Forest Reserves in vicinity of Masindi (grouped);
- Bugoma and southern forest reserves (grouped); and
- Murchison Falls – Albert Delta Ramsar site (this is described in ***Chapter 15: Aquatic Life***).

[16] IUCN Protected Area Category VI: Protected area with sustainable use of natural resources

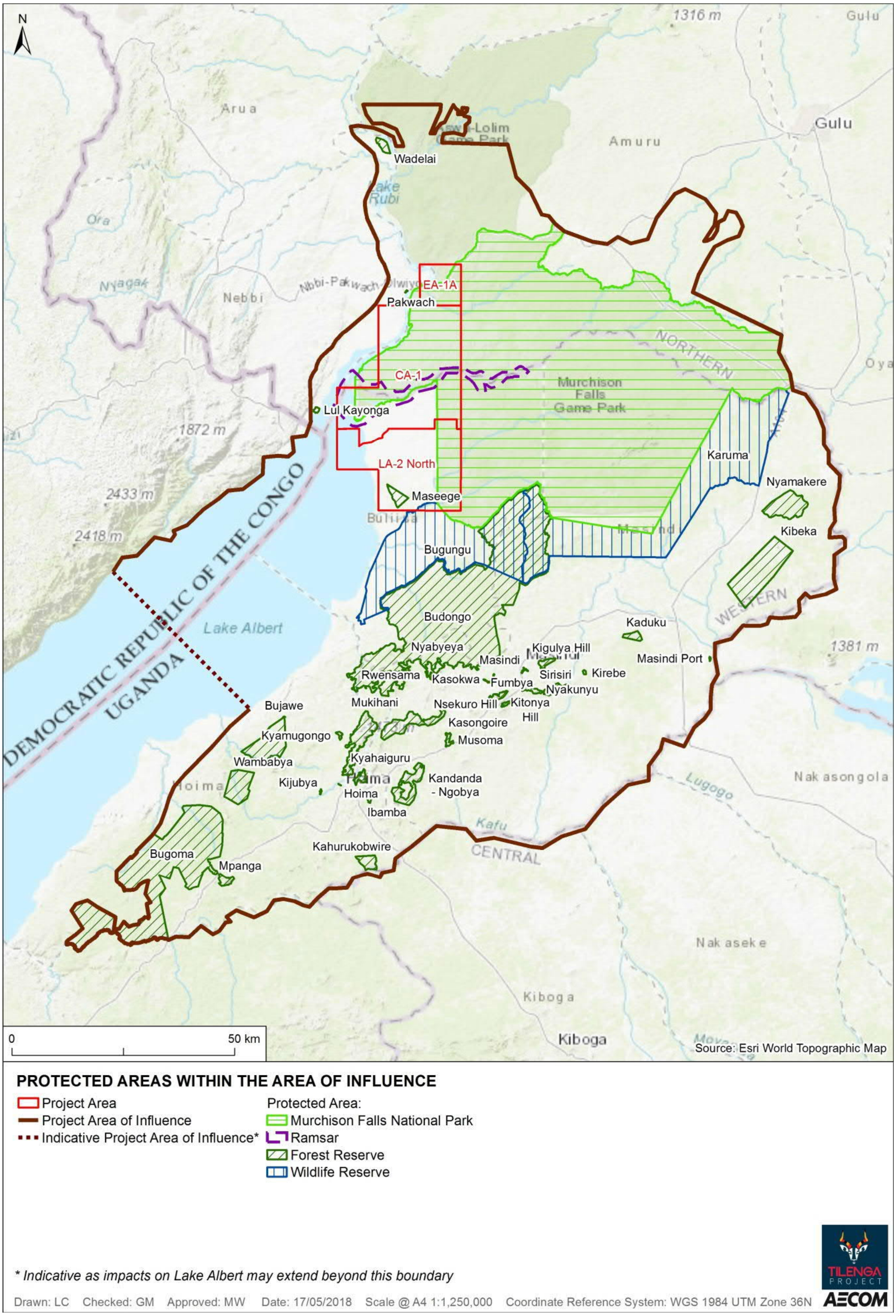

Figure 13-6: Protected Areas

Baseline information on these protected areas is present in Table 13-10 below.

Table 13-10: Summary of Protected Areas

<table>
<tr><th colspan="8">Murchison Falls National Park (MFNP) [with Karuma Wildlife Reserve (KWR)]</th></tr>
<tr><th colspan="8">Designation/Category</th></tr>
<tr><td>Type of Designation:</td><td>National</td><td>Legal status:</td><td>National Park</td><td>IUCN:</td><td>II</td><td>KBA:</td><td>Yes</td></tr>
<tr><td></td><td>International</td><td></td><td>IBA</td><td></td><td>A1, A3, A4i</td><td></td><td></td></tr>
<tr><th colspan="8">Summary Description</th></tr>
<tr><td colspan="8">This is the largest National Park in Uganda (3,877 km²) and was initially gazetted in 1926 as a game reserve and subsequently as a National Park in 1952, based on its animal conservation status[17]. The park is recognised by the International Union for the Conservation of Nature (IUCN) as a Category II Protected Area.

The MFNP is bisected by the Victoria Nile for 80 km flowing in an east to west direction. The MFNP supports rich and varied habitat types including grassland savannas, wooded grassland, bushlands, woodlands, forests and wetlands that provide varied ecosystems that in turn support a high diversity of both flora and fauna.

The MFNP is of ecological importance for a number of globally and regionally endangered species including plants, reptiles, mammals and birds. The MFNP is also designated as an International Bird and Biodiversity Area (IBA). The park is notable for its large population of mammals, particularly the largest proportion of the Rothschild's giraffe population in Uganda (and indeed, the world).

The park has a rich level of biodiversity and recent wide-ranging surveys of the wider Murchison Falls Protected Area (MFPA), which also includes the Karuma Wildlife Reserve and the Bugungu Wildlife Reserve, which is discussed separately below, (Ref. 13.30), identified a total known list of 144 mammal species, 556 bird species, 51 reptile species, 28 known amphibian species with an additional 23 species still (at that time) to be identified (i.e. 51 species). A total of 755 plant species were recorded in the MFPA.

Part of the south-western portion of the MFNP is located within LA-2 North. The portion of the MFNP south of the Victoria Nile within the LA-2 North, is generally less open than the MFNP north of the Victoria Nile and consists mainly of woodland and wooded grassland with areas of thickets. There are some areas of wetland associated with the Waiga River in addition to other seasonal wetlands which generally drain either northwards towards the Victoria Nile, or westwards toward Lake Albert.

MFNP is divided into a number of management zones (Ref 13.60), comprising the Wilderness Zone (formed by the northern part of the park and almost the entire park south of the Victoria Nile and the Tourist Zone, which covers the central part of the park north of the Nile. In addition, there are some areas, for example where the MFNP overlaps with the Ramsar site and the south-western corner of the park around the confluence of the Waiga and Izizi Rivers, which are defined as Critical Ecosystem Zones. A narrow Resource Zone is located along the eastern edge of the Karuma WR.</td></tr>
<tr><th colspan="8">Relation to Project</th></tr>
<tr><td colspan="2" rowspan="2">Planned Project facilities within the protected area</td><td colspan="2">Core infrastructure</td><td colspan="4">• Ten (10) well pads [JBR-01 to JBR-10] will be constructed within the MFNP. These will be connected between each other by access roads and by buried flow lines.
• In addition to use of the existing park road network, two other distributor roads (C1 and C3) are proposed within the park.
• A directionally drilled pipeline will be installed beneath the Victoria Nile linking the network in the MFNP with the pipeline network south of the river.
• An extension of Bugungu Airstrip south of the Nile.
• Victoria Nile Ferry crossing piers on either side of the river at Paraa within the MFNP.</td></tr>
<tr><td colspan="2">Supporting infrastructure /</td><td colspan="4">• Associated facilities include a number of oil roads (see Chapter 4: Project Description and Alternatives) through MFNP.</td></tr>
</table>

[17] *http://www.ugandawildlife.org*

	associated facilities	
	Activities	• Full details of construction and operation of the oil field are provided in ***Chapter 4: Project Description and Alternatives*.** Activities will comprise: 1) Site Preparation and Enabling Works; 2) Construction and Pre-Commissioning; 3) Commissioning and Operations; 4) Decommissioning.
Planned Project facilities in proximity to the protected area	**Core infrastructure**	• Core Project infrastructure outside the MFNP will comprise 24 well pads and associated flowlines and access roads, the CPF/Industrial area, Lake Water Abstraction Station and a number of worker camps in Buliisa. These comprise Bugungu Camp which is located within 500m of the park's Bugungu gate south of the Nile and the Buliisa Camp located approximately 15km from the Bugungu gate. In addition, there will be a camp at Tangi approximately 500m from the northern Tangi gate of the MFNP.
	Supporting infrastructure / associated facilities	• Associated facilities include a number of oil roads (see **Chapter 4: Project Description and Alternatives**) including one routed from Masindi through the Kicumbanyobo gate and southern portion of the MFNP to Paraa (R3). Also, road of Paraa-Pakwach and Buliisa-Paraa roads
	Activities	• Activities will comprise: 1) Site Preparation and Enabling Works; 2) Construction and Pre-Commissioning; 3) Commissioning and Operations; 4) Decommissioning. • In addition, there will be waste management facilities, borrow pits. • Project traffic from the Masindi check point to Buliisa will use the R3 road
Key features of the Protected Area		
Key Habitats & Quality	The MFNP contains a variety of key habitat types. In the north, particularly in the western part of the park where well pads and flowlines will be constructed (in the vicinity of the "Buligi Circuit"), this area is predominantly open grassland dominated by *Hyperthelia dissoluta*, *Sporobolus pyramidalis*, *Ctenium newtonii*, while *Chloris gayana*, *Chamaecrista mimosoides*, *Brachiaria brizantha* and *Andropogon schirensis* are abundant. Where woody vegetation is present, it is characterized by thickets of *Harissonia abyssinica*, *Combretum aculeatum* and *Acacia senegal*. Throughout the wetter eastern and southern parts of the PA, the grass layer is dominated by *Hyperthelia dissoluta*, *Hyparrhenia filipendula* and *Loudetia arundinacea*, plus fire climax species, which grow to 1-3 m in the wet season, forming fuel for the hot fires which sweep through the park during most dry seasons. In the northern MFNP are the largest stands of *Borassus aethiopum* palms found in Uganda, although elsewhere in Guinea-Congolian and Sudanian Africa they are more widespread (Ref 13.59). This species is very slow regenerating because of long dormancy periods, and younger trees need a period free of fires to survive and form a stem. Elephants are very fond of the fruits and younger trees (R.Kityo pers. Comm), and play a major part in dispersing this species across the savannas. In the south of the park, the tropical high forest of Budongo extends northwards into the Protected area in a few places into Bugungu Wildlife Reserve (and as the Kaniyo-Pabidi Forest in the Karuma Wildlife Reserve and Rabongo Forest in MFNP). In the earlier part of this century parts of this forest extended as far as the Nile, but under the influence of elephants and fire, these were destroyed by the 1960s (see Ref 13.60). The 'mixed tree and shrub savanna', covering an extensive area south of the Nile, has undergone a great transformation over the last half-century. This vegetation type was completely eradicated by elephants and fire to create huge tracts of grassland (Ref. 13.60). Following the near elimination of elephants from the ecosystem during the 1970/80s, woodlands and thickets regenerated throughout the southern part of the PA. Most woodland on the south are now *Terminalia-Combretum-Piliostigma* with *Philenoptera* in the mid-storey, with *Kigelia africana* and *Balanites aethiopum* as notable tree species still thinly scattered over the savanna areas. Key habitats include Vulnerable	

	(VU) Hyparrhenia Grass Savanna ecosystem located in the western part of the MFNP. In the east and south of the MFNP the Endangered (EN) Moist Combretum Savanna ecosystem (Ref 13.19) is supported.
Species Significance	MFNP / KWR is Critical Habitat for the following animal species: • Bohor reedbuck • Lelwel hartebeest • Lion • Rothchild's giraffe • Spotted hyena • Uganda kob • Black-rumped button quail • Denham's Bustard • Fox kestrel • Hooded vulture • Lappet-faced vulture • Pallid harrier • Pel's fishing owl • Ruppel's vulture • White-backed vulture • White-headed vulture • Smooth Chameleon • Christy's grassland frog MFNP / KWR is Critical Habitat for the following plant species: • *Afzelia africana* • *Khaya senegalensis*
Protected area management	
Management authority	MFNP is managed by Uganda Wildlife Authority (UWA) as a single unit within the MFPA.
General management objectives	• The general management objectives of a MFNP are the conservation of biological diversity, scenic viewing, recreation, scientific research and regulated extractive utilisation of natural resources. In particular to: "Protect and conserve MFPA, one of Uganda's biodiversity hotspots with varied ecosystems including the wetland of international importance, scenic landscapes, spectacular Murchison Falls, rich cultural and historical sites for the benefit of the people of Uganda and the global community (Ref 13.60)."
Relevant management plans:	• Murchison Falls Protected Area General Management Plan (2012 – 2022), Uganda Wildlife Authority. Published: September 2013. • MFNP Community-Based Wildlife Crime Prevention Action Plan (2017 – 2023), Uganda Wildlife Authority. Published: April 2017. • The MFNP is also considered a national priority site for conservation of Lion under the Strategic Action Plan for Large Carnivore Conservation in Uganda 2010-2020 (UWA 2010) and African Elephant under the Elephant Conservation Action Plan for Uganda (2016-2026) (UWA 2016). • National Giraffe Conservation Strategy and Action Plan of Uganda (2017-2027) Uganda Wildlife Authority: published 2017
Specific management objectives:	Specific management objectives from the MFPA General Management Plan are divided into 3 programs, each with its own subset of objectives: 1. Resource conservation program o To maintain the integrity of the PA by end of the plan period o To ensure that all activities related to petroleum, hydropower and tourism developments do not adversely harm the integrity of the PA o To reduce adverse effects of fires, exotics and invasive species, vegetation

	changes on ecosystem health o To ensure the conservation of wildlife outside the protected area o To contain and manage wildlife diseases 2. Community Conservation program o Objective: To ensure harmonious coexistence between the PA/wildlife and the neighbouring communities by 2022 3. Monitoring and Research program o To establish the impact of climate and vegetation changes on the ecosystem health by the end of the plan period o To monitor ecosystem health, socio-economic dynamics of neighbouring communities and generate information for decision making throughout the planned period o To establish the impact of oil, hydropower and tourism developments on ecosystems by the end of the plan period • To establish the socio-economic impacts of conservation and tourism on the neighbouring communities by year 2017

Management status, existing threats & challenges

- MFNP / KRA are actively managed by UWA and wildlife populations are stable or recovering from previous heavy poaching. However, according to the MFPA General Management Plan MFNP remains threatened by poaching and degradation from cattle grazing. Barrier effects due to agriculture on the park's periphery preventing wildlife accessing Lake Albert or associated wetlands and water sources may be an issue, and disease transmission between livestock and wildlife is a risk.
- A recent law enforcement review concluded that MFPA is significantly under-resourced (in terms of numbers of staff, staff training and capacity, funding and logistics) for effectively tackling poaching (Ref 13.61).
- An action plan to address illegal hunting through community-based interventions has been developed (UWA 2017) but lack of resources mean it has not yet been implemented at scale.
- In addition to poaching (but associated with it) is the frequent burning of many parts of the MFNP. UWA has advised (pers. comm. 2017) that around 90% of the fires occurring in the park are set by poachers and not the authorities. Such burning, whilst promoting fresh grazing, also reduces plant species diversity and may affect populations of herpetiles and ground nesting birds though direct loss.

Bugungu Wildlife Reserve (BWR)

Designation/Category

Type of Designation:	National	Legal status:	Wildlife Reserve	IUCN:	III	KBA:	No

Summary Description

The Bugungu Wildlife Reserve (BWR) is a part of the Murchison Falls Protected Area (MFPA) together with the MFNP and Karuma Wildlife Reserve. It covers 474 km^2 and is managed by UWA. Approximately 195km^2 of BWR overlap with the Budongo Forest Reserve, notably in the east (UWA 2014), and are under joint management with the National Forest Authority.

As a wildlife reserve under the Uganda Wildlife Act, BWR is considered "an area of importance for wildlife conservation and management and in which the following activities are permitted: conservation of biological diversity, scenic viewing, recreation, scientific research and regulated extractive utilisation of natural resources" (Ref 13.6).

Originally created as a buffer zone for MFNP, BWR is now recognized to support significant biodiversity in its own right (Ref. 13.30).

Internally, BWR is zoned for management (see Ref 13.60). The majority is categorised as 'Wilderness zone' with the northern tip as a 'Critical ecosystem zone', and small areas as 'Resource Use zone' and 'Tourism zone'. The wilderness zone should be subject to minimal disturbance with no extraction allowed and only routine patrols and tourism (subject to EIA) authorised.

BWR does not have an external buffer zone.

Relation to Project

Planned Project	**Core**	• No oil production or treatment infrastructure is planned to be within BWR

facilities within the protected area	**infrastructure**	
	Supporting infrastructure / associated facilities	• None
	Activities	• Full details of construction and operation of the oil field are provided in Chapter 4: Project Description and Alternatives. • None of Project activities will take place in or close to the BWR.
Planned Project facilities in proximity to the protected area	**Core infrastructure**	• Core Project infrastructure including 34 well pads and associated flowlines, the CPF/industrial area and the Bugungu and Buliisa Camps are situated to the north of BWR. The closest feature of the Project (well pad KGG-09) is approximately 10km north of the boundary of the BWR of the western portion of BWR.
	Supporting infrastructure / associated facilities	• Associated facilities include a number of oil roads (see Chapter 4: Project Description and Alternatives) including one routed from Masindi through the Kicumbanyobo gate and southern portion of the MFNP to Paraa (R3). There are no roads proposed through BWR, although the Kasanja – park junction oil road (R3) will go along the border between Bugungu and Karuma WRs
	Activities	• Activities will comprise: 1) Site Preparation and Enabling Works; 2) Construction and Pre-Commissioning; 3) Commissioning and Operations; 4) Decommissioning. • In addition, there will be waste management facilities, borrow pits. • None of these will take place close to the BWR. Project traffic from the Masindi check point to Buliisa will use the R3 road
Key features of the Protected Area		
Key Habitats & Quality	The escarpment of the Albertine Rift runs in a southwest to northeast direction through the reserve and divides it into two distinct sections, which differ in terms of their dominant vegetation formations. The top of the escarpment supports dense, closed canopy woodland interspersed with tall grassland, while the valley floor supports more open savanna woodland and grassland. The wildlife reserve connects to Lake Albert mainly through the river corridors, such as the Waisoke, that run from it to the lake. The east of BWR supports the Endangered Moist Combretum Savanna ecosystem (TBC & FFI, 2017).	
Species Significance	BWR is Critical Habitat for Uganda Kob and Lion (TBC & FFI, 2017). The habitat association and preference analysis for Uganda Kob, African Elephant, Lion, and Lelwel Hartebeest confirm that BWR is important for the long-term conservation of these species in MFPA (Nangendo et al., 2017). BWR also contains suitable habitat for Rothschild's Giraffe so may become of importance for the translocated population being established south of the Nile. Biodiversity surveys of MFPA highlighted the high species richness of birds, amphibians and plants in BWR compared to the rest of MFPA (Ref 13.30). Other CHQS present (Ref. 13.19) or potentially present in BWR are the plant species: • *Khaya anthrotheca* (EN); • *Khaya grandifoliola* (EN); *Lovoa trichiloides* (EN)	
Protected area management		
Management authority	BWR is managed by UWA as a single unit with MFPA. The north east is jointly managed with the National Forest Authority (NFA).	

<table>
<tr><td>General management objectives</td><td colspan="7">The general management objectives of a Wildlife Reserve are the conservation of biological diversity, scenic viewing, recreation, scientific research and regulated extractive utilisation of natural resources.</td></tr>
<tr><td>Relevant management plans:</td><td colspan="7">Murchison Falls Protected Area General Management Plan (2012 – 2022), Uganda Wildlife Authority. Published: September 2013
MFNP (BWR) Community-Based Wildlife Crime Prevention Action Plan (2017 – 2023), Uganda Wildlife Authority. Published: April 2017
As part of MFPA, BWR is also considered a national priority site for conservation of Lion under the Strategic Action Plan for Large Carnivore Conservation in Uganda 2010-2020 (UWA 2010) and African Elephant under the Elephant Conservation Action Plan for Uganda (2016-2026) (UWA 2016).</td></tr>
<tr><td>Specific management Objectives:</td><td colspan="7">Specific management objectives from the MFPA General Management Plan are divided into 3 programs, each with its own subset of objectives:
1. Resource conservation program
o To maintain the integrity of the PA by end of the plan period
o To ensure that all activities related to petroleum, hydropower and tourism developments do not adversely harm the integrity of the PA
o To reduce adverse effects of fires, exotics and invasive species, vegetation changes on ecosystem health
o To ensure the conservation of wildlife outside the protected area
o To contain and manage wildlife diseases
2. Community Conservation program
o Objective: To ensure harmonious coexistence between the PA/wildlife and the neighbouring communities by 2022
3. Monitoring and Research program
o To establish the impact of climate and vegetation changes on the ecosystem health by the end of the plan period
o To monitor ecosystem health, socio-economic dynamics of neighbouring communities and generate information for decision making throughout the planned period
o To establish the impact of oil, hydropower and tourism developments on ecosystems by the end of the plan period
4. To establish the socio-economic impacts of conservation and tourism on the neighbouring communities by year 2017</td></tr>
<tr><td colspan="8">Management status, existing threats & challenges</td></tr>
<tr><td colspan="8">BWR is actively managed by UWA and wildlife populations are stable or recovering from previous heavy poaching. However, according to the MFPA General Management Plan BWR remains threatened by poaching and degradation from cattle grazing. Barrier effects due to agriculture on the western periphery preventing wildlife accessing Lake Albert or associated wetlands and water sources may be an issue, and disease transmission between livestock and wildlife is a risk.
A recent law enforcement review concluded that MFPA is significantly under-resourced (in terms of numbers of staff, staff training and capacity, funding and logistics) for effectively tackling poaching (Ref 13.61).
An action plan to address illegal hunting through community-based interventions has been developed (UWA 2017) but lack of resources mean it has not yet been implemented at scale.</td></tr>
<tr><td colspan="8">Budongo Central Forest Reserve (CFR)</td></tr>
<tr><td colspan="8">Designation/Category</td></tr>
<tr><td rowspan="2">Type of Designation:</td><td>National</td><td>Legal status:</td><td>Forest Reserve</td><td>IUCN:</td><td>-</td><td>KBA:</td><td>Yes</td></tr>
<tr><td>International</td><td></td><td>IBA</td><td></td><td>A1, A3</td><td></td><td></td></tr>
<tr><td colspan="8">Summary Description</td></tr>
<tr><td colspan="8">The Budongo CFR is made up of four 6 forest blocks: Siba, Waibira, Busaju, Kaniyo-Pabidi, Biiso and Nyakafunjo. These make the Budongo Sector Forest Management Plan Area (MPA) totalling 82,530ha.

The forest lies above the escarpment shielding the Albertine rift valley, in the districts of Masindi, Buliisa and Hoima, most of it is in Buliisa. To the south, most of forest reserve lies north of the Masindi to Butiaba Road.</td></tr>
</table>

Kaniyo-Pabidi is situated east and west of the Masindi to Paraa Lodge Road starting at 20km from Masindi.

Budongo CFR is a very important area of forest and represents the largest block of medium altitude, semi-deciduous forest type in the region. It also supports a well-studied proportion of the population of Chimpanzee (*Pan troglodytes*), a species listed as EN IUCN and for which the IUCN Red List (IUCN, 2015) notes a decreasing trend in its global population.

The reserve occupies gently undulating terrain, with a general slope north-north-west towards the Rift Valley. The forest is drained by four small rivers (Sonso, Waisoke, Wake and Bubwa), which flow generally westwards into Lake Albert. The forest is partially degraded, mainly because of pit-sawing and saw-milling over many years.

At least, 50% of the area is covered by tropical high forest (THF) communities comprising medium altitude semi-deciduous Cynometra-Celtis forest and 46% is classified as moist Combretum savannah. The remainder comprises Combretum-Loudetia Combretum–Hyparrhenia (Ref 13.25).

The Cynometra-Celtis forest vegetation type has changed considerably following 70 years of selective logging and tree stand improvement activities, which favoured growth of valuable timber species, especially mahogany. Therefore this forest type has been replaced by mixed forest type, estimated at 65% of the whole forest area and stood at 85% of the whole forest (Ref 13.63). However, the original ecological characteristics are still recognisable and the forest can be divided into wooded grassland, colonising or woodland mixed forest, Cynometra dominated and swamp forest types.

A number of bird species found in Budongo Forest Reserve are of restricted range and are not found outside of forests in the Albertine Graben including Nahan's Partridge *Ptilopachus nahani*, (formerly Nahan's Francolin), defined as EN and as a globally threatened species (which is also present in Bugoma Forest and also in the Mabira forest near Jinja).

Maseege FR is also included here, although it is a small isolated reserve and does not appear to have any significant species associated with it.

Relation to Project		
Planned Project facilities and activities within the protected area	**Core infrastructure**	• No oil production or treatment infrastructure is planned to be within Budongo CFR
	Supporting infrastructure / associated facilities	• The feeder pipeline and associated right of way will not pass through the Budondgo FR • The Kisanja-Park junction oil road (R3) traverses the Kanio-Pabidi Block of Budongo CFR and The Masindi-Biiso road (R2) crosses the south of Budongo CFR
	Activities	• Full details of construction and operation of the oil field are provided in ***Chapter 4: Project Description and Alternatives*.** • Project traffic from the Masindi check point to Buliisa will use the R3 road
Planned Project facilities and activities in proximity to the protected area	**Core infrastructure**	• Core Project infrastructure including 34 well pads and associated flowlines, the CPF/industrial area and the Bugungu and Buliisa Camps are situated well to the north of Budongo CFR. The closest feature of the Project (well pad KGG-09) is approximately 30km north of the boundary of the Budongo FR and located between the forest and well pad is the Bugungu Wildlife Reserve.
	Supporting infrastructure / associated facilities	• Associated facilities include a number of critical oil roads (see ***Chapter 4: Project Description and Alternatives***) including one routed from Masindi through the Kicumbanyobo gate and southern portion of the MFNP to Paraa (R3). • This improved road will follow the existing road route (with some minor alignments) and will pass through the Kaniyo-Pabidi block of the Budongo CFR (and therefore through part of the Budongo CFR), located towards the north-eastern end of the forest.
	Activities	• Activities will comprise: 1) Site Preparation and Enabling Works; 2) Construction and Pre-Commissioning; 3) Commissioning and Operations; 4) Decommissioning. • In addition, there will be waste management facilities, borrow pits.

		• None of Project activities will take place close to the Budongo FR.
Key features of the Protected Area		
Key Habitats & Quality	The forest is situated on the escarpment of the Albertine Rift and runs in a southwest to northeast direction. It is composed mainly of moist, medium-altitude, semi-deciduous forest, with patches of savanna and woodland. It covers a gently rolling landscape, sloping down to the East African Rift. Waisoke, Sonso, Kamirambwa and Siba watercourses, drain the forest and flow westwards into Lake Albert. The Budongo FR supports the Endangered Moist Combretum Savanna ecosystem (Ref 13.19).	
Species Significance	Budongo FR is Critical Habitat for the following Tier 1 species: • Chimpanzee • Amphibians: Rugege Forest Squeaker and Golden Puddle Frog Tier 1 plant species include: • *Afrothismia winkleri* (CR) • *Brazzia longipedicellata* (EN) • *Dialium excelsum* (EN) • *Uvariodendron magnificum* (EN) Tier 2 species include: • African crowned eagle • Medje mops bat, Trevor's free-tailed bat, Savanna/Helios bat • *Aethiothemis coryndoni* (dragonfly) Tier 2 plant species include: • *Albizia ferrunginea* • *Antrocaryon micraster* • *Chytranthus atroviolaceus* • *Cordia millenii* • *Entandrophragma cylindricum* • *Entandrophragma utile* • *Guarea cedrata* • *Holarrhena floribunda* • *Irvingia gabonensis* • *Khaya anthotheca* • *Khaya grandifoliola* • *Milicia excelsa*	
Protected area management		
Management authority	• Budongo FR is managed by the NFA	
General management objectives	The general management objectives of a National Forest Reserve (Ref 13.62) are: • Restoring forest cover back to the1990 levels by 2015; • Restoring degraded natural forests in forest reserves and private forests; • Reducing pressure on forest cover as a source of woodfuel and construction materials; • Promoting forestry based industries and trade. This will be achieved by: • Increasing economic productivity and employment through forest production,	

	processing and service industries; • Raising incomes for households through forest-based initiatives; • Restoring and improve ecosystem services derived from sustainably managed forest resources.
Relevant management plans:	• **Budongo Forest Management Plan 2011-2012** MWE (2012)
Specific management Objectives:	Specific management objectives from the Management Plan are: **Mission** is to ensure "Budongo Central Forest Reserve [is] sustainably managed, [with] high quality forest related products and services supplied to Government, local communities, the private sector and the international community on a sustainable basis. **Objectives:** I. *To enhance biodiversity conservation of the Budongo Forest Resource.* II. *To increase supply of timber and non-timber forest products for local and national requirements.* III. *To integrate communities in the management of Budongo CFR and their livelihoods improved.* IV. *To improve stock levels through gap and enrichment planting in the forest.* V. *To enhance Budongo CFR ecological systems capacity to sequester carbon and provide other environmental services.*

Management status, existing threats & challenges

- Budongo CFR is actively managed by NFA
- Tourism is an important feature of Budongo CFR
- Main threats include illegal logging activities, habitat clearance, poaching, including of the chimpanzee population

Forest Reserves in the Masindi Area

Designation/Category

Type of Designation:	**National**	**Legal status:**	**Forest Reserves**	**IUCN:**		**KBA:**	**No**

Summary Description

There a large number of Forest Reserves present within the Project's AoI. Many of these are small but, within the landscape they represent the remnants of a wider and more comprehensive forest coverage. In this assessment they generally form part of forest/savanna mosaic Landscape Context (D) defined in the CHA (Ref 13.19).

The Masindi area is likely to see an important change as a result of the development of the Project. This is partly because Masindi town itself will become a logistical hub for the Project. In addition, a number of 'critical oil roads' will be constructed by UNRA and some pass through this area. These are not new roads *per se* but are upgrades of existing murram roads to a permanent tarmac surface.

Small forests in the vicinity of Masindi town include: Kaduku, Kigulya Hill, Sirisiri Kirebe, Nyakunyi, Fumbya and Nsekuro Hill (see Figure 13-5), although there are other forests further to the south -east and south of Budongo Forest and towards the Bugoma and Wambabya Forest Areas.

None of these forests have been surveyed as part of the Project so there is little direct information on the biodiversity of these forests. However, they do form part of the network of forests in the area and are therefore likely to have ecological value and may support small isolated populations of priority species.

Relation to Project

Planned Project	**Core**	• No oil production or treatment infrastructure is planned to be within Budongo FR

facilities within the protected area	**infrastructure**	
	Supporting infrastructure / associated facilities	• Oil road upgrade may pass close to these areas as well as general increased activity around Masindi.
	Activities	• Full details of construction and operation of the oil field are provided in **Chapter 4: Project Description and Alternatives.** None of the Project activities will take place in or close to these forests
Planned Project facilities in proximity to the protected area	**Core infrastructure**	• Core Project infrastructure including 34 well pads and associated flowlines, the CPF/Industrial area and the Bugungu and Buliisa Camps are situated well to the west of these forests. • Masindi Vehicle Check Point (only present during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases of the Project)
	Supporting infrastructure / associated facilities	• Associated facilities include a number of oil roads (see **Chapter 4: Project Description and Alternatives**) including one routed from Masindi through the Kicumbanyobo gate and southern portion of the MFNP to Paraa (R3).
	Activities	• Activities will comprise: 1) Site Preparation and Enabling Works; 2) Construction; 3) Operation; 4) Decommissioning. • None of these will take place close to these forests as the nearest forest is around 10km away.
Key features of the Protected Area		
Key Habitats & Quality	The forests are situated well above the escarpment of the Albertine Rift and are generally small and isolated. They consist of mainly moist, medium-altitude, semi-deciduous forest, with patches of savanna and woodland.	
Species Significance	As none of these forests have been surveyed the species they may support are unknown. They may however contain plant species of conservation concern, but are unlikely to support mammals such as chimpanzees, although bat species and forest amphibians may be present.	
Protected area management		
Management authority	• These forests are managed by National Forest Authority (NFA)	
General management objectives	The general management objectives of a National Forest Reserve (Ref 13.62) are: • Restoring forest cover back to the1990 levels by 2015; • Restoring degraded natural forests in forest reserves and private forests; • Reducing pressure on forest cover as a source of woodfuel and construction materials; • Promoting forestry based industries and trade. This will be achieved by: • Increasing economic productivity and employment through forest production, processing and service industries; • Raising incomes for households through forest-based initiatives; • Restoring and improve ecosystem services derived from sustainably managed forest resources.	
Relevant management plans:	• **Masindi Forest Management Plan** • **The National Forest Plan 2011/12–2021/22**, (2013) MWE	

Specific management Objectives:	Information not available at time of writing.						
Management status, existing threats & challenges							
• These forests are actively managed by NFA [some may be private forests]. • Main threats include illegal logging activities, habitat clearance, poaching and resource collection including firewood and fibres.							
Bugoma Forest (and Related Southern Forest Reserves)							
Designation/Category							
Type of Designation:	**National**	**Legal status:**	**Forest Reserves**	**IUCN:**	**-**	**KBA:**	**Yes**
Summary Description							
There a large number of Forest Reserves present within the Project's AOI. Many of these are small but, within the landscape they represent the remnants of a wider and more comprehensive forest coverage. In this assessment they generally form part of forest/savanna mosaic Landscape Context (D) defined in the CHA (Ref 13.19). Below the escarpment and south of the Project area are a number of significant forests. These include the Bugoma Forest and associated smaller forests, including Wambabya and Bujawe Forest Reserves. This area is located to the west and south west of Hoima and the EACOP passes through this area, although it does not pass through any of these forests. **Bugoma CFR** covers an area of 41,144 ha and is situated on top of escarpment east of and overlooking Lake Albert on the edge of the Western Rift. It lies to the west of and midway along the main Kyenjojo – Hoima highway, approximately 10km South West of Hoima and 10 Km east of Lake Albert. The forest is isolated from other protected areas and surrounded by smallholdings and settlements. The site has a range of forest dependent and biome-restricted species including the globally threatened Nahan's Francolin. The forest contains numerous other species of conservation concern including chimpanzee. Threats to the forest include illegal logging and clearance for subsistence farming. **Wambabya CFR** is one the larger fragments of forest remaining within the Albertine Graben. It lies to near the north-eastern border of Bugoma Forest Reserve. Wambabya CRF has a small population of around 120 chimpanzees (Ref 14.78). The forest is under pressure from logging and clearance. In addition to chimpanzee, Wambabya Forest Reserve is noteworthy because it contains several threatened species not found in the adjacent, larger Bugoma Forest. However, the Hoima area is likely to see considerable change as a result of the development of the Project. This is partly because a refinery will be built near Hoima (which will link to development of other oil fields in the Albertine Graben). In addition, a number of 'oil roads' will be constructed by UNRA and some pass through this area. These are not new roads *per se* but upgrades of existing murram roads to a permanent tarmac surface.							
Relation to Project							
Planned Project facilities within the protected area	**Core infrastructure**	• No oil production or treatment infrastructure is planned to be within Bugoma or other forests					
	Supporting infrastructure / associated facilities	• The EACOP will pass near to some of these forests Road upgrades (critical oil roads) include Kaseeta-Lwere passing via Bugoma Forest and a Kibaale-Kiziranfumbi road passing between Bugoma and Wambabya forests					
	Activities	• Full details of construction and operation of the Project are provided in **Chapter 4: Project Description and Alternatives.** • None of the Project activities will take place in or close to these forests					
Planned Project facilities in proximity to the	**Core infrastructure**	• Core Project infrastructure including 34 well pads and associated flowlines, the CPF/industrial area and the Bugungu and Buliisa Camps are situated well to the north of these forests.					

protected area	**Supporting infrastructure / associated facilities**	• Associated facilities include a number of oil roads (see **Chapter 4: Project Description and Alternatives**) The EACOP passes close to these forests.
	Activities	• None of the Project activities will take place in or close to these forests
Key features of the Protected Area		
Key Habitats & Quality	Bugoma Central Forest Reserve is situated on top of escarpment east of and overlooking Lake Albert on the edge of the Western Rift valley. To the North Eastern are Bujawe and Wambabya Central Forest Reserves whose patches are continuous with Kinyara sugar plantation that reaches Budongo Forest Reserve. The forest type is classified as medium altitude moist semi-deciduous forest with a high biodiversity. The majority of the area 32,000ha (80%) is covered by Tropical High Forest (*Cynometra–Celtis* forest) with around 4,000ha classified as *Albizia-Combretum–Terminalia–Hyparrhenia rufa*) and 3,500 Ha as *Combretum-Hyparrhenia Savannah* (Ref. 13.25). There are grasslands (mainly *Hyparrhenia* spp) which tend to be on hill tops and ridges and are frequently burnt by fire in dry seasons (Ref 13.64). It occupies a gently sloping area, which drains towards Lake Albert in the west. There is only one permanent river, the Nkusi, which forms the southern boundary. The forest is isolated from other protected areas and surrounded by smallholdings and settlement.	
Species Significance	Bugoma Central Forest Reserves has a range of forest dependent and biome-restricted species and with two globally threatened species. Nahan's Francolin and Grey Parrot are the only two recorded globally threatened species found here. The surveys done in the major sites for Nahan's Francolins in Uganda suggest that Bugoma Forest Reserve contains the highest density of the species. In addition to birds, Bugoma Central Forest Reserve is also important for other biodiversity including chimpanzees. Tier 1 animal species recorded include: • Chimpanzee • Elephant • Golden puddle frog • African crowned eagle • Nahan's Francolin • Numerous butterfly species Tier 1 plant species include: • *Afrothismia winkleri* (CR) • *Brazzia longipedicellata* (EN) • *Dialium excelsum* (EN) • *Uvariodendron magnificum* (EN) Wambabya forest is smaller and is known for its population of chimpanzee. However, as with other smaller forests in the region it is under threat from logging, poaching and clearance for settlements and farming. Wambabya is recorded to support a number of typical forest plant species as well as forest amphibians.	
Protected area management		
Management authority	• These forests are managed by NFA	
General management objectives	The general management objectives of a National Forest Reserve (Ref 13.62) are: • Restoring forest cover back to the1990 levels by 2015;	

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Restoring degraded natural forests in forest reserves and private forests;
Reducing pressure on forest cover as a source of woodfuel and construction materials;
Promoting forestry based industries and trade.

This will be achieved by:

Increasing economic productivity and employment through forest production, processing and service industries;
Raising incomes for households through forest-based initiatives;
Restoring and improve ecosystem services derived from sustainably managed forest resources.

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<tr><td>Relevant management plans:</td><td>

Forest Management Plan For Bugoma Central Forest Reserves Management Plan Area 2012-2022 (2012) Ministry Of Water And Environment

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<tr><td>Specific management Objectives:</td><td>
Long Term Objective (Goal): 20-30years
To significantly improve management of Bugoma MPA and increase the forest based livelihood benefits of the local community adjacent to the forest reserves with a sustainable flow of products and services in an environmentally friendly manner.
Immediate Objectives (5- 10 years)

To conserve "in-situ" forest biodiversity and ecological conditions.
To produce economically and sustainable hardwood timber and non-timber products.
To integrate local communities adjacent to the forest in participatory management of the forest reserve.
To promote commercial tree planting using quick growing species that will supply timber to supplement naturally growing trees.
To carry out research in order to obtain information on various aspects of forest ecosystem dynamics.
To develop recreational facilities for the people of Uganda and others.

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<tr><td colspan="2">Management status, existing threats & challenges</td></tr>
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These forests are actively managed by NFA.
Main threats include illegal logging/pitsawing activities, pole cutting, habitat clearance, poaching and resource collection including firewood and fibres.
Poor honey harvesting methods.
Illegal removal of herbs.
Negative political intervention (Ref. 13.64).

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13.6.8 Invasive Plant Species

As highlighted in the National Environment Management Policy for Uganda 2014 (Ref. 13.65) and the National State of the Environment Report for Uganda (2014) (Ref. 13.66), Invasive Alien Species (IAS) are a significant threat to ecosystems, biodiversity, human health, and land value/productivity (crops/livestock/recreation/tourism), the impacts of which can be hard/impossible to reverse and can escalate rapidly following initiation of the impact.

As such, this specific impact is considered further. At a national level, in collaboration with neighbouring nations, a proactive approach to combatting IAS is advocated (Refs. 13.66 and 13.67). The guiding principles are:

- Early detection and implementation of an integrated control program;
- Effective control, monitoring and surveillance; and
- Involvement of local community in the management of invasive and alien species.

Accordingly, in order to support early detection and surveillance (allowing for effective control), a literature review was carried out to identify those IAS most likely to have the potential to impact the Project Area. Impact species are considered to be those with the potential to cause significant adverse impacts to at least one of the Landscape Contexts present within the Project AoI and for which introduction/spread pathways exist and/or the species is already present within the zone of influence of the Project.

Additionally, a risk rating is assigned to each species; Table 13-11 provides a description of each risk rating. A list of species that could affect the Project is provided in Table 13-12 along with their known distribution, summary of impacts, method of spread and risk rating.

Table 13-11: Risks ratings for Invasive Species

Risk Rating	Description
1	High risk of impact on native habitats/biota and/or development, due to high rate of spread and competitiveness with resident species, and known to be present or likely to be encountered along or close to the AoI. Action is required to prevent spread (Refs. 13-40 to 13-44).
2	Medium risk of impact on native habitats and biota or unlikely to be encountered, and present or likely be present in the AoI but not known to be in or close to Exploration Areas. Standard biosecurity procedures should prevent introduction/spread (Refs. 13-40 to 13-44); however, additional care needs to be taken, particularly with respect to surveillance.
3	Low risk of impact on native habitats and biota or very unlikely to be encountered. If encountered, standard good site hygiene biosecurity procedures should prevent spread (Refs. 13-40 to 13-44).

The risk ratings below are based on currently available information, primarily records of occurrence particularly from large scale field surveys (such as Refs. 13.26 and 13.30), known distributions at the time of publication of relevant sources (see Table 13-3) and recent field studies in the Project Footprint for this ESIA. With respect to IAS, distributions can vary dramatically in a short space of time. As such, the risk ratings below should be considered as being a snap shot and subject to change.

Additionally, the below should not be considered a comprehensive list of all IAS with the potential to impact the region due to development, as the list is limited by the availability and publication date of relevant literature. Other IAS may be encountered within the Project AoI; if encountered, they should be subjected to risk assessment.

Table 13-12: Invasive Alien species (IAS) with the potential to impact the Project Area

Species	Known Distribution	Known Relevant Impacts	Method of spread	Risk Rating
Terrestrial species				
Chromolaena odorata (Siam weed or Christmas bush) - shrub	Tilenga ESIA surveys identified this at the Nile crossing Pipeline Isolation Valve South (very low abundance) Bugungu Airstrip Extension (very low abundance)	Invades and frequently dominates disturbed areas, grasslands, fallow areas and forestry plantations.	Primarily by seed (persistence: 1(6) years, dispersal: generally by wind but also by sticking to fur, feather and clothes and in soil). Also stem layering.	**1**
Mimosa pigra (catclaw mimosa or giant sensitive tree) – shrub or small tree	Tilenga ESIA surveys identified this at the Nile crossing Pipeline Isolation Valve South ('likely present') Victoria Nile Ferry crossing South ('moderate abundance') Water abstraction point ('very low abundance')	Regarded as one of the worst IAS of tropical Africa wetlands (REF), which it frequently comes to dominate, and alters open grasslands into dense thorny thickets, negatively impacting on native biodiversity. Can also dominate roadside verges.	Seeds (persistence: 2 years, dispersal: water flow, cattle movement and in soil). Noted as being readily spread by road construction equipment.	**1**
Acacia hockii (white thorn acacia) - shrub or small tree	This was recorded at NSO-02, NSO-04 during Tilenga ESIA surveys.	A native plant noted as being invasive in parts of Uganda for more than 50 years (REF), in particular, overgrazed grasslands and evergreen thickets. Presence of tall shrubs can prevent effective control of tsetse fly.	Seed (persistence: no information), dispersal: primarily by animals but also by water flow and in soil.	**2**
Cassia siamea (also *Senna siamea*) (Siamese cassia or kassod tree) - tree	Identified during Tilenga ESIA surveys at several sites (GNA-02, KW-02, NGR-06, NGR-07, NSO-04).	Unlikely to cause major impacts; however, it can be a nuisance weed on river and road verges and potentially in forests.	Seeds (persistence: 'many years', dispersal: primarily water flow and possibly by animal).	**3**
Opuntia species (a prickly pear cactus) - *cactus*	Tilenga ESIA survey identified this in one location (KW-01).	Competes with and replaces indigenous species. Dense infestations reduce the grazing potential of land and restrict access by domestic and wild animals and can cause drastic devaluation of agricultural and conservation land. The spiny cladodes	Seeds (persistence: 1 year, dispersal: humans and animals) and vegetative fragments.	**1**

Species	Known Distribution	Known Relevant Impacts	Method of spread	Risk Rating
		can cause injuries to animals and during the fruiting season the minute spines on the fruits can be highly irrigative and can result in animals being unable to feed.		
Lantana camara (lantana or tickberry) - shrub	Not recorded in field surveys in the Project area but this species is widely distributed in Uganda	Forms extensive, dense and impenetrable thickets in forestry plantations, orchards, pasture land, waste land and in natural areas (including protected grasslands and woodlands and forest gaps). Poisonous to livestock.	Seeds (persistence: 11 years, dispersal: primarily by birds and by water flow) and by adventitious shoots.	**2**
Solanum mauritianum (tobacco tree) - shrub or small tree	Not recorded in field surveys in the Project area but this species is widespread in Uganda	Invades natural forests, forestry plantations, riparian zones, urban open space and various disturbed areas, displacing native vegetation, hindering commercial forestry activities, harbouring agricultural pests, poisoning livestock and providing health risks for humans	Seed (persistence: not long lived, dispersal: birds, bats, monkeys and human activity) and, more commonly, by adventitious roots.	**2**
Parthenium hysterophorus (Parthenium weed) - *annual herb*	Known to be present in MFNP and in other areas where it spreads rapidly	Infestations are responsible for declines of 40% in food-crop yields, and reductions of 90% in livestock carrying capacities of some grassland areas. Contains potent allergens that can cause severe ailments in grazing and browsing animals, while also inflicting on people discomforting conditions such as dermatitis, asthma, hay-fever, breathing difficulties (potentially leading to death) and irritations of the eyes. Survival of entire populations of wild herbivores at risk in heavily invaded areas (e.g. MFNP). Greatly reduces biodiversity in a range of habitats including savanna and open woodland.	Seeds (persistence: 6 years, dispersal: wind, water, farm machinery, industrial machinery, animals, humans, vehicles, stock fodder, movement of stock, grain and seed).	**2**
Senna spectabilis (white barked senna) - tree	Occupies more than 1,000 hectares of Budongo Forest Reserve and environs	Poses a high risk to native flora (and dependent fauna) in Uganda. Out-competes and replaces whole	Seeds (persistence: 3 years, dispersal: gravity, water flow and in soil) primarily, but also adventitious roots and by plant cuttings.	**2**

Species	Known Distribution	Known Relevant Impacts	Method of spread	Risk Rating
		communities of native forest plants. Leaves unpalatable.		
Broussonetia papyrifera (paper mulberry) - tree	Budongo Forest Reserve near Lake Albert	Spreads rapidly through forest reserves and adjoining farmland and pastures, reducing biodiversity and impacting rural livelihoods.	Seed (persistence: no data, dispersal: birds, small animals, water flow and in soil), stem cuttings, coppice and root suckers.	**2**
Cymbopogon nardus (citronella grass) – grass	Common in grassland and open woodland in Uganda	Invades grazing lands and affects plant species composition, lowering the quality and yield of forage. Unpalatable to cattle. May constitute a threat to biodiversity in Uganda national parks.	Seed (persistence: no data, dispersal: wind, animals, water, machinery and road vehicles) and via vegetative clumps.	**3**
Aquatic species				
Salvinia molesta (giant salvinia or Kariba weed) – free-floating aquatic herb	• JBR-08 (present, no abundance given) • Nile crossing Pipeline Isolation Valve North (not recorded in any plots but present nearby) • Nile crossing Pipeline Isolation Valve South ('likely present') • Victoria Nile Ferry crossing North ('low abundance') • Victoria Nile Ferry crossing South ('low abundance') • Victoria Nile river – AL13 (present, forming mats at the fringe of floodplains) and AL2 (present in sheltered nooks) • Victoria Nile river Delta/Lake Albert - AL4/AL4B (present, no abundance given) • Unnamed Watercourse - AL5A, AL5B (present, dominant)	Can form mats that are up to 1 m thick, impeding boat traffic, blocking access to water, clogging irrigation piping, impairing the function of hydro installations, and disrupting fisheries. Dense mats suffocate and replace native aquatic vegetation, reducing underwater light penetration and prevent oxygen transfer, making aquatic habitats unsuitable for fish and other animals.	Exclusively vegetative from plant fragments and thin fragmenting 'colonising' stems. Boat ballast.	**1**
Eichhornia crassipes (water hyacinth) – free-floating aquatic herb	• JBR-08 • near Nile crossing Pipeline Isolation Valve North, • likely present Nile crossing Pipeline Isolation Valve South • Victoria Nile Ferry crossing North ('low abundance') • Victoria Nile Ferry crossing South ('low	Regarded as the world's worst aquatic weed. In Uganda it is having a major impact on the biodiversity of lakes and wetlands, as well as on fisheries and on the lives and livelihoods of the people who are dependent on such freshwater ecosystems.	Seed (persistence: 'many years', dispersal: birds and in mud attached to animals and vehicles). Seedlings rooted at first before becoming free floating. Vegetative fragments and stolons which are dispersed by water flow, blown by wind and attached to boats and in ballast, etc.	**1**

Species	Known Distribution	Known Relevant Impacts	Method of spread	Risk Rating
	abundance') • Water abstraction point ('low abundance') • Victoria Nile river – AL13 (present, forming mats at the fringe of floodplains) • Victoria Nile river Delta/Lake Albert - AL4/AL4B (present, no abundance given) • Unnamed Watercourse - AL5A, AL5B (dominant)			
Pistia stratiotes (water lettuce) - free-floating aquatic herb	• Victoria Nile river Delta/Lake Albert - AL4/AL4B (present, no abundance given)	Can rapidly form dense mats which may completely cover the surface of the water, particularly where stagnant conditions exist such as ditches. Subsequently reduces biodiversity and impacts irrigation and drainage. Can also hinder navigation and fishing.	Seeds (persistence: no data, dispersal: water flow and attached to water fowl or vehicles), vegetative fragments and vegetative offshoots that are connected to the mother plant by stolons. Vegetative fragments are dispersed by water flow and attached to vehicles. Boat ballast.	**2**
Ipomoea aquatica (swamp morning-glory) – herbaceous vine creeping on mud or floating on water	Victoria Nile river Delta/Lake Albert - AL4/AL4B (present, no abundance given)	Aggressively colonises aquatic and marginal muddy habitats leading to loss of biodiversity and impacts on irrigation systems, navigation and recreation.	Seeds (persistence: no data), plant fragments or whole plants by water, animals and humans. Boat ballast.	**2**

13.6.9 Baseline trends and ecological processes

The rich biodiversity of the Albertine Graben is maintained and supported by an interconnected system of savanna, forest and woodland habitats.

Over time, land use practices have resulted in clearance and modification of the original natural land cover particularly outside of designated protected areas, with the local population engaged primarily in subsistence land use, practicing small-scale agriculture, livestock rearing and fishing. There is a particular reliance on locally harvested natural resources for providing meat, building and other raw materials.

Human population increase and the associated overexploitation of natural resources have greatly contributed to far-reaching changes in land use and a pervasive decrease in natural land cover. The development of oil projects such as Tilenga will inevitably result in further pressures and challenges on the biodiversity of the region.

To this end specific studies have been undertake to establish trends in landcover changes within the AoI and how this has changed over time (see Ref. 13.24). One aim of this has been to define a baseline for land use and to identify trends which may be exacerbated by oil developments in the Albertine Graben, particularly in relation to loss of natural habitat.

Landcover trends (based on analysis of data for the period 2007-2013, Ref 13.24) within each Landscape Context are summarised in Table 13-13 below. Landcover mapping is shown on Figure 13-6.

Table 13-13: Landcover Trends

Context	Name	Description	Landcover Trends and Pressures
A	MFPA	**Grassland and woodland within the MFPA and to its north**. Contains extensive areas of Moist Combretum Savanna and *Hyparrhenia* Grass Savanna, and a concentration of Vulnerable species in Bugungu Wildlife Reserve. Context A is linked ecologically with Context B, but the management issues in each are different.	Generally, there has been an increase in woody cover within protected areas, especially MFNP, Karuma WR (and also Bugungu WR). Most of the natural vegetation at the edge of protected areas has been cleared to create a sharp boundary between natural vegetation inside protected areas and agricultural areas outside the protected areas. Burning of grassland within the MFNP and other protected areas is a particular issue, with (according to UWA) up to 90% of fires not being managed but suspected to be set by poachers. It is noted however that most change for the defined period within protected areas can be attributed to natural origins (i.e. normal successional progression, grazing (and seed distribution, e.g. Borassus) by ungulates. It is notable that when elephant dropped dramatically during the 1970s/80s areas, that they had kept open, reverted to closed woodland areas, particularly south of the Nile. It remains to be seen whether the increase in numbers will cause these wooded areas to revert to savanna. Change in protected areas can therefore be considered to represent the background natural drivers of change in the area (Ref 13.24). In addition, there are management interventions such as: • controlled burning carried out late in the dry season at the onset of the rainy season to reduce intense fire risk of dry vegetation, increase new growth for grazing, control ectoparasites and increase visibility in tourism areas; • clearance of vegetation, including removal of invasive species, creation of firebreaks or removal of excessive dry material which could lead to more intense fires; and • development of park or reserve infrastructure (tourism and park management, including roads and drainage gullies.
B	Savanna corridor	**Grassland and open wooded or scrub habitats** along a **weakly-protected savanna corridor** that runs approximately north-south along and below the escarpment. Contains Natural Habitat and transitional habitat, with areas of Moist Combretum Savanna and a concentration of Vulnerable species along the escarpment. Context A is linked ecologically with Context B, but the management issues in each are different.	There has been steady pressure on unprotected savanna areas for conversion from natural habitat to transitional or modified subsistence farming. This is noticeable for example in the Buliisa area where such subsistence farming now comes right up to the edge of southern parts of the MFPA. Other areas of unprotected grassland are under pressure from overgrazing, and again this is evidence in the western part of the Project area. This habitat type has been referred to as Transitional Habitat, which is habitat "that has the capacity to be restored to a natural, functioning state with appropriate management actions in the near future. This is considered to be a sub-set of "natural" habitat in the sense of PS" (see definition in Ref 13.23). Some of the areas of Transitional and Modified habitats in the Buliisa area are nevertheless important for birds,

Context	Name	Description	Landcover Trends and Pressures
			although large mammals are largely absent. In other areas, commercial large scale farming, particularly above the escarpment, has greatly increased at the expense of subsistence farmland mainly.
C	**Lake Albert, rivers and wetlands**	**Lake Albert** and **fringing wetlands**, including the Murchison Falls-Albert Delta Wetland System Ramsar Site and Waiga/Waisoke River floodplain, as well as many other smaller rivers and swamps: Contains a concentration of Vulnerable species in the Murchison Falls-Albert Delta Wetlands System Ramsar Site.	Lake Albert itself has not been noticeably modified but there is pressure on wetlands particularly within the Ramsar site, which in some areas south of the Victoria Nile is subject to clearance and settlement. In addition, the recent landcover study (Ref 13.24) found that there had been an increase in papyrus swamp and open water within the protected area system (MFNP & Ramsar site). However, seasonal wetlands present, particularly in the south Nile area are degraded through their use by grazing animals and also presence of borehole wells that may locally affect baseflow to seasonal watercourses.
D	***Tropical high forest***	**Forest** and **forest fragments** and **corridors**, including the large Central Forest Reserves of Budongo and Bugoma; smaller fragments, including Wambabya, between and around these; and gulley/riparian forests along rivers and streams running down to Lake Albert.	Analysis of landcover changes indicates that the level of protection of forest reserves could be improved by preventing or reducing pressures on forest reserves such as illegal pit-sawing, logging, fibre collection, firewood, honey harvesting, poaching (and resultant fires from discarded smokers) and some habitat clearance for settlements. In addition, forests such as Bugoma have savanna areas which may be subject to fires. Within forest reserves landcover changes are to other apparently natural vegetation classes, with by far the largest area representing conversion to closed woodland. Whilst this could represent a natural change or progression, with a general drying of the forest, this would contradict the apparent gains in woody biomass in the savannah systems. It is possibly more likely that this conversion represents a steady degradation and opening up of forests through clearance of trees for firewood, building resources and charcoal. A smaller proportion of the change is shown to be to human modified classes with small scale agriculture dominant. Outside of protected areas, forest fragments are reducing rapidly, with around 100,000 ha of forest recorded as being lost between 2006-2013 (Ref 13.26). Consequently any moist medium altitude semi-deciduous forests are now extremely rare outside of the central forest reserves within the forest savanna mosaic. The loss of unprotected forest is particularly dramatic as it actually represents a loss of coverage from 9% of the landscape to just 1% being converted to open scrub, which may represent the woody undergrowth left behind after the clearance of trees for charcoal, firewood or through pit sawing. A smaller proportion of these former forests being converted to small scale farming. The WCS report (Ref 13.26).) predicts that at this rate of loss, by 2015 the forest cover outside of protected areas will be 'negligible'. This loss of forest reduces the connectivity across the landscape, isolating populations and reducing overall biodiversity in the region
E	***Nebbi***	Unprotected **savanna habitats** in **Nebbi District (**West Nile sub-	This area comprises unprotected savanna habitats to the west of the Nile.

Context	Name	Description	Landcover Trends and Pressures
		region), including areas of two threatened ecosystems. This context also potentially contains Critical Habitat for a globally and nationally threatened cycad species.	As with the Buliisa area, the habitat here is becoming transitional and/or modified with grazing and subsistence farming reducing the extent of natural habitat. In addition, fire wood collection as well as burning is also modifying the habitats in this region.
F	**Mixed land-scape**	This is a 'catch all' context that covers mixed habitats landscape-wide, including agriculture. Two landscape species, African Elephant and Chimpanzee, are wide-ranging across several ecosystems and in Modified Habitat.	Outside of protected areas there has been considerable land-use change between 2007 and 2013. The drivers are markedly different from those described for the protected areas and confirm that the largest influence is anthropogenic, with all land-use classes showing substantial gain with the exception of small scale farming (Ref 13.24). Clearance of natural land cover for agriculture or other land use is certainly a major driver of change, however overall the loss of broadly natural land cover is at a lower rate than expected, at only 2%, although still representing less around 2.5 million hectares). Analysis of change between the natural classes suggests degradation is taking place as explained in the following sections. The underlying successional progression (which appears to be linked to a rise in woody biomass) will still be taking place, but in this case masked and over-ridden by the anthropogenic drivers. This includes: • Modification of grassland through ungulate grazing is replaced by modification through cattle and livestock grazing and clearance for farming; • Uncontrolled and frequent burning to increase new growth for cattle grazing and also to clear ground for farming; • Clearance of vegetation, particularly woody biomass, for fuel (firewood and charcoal), for use in building and for acquiring perceived fertile land under forest or woodland for farming; and • Development of infrastructure (roads, municipal buildings and services, dwellings, commercial activity) as population increases. Excluding protected areas the main percentage changes (2007-2013) are as follows: • Tropical high forest - 88.4% • Grassland - 41.8% • Wooded grassland - 13.4% • Closed woodland - 26.0% • Bushland - 33.2% However, large percentage increases in planted forest, commercial farmland, dense scrub and open scrub have been recorded (see Table 7, Ref 13.24) clearly at the loss of natural habitat, including forests.

13.7 Impact Assessment and Mitigation

13.7.1 Introduction

The following sections set out the impact assessment relating to Terrestrial Vegetation. The assessment has been undertaken for four distinct stages of the Project as follows:

- Site Preparation and Enabling Works;
- Construction and Pre-Commissioning;
- Commissioning and Operations; and
- Decommissioning.

For each stage of the Project the assessment sets out:

- the potential impacts on each of the defined receptors (this takes into account the embedded mitigation described below), in terms of effects on species and/or habitats;
- the additional mitigation measures; and
- the residual impacts of the Project, taking all mitigation measures (embedded and additional) into account), in terms of effects on species and/or habitats. The assessment considers the direct and indirect impacts of each stage of the Project and the effects of measures to achieve no net loss / net gain.

For most stages of the Project, activities are often the same and therefore the impacts will actually be quite similar. Because of this, and in order to minimise repetition of text the assessment is largely presented in tabular form with additional commentary where necessary to highlight significant impacts, and any differences in potential impacts and residual impacts that can be defined between Project phases.

It should be noted however, that most impacts on biodiversity have long-term impacts and, except where species-specific mitigation has been identified, most mitigation measures will be generic and based on the general habitat and landscape scale of receptors, and with long-term objectives.

13.7.2 Impact Assessment Methodology

13.7.2.1 General Approach

This section describes the approach to impact assessment for terrestrial vegetation.

In order to undertake the assessment, it is necessary to understand the likely effects of the Project and the receptors that may be affected by it. The Project is likely to have effects on a large number of receptors, and the receptors are evaluated so that the assessment concentrates on those species and other receptors of greatest conservation concern.

Therefore, for this assessment each identified receptor is assigned an indication of its sensitivity, which is based on a number of factors as set out below. Once the sensitivity of the receptor is known, it can be considered in the context of the likely magnitude (used interchangeably with the word character in this chapter) of the impact on the receptor and the significance of the potential impact can therefore be determined.

In considering the actual impact on the receptor, the impact that is most relevant is the **residual impact**, i.e. the impact after additional mitigation has been taken into account.

There is also another level of mitigation which relates to indirect impacts and achieving the objectives of no net loss / net gain which are part of the Net Gain Strategy (that some may refer to as “Offset Strategy”) for direct and indirect impacts. These are referred to as mitigation concept strategies or biodiversity conservation initiatives.

Identifying and evaluating the sensitivity of receptors and defining impacts on them in this systematic way provides a robust assessment and framework for understanding what receptors are likely to be most affected by the Project. This therefore allows the identification and prioritisation of management measures for these receptors, with clearly defined mitigation actions, that will be required during appropriate stages of the Project's life.

13.7.2.2 Receptor Sensitivity

Based on the information collected from previous studies, data gathering and field surveys, the ESIA has identified the relevant receptors and assigned a sensitivity value (very high / high / medium / low / negligible) to each identified species, protected area or Landscape Context present, or likely to be present, within the Project AoI.

The sensitivity of species receptors relates to their level of conservation concern and has been defined based on a combination of vulnerability (e.g. level of extinction risk) and irreplaceability (e.g. relating to issues of species considered to have a restricted range). Extinction risk has been defined based on the IUCN Red List of Threatened Species (IUCN 2017, Ref 13.48) and the Uganda Red List (2016) (Ref 13-22).

There is no systematic method for assessing habitat threat status at the Ugandan national level, but these has recently been development of a global method for determining threat levels to ecosystems (Ref 13.49), which has helped to create the IUCN Red List of Ecosystems. The categories defined in the CHA interpretation report (Ref 13-19) have been used in this assessment to assign value to receptors incorporating threatened ecosystems/habitats.

The ecosystem categorisation method considers irreplaceability, based on the total area covered by a particular vegetation type globally, and vulnerability, measured by the proportion of the total distribution of a particular habitat type that is included within protected areas. It follows that habitat types that are largely found outside of protected areas are more vulnerable than those that are well represented within protected areas.

Combined with information about the magnitude of the impact, the significance of the impact(s) on the identified receptor can be determined.

For this assessment the main categories of receptor sensitivity/importance have therefore been based on those identified as part of the CHA process (see Ref. 13-23). Receptor value categories are defined in Table 13-14 as follows.

Table 13-14: Receptor Sensitivity

Receptor Sensitivity	Selection Criteria
Very High	• Legally protected and internationally recognised areas (Class I and II), such as Ramsar sites, Important Bird and Biodiversity Areas (IBA), the MFNP, wildlife reserves, or areas of high biodiversity value (including some Forest Reserves (FR)) that meet the criteria for such designation, irrespective of whether or not they have yet been designated. • Critically Endangered (CR) and Endangered (EN) species (PS6 Criterion 1: Tier 1); • Endemic/ Restricted Range Species (PS6 Criterion 2: Tier 1); • Migratory/Congregatory Species (PS6 Criterion 3: Tier 1);
High	• Legally protected and nationally recognised areas, such as wildlife reserves, or areas of high biodiversity value (including some FR) that meet the criteria for such designation, irrespective of whether or not they have yet been designated. • Critically Endangered (CR) and Endangered (EN) species (PS6 Criterion 1: Tier 2); • Endemic/ Restricted Range Species (PS6 Criterion 2: Tier 2); • Migratory/Congregatory Species (PS6 Criterion 3: Tier 2); • Endangered (EN) Highly Threatened / Unique Ecosystems (PS6 Criterion 4); • Key Evolutionary Processes (PS6 Criterion 5).

Receptor Sensitivity	Selection Criteria
Medium	• Vulnerable (VU) Highly Threatened / Unique Ecosystems (PS6 Criterion 4); • Sites that are of regional importance such as Community Wildlife Management Areas. Regionally important areas that may meet the published ecological selection criteria for designation, but are not designated as such; • Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan RedList as Vulnerable (VU), Near Threatened (NT), Data Deficient (DD) or Not Evaluated (NE), whichever is the higher category; • A regularly occurring, locally significant number of a regionally important species. Or species which is legally protected; • Features functioning as wildlife corridors or migration routes but which may not be designated or protected.
Low	• Areas of habitat considered to appreciably enrich the habitat resource within the context of the area, e.g. species-rich grassland, less usual ecological features. • A significant population of a locally important species. Sites/features that are scarce within the locality or which appreciably enrich the local area's habitat resource. • Species that do not meet the criteria for "high' or 'medium' but are notable for other reasons (e.g. of socio-economic importance).
Negligible	• Areas with no protected status or designation. • Species that are common and widespread.

13.7.2.3 Impact Magnitude

Once the sensitivity of a particular receptor has been identified it is then necessary to determine the magnitude of changes/activities and therefore impacts on the receptor. To determine the magnitude the following four parameters have been considered:

- Scope;
- Severity;
- Duration; and
- Permanence (Reversibility).

These parameters are defined below.

Scope: relates to the location and proportion of the feature's area or population in the landscape that is expected to be impacted by the Project.

Severity: is a measure (or estimation) of how severe the impact could be on that proportion of the population or location defined by the scope. Such parameters would include extent of habitat degradation, loss of integrity of protected areas (including connectivity) and changes ranging from disturbance to measurable demographic extent on species populations.

Duration: is defined by whether the impact is short term, temporary or long term.

Permanence (Reversibility): defines the expected capacity for the species or habitat to recover once the cause of the impact has been removed. This includes the time it might take for a population or status to recover and also what proportion of that impact will also be reversible.

This assessment has therefore been undertaken with reference to Table 13-15 below, where the magnitude of each impact is defined based on consideration of these parameters. Where parameters differ within each category, the highest level of change for each parameter is used to determine the impact character.

Table 13-15: Impact Magnitude Assessment Criteria

Magnitude	Assessment Criteria
High Adverse	**Scope:** 20% or more of the feature's population and/or distribution within the Project AoI will be affected by the impact. **Severity:** Complete loss or severe degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Change may result in reduction in conservation status (as defined by IUCN) of the species or habitat. **Duration:** The impact will be long term (10 to 20 years) or permanent. **Permanence:** The impact cannot be reversed with 10 years of the activity causing the impact has ceased and/or less than 30% of the population / areas lost / habitat quality will be fully recovered / restored.
Medium Adverse	**Scope:** Between 10% and 20% of the feature's population and/or distribution within the AoI will be affected by the impact. **Severity:** Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Change likely to result in change in conservation status of the species or habitat. **Duration:** The impact will be temporary and medium term (between 5 and 10 years). **Permanence:** The impact can be reversed to baseline levels within 5 years of the activity causing the impact having ceased and/or less than 60% of the population / areas lost / habitat quality will be fully recovered / restored.
Low Adverse	**Scope:** Up to 10% of the feature's population and/or distribution within the AoI will be affected by the impact. **Severity:** insignificant degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Change will not be enough to result in change in conservation status of the species or habitat. **Duration:** The impact will be temporary and short term (between 1 and 5 years). **Permanence:** The impact can be reversed to baseline levels with 2 years of the activity causing the impact having ceased and/or less than 90% of the population / areas lost / habitat quality will be will be fully recovered / restored.
Negligible	**Scope:** Less than 1% of the feature's population and/or distribution within the AoI will be affected by the impact. **Severity:** No discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. **Duration:** The impact will be temporary and short term (less than 1 year). **Permanence:** The impact can be reversed to baseline levels within 2 years of the activity causing the impact having ceased and will be fully reversed and restored.

13.7.2.4 Impacts significance

Due to the nature of the environment where the Project is located, it has been necessary to extend the standard impact significance matrix to allow for an extra category of Very High in determining the receptor sensitivity, thus the impact significance matrix deviates slightly from the standard approach presented in ***Chapter 3: ESIA Methodology***.

Impacts of the Project on terrestrial vegetation have been determined by comparing the sensitivity of the receptor against the magnitude of the impact. This comparison is done using a modified ESIA assessment method comprising a cross-referencing matrix, as shown in Table 13-16 below.

Table 13-16: Impact Assessment Matrix

	Impact Magnitude			
Receptor Sensitivity	**Negligible**	**Low Adverse**	**Medium Adverse**	**High Adverse**
Negligible	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	LOW
Low	INSIGNIFICANT	INSIGNIFICANT	LOW	MODERATE
Medium	INSIGNIFICANT	LOW	MODERATE	MODERATE
High	LOW	MODERATE	MODERATE	HIGH
Very High	LOW	MODERATE	HIGH	CRITICAL

Based on this approach potential or residual impact of moderate or higher significance as indicated on the assessment matrix is regarded as a **significant** impact.

In following this framework the assessment of significance has also been informed by the principles within the most recent Guidelines for Ecological Impact Assessment (CIEEM, 2016, Ref 13.50). These use the principle of valuing an ecological resource at a defined geographic scale but advocating that impacts are evaluated simply as significant or not significant for the geographic level at which the ecological resource is valued.

Therefore, whether potential or residual impact is significant or not is based on whether the impact could affect the conservation status of a defined landscape or species. This allows some flexibility in defining significance based on the geographical scale because if an impact is found not to be significant at the level at which the resource or feature has been valued, it could be that it is significant at a more local level.

13.7.3 Receptors

This section summarises the receptors that will be considered in this assessment. It is necessary to identify these explicitly because the assessment needs to define what the likely potential and residual impacts of the Project will be on specific receptors so that appropriate mitigation can be developed where necessary.

As part of the mitigation activities will involve planning and long-term management for some of the receptors, it is therefore important to understand as clearly as possible and in specific terms what the specific pressures on those receptors are likely to be, what needs to be managed and what the priorities and targets for management will be. This is particularly important where long-term management on particular receptors will be required in order to mitigate residual impacts of the Project that remain after other mitigation activities have been considered.

This section is structured to reflect the requirements and receptor types (criteria) defined by PS6 and draws on the findings of the CHA (see Appendix O.2). In addition, there are some other receptors that have been defined based on other criteria, which although not strictly an IFC requirement, have been considered in terms of general biodiversity value within the AoI.

Receptors are summarised in a series of tables where their level of sensitivity is indicated, based on the criteria discussed above. The receptors are grouped as follows:

- Plant species comprising CHQS, followed by other species of conservation concern;
- Threatened ecosystems; and
- Protected Areas.

The assessment therefore considers the potential and residual impacts at a variety of levels, which are interlinked, as it is important to try to assess receptors not in ecological isolation but to consider them in the context of habitats and biodiversity generally. As there are so many receptors at various levels of sensitivity and interaction, this is a complex undertaking and consequently, there will be some overlaps with the baseline and assessment included in the ***Chapter 14: Terrestrial Wildlife*** and ***Chapter 15: Aquatic Life***.

Nevertheless, the aim of this ESIA is to present the assessment as simply as possible so that it is clear how and which receptors could be affected by the Project. This will help to define the requirements for management of direct and indirect impacts and on which receptors (and in which locations), in order to mitigate those potential impacts during the Site Preparation and Enabling Works, Construction and Pre-Commissioning and Commissioning and Operations Phases, as well as during the Decommissioning phase (and possibly beyond).

Table 13-17 summarises the species that have been defined as receptors for the purposes of this assessment. The table gives the IUCN or Uganda Red List status of each species, its PS6 criterion and the landscape context with which it is generally associated. Based on these parameters and with reference to Table 13-9 above, the sensitivity of each receptor is then defined.

Table 13-17: Receptor Species

Species	IUCN	PS6 Criterion	Landscape Context(s)	Receptor Sensitivity
Criterion 1, Tier 1 Critically Endangered and Endangered Species				
Afrothismia winkleri (parasitic plant)	CR	1ab	D	VERY HIGH
Brazzeia longipedicellata (woody plant)	EN	1ab	D	VERY HIGH
Dialium excelsum (flowering plant – legume)	EN	1b	D	VERY HIGH
Uvariodendron magnificum (small tree)	EN	1b	D	VERY HIGH
Psilotrichum axilliflorum	EN	1b, 2b	D	VERY HIGH
Globally threatened Criterion 1, Tier 2 CHQS				
Encephalartos macrostrobilus (cycad)	EN	1c	E	VERY HIGH
Species	**Uganda Red List**	**PS6 Criterion**	**Landscape Context(s)**	**Receptor Sensitivity**
Nationally-threatened Criterion 1, Tier 2 CHQS recorded in the Project Footprint (Project Area)				
Afzelia africana (tree)	EN	1e	A	HIGH
Khaya senegalensis (tree)	EN	1e	A	HIGH
Nationally-threatened Tier 2 CHQS thought likely to occur in/near to the Project footprint				
No plant species are listed in this category.				
Nationally-threatened Tier 2 CHQS that are data deficient				
Albizia ferruginea (tree)	EN	1e	D	HIGH
Antrocaryon micraster (woody plant)	CR	1e possible	D	HIGH
Brachylaena huillensis (hard wood tree)	CR	1e possible	D	HIGH
Chytranthus atroviolaceus (tree)	EN	1e	D	HIGH

Species	Uganda Red List	PS6 Criterion	Landscape Context(s)			Receptor Sensitivity
Cordia millenii (tree)	EN	1e	D			HIGH
Encephalartos septentrionalis (cycad)	EN	1e	E			HIGH
Entandrophragma angolense (tree)	EN	1e	D			HIGH
Entandrophragma cylindricum (tree, sapele)	EN	1e	D			HIGH
Entandrophragma utile (tree)	EN	1e	D			HIGH
Guarea cedrata (tree)	EN	1e, 2b	D			HIGH
Holarrhena floribunda (tree)	CR	1e	D			HIGH
Irvingia gabonensis (wild mango tree)	EN	1e	D			HIGH
Khaya anthotheca (tree, mahogany)	EN	1e	D			HIGH
Khaya grandifoliola(tree)	EN	1e	D			HIGH
Lovoa swynnertonii (tree)	EN	1e	D			HIGH
Lovoa trichilioides (tree)	EN	1e	D			HIGH
*Milicia excelsa (tree)**	EN	1e	D	F		HIGH
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range CHQS Restricted range species for which there are species point location records in the Project AoI.						
Afrothismia winkleri (herbaceous plant)	N/A	1a, 2b (Tier 2)	D			VERY HIGH
Brazzeia longipedicellata (woody plant)	EN	1a, 2b (Tier 2)	D			VERY HIGH
Citropsis articulata (tree)	NE	2b (Tier 2)	D			HIGH
Efulensia montana (liana)	NE	Poss. 2b (Tier 2)	D			HIGH
Guarea cedrata (tree)	N/A	2b (Tier 2)	D			HIGH
Millettialacus alberti (flowering plant – legume)	N/A	2b (Tier 2)	D			HIGH
Uvariodendron magnificum (tree)	EN	2b (Tier 2)	D			HIGH
National Forestry Act, Schedule 8 Reserved Species This is the complete list of tree species from the Schedule so some species may already be listed above as CHQS.						
Afzelia africana	EN	Crit.1, Tier 2, 1e	A			HIGH
Albizia spp. *[A. coriaria & A. grandibracteata] **	-	-	D	F		MEDIUM
Aningeria altissima	-	-	D			MEDIUM
Aningeria adolfifriederici	-	-	D			MEDIUM
Canarium schweinfurthii	-	-	D			MEDIUM
Cordia millenii	EN	Tier 2, 1e	D			HIGH
*Dalbergia melanoxylon ***	VU	Crit. 1, Tier 2, 1e	A	D	F	HIGH
Entandrophragma (all species)	EN	Tier 2, 1e	D			HIGH
Erythrophleum guineense	-	-	D			MEDIUM
Fagara (all species)	-	-	D			MEDIUM
Faurea saligna	-	-	D			MEDIUM

Species	Uganda Red List	PS6 Criterion	Landscape Context(s)		Receptor Sensitivity
Ficalhoa laurifolia	-	-	D		MEDIUM
Ficus spp. *	-	-	D	F	MEDIUM
Hallea rubrostipulata	-	-	D		MEDIUM
Juniperus procera	-	-	D		MEDIUM
Khaya (all species)	EN	Tier 2, 1e	D		HIGH
Lovoa (all species)	EN	Tier 2, 1e	D		HIGH
Maesopsis eminii	-	-	D		MEDIUM
Mangifera indica *	-	-	D	F	MEDIUM
Mildraediodemdron excelsum	-	-	D		MEDIUM
Milicia excelsa *	EN	Tier 2, 1e	D	F	HIGH
Morsus lactea	-	-	D		MEDIUM
Newtonia buchanani	-	-	D		MEDIUM
Ocotea usambarensis	-	-	D		MEDIUM
Olea hochstetteri	-	-	D		MEDIUM
Olea welwitschii	-	-	D		MEDIUM
Osyris spp.	-	-	D		MEDIUM
Piptadeniastrum africanum	-	-	D		MEDIUM
Podocarupus (all species)	-	-	D		MEDIUM
Prunus africana	-	-	D		MEDIUM
Pygeum africanum	-	-	D		MEDIUM
Symphonia globulifera	-	-	D		MEDIUM
Vittaleria paradoxa	-	-	D		MEDIUM
Warbugia ugandensis	-	-	D		MEDIUM

* Field surveys also recorded this species in Landscape Context F (Buliisa Area).

** Field surveys also recorded this species in Landscape Contexts A and F (within MFNP and also the Buliisa Area).

In addition to individual species, threatened ecosystems have also been defined as receptors for this assessment. Seven ecosystems defined as Endangered or Vulnerable are identified in the CHA (see Ref. 13-19) and these ecosystems are listed in Table 13-18 below.

Of these, the Project Footprint will directly impact *Hyparrhenia* Grass Savanna habitat, (landscape context A), which is concentrated in and around the Project footprint. However, there may be indirect impacts on some or all of the other ecosystems where changes due to induced in-migration create pressures on these areas.

Table 13-18: Threatened / Unique Ecosystems

Ecosystem	Criterion 4, Category	Landscape Context(s)		Receptor Sensitivity
Dry Acacia Savanna	Endangered (EN)	E		HIGH
Forest-Savanna Mosaic	Endangered (EN)	D		HIGH
Moist Acacia Savanna	Endangered (EN)	F		HIGH
Moist *Combretum* Savanna	Endangered (EN)	A	B	MEDIUM
Butyrospermum Savanna	Vulnerable (VU)	E		MEDIUM
Palm Savanna (*Borassus* palms)	Vulnerable (VU)	B	F	MEDIUM
Hyparrhenia Grass Savanna	Vulnerable (VU)	A		MEDIUM

Finally, protected areas are defined as receptors in their own right in this assessment. Their sensitivity is presented in Table 13-19 below.

Table 13-19: Protected Areas

Protected Area	Category	Landscape Context(s)		Receptor Sensitivity
MFNP (with Karuma)	National Park Important Bird Area KBA	A		VERY HIGH
Bugungu Wildlife Reserve	Wildlife Reserve	A	D	VERY HIGH
Budongo Forest Reserve	Forest Reserve Important Bird Area KBA	D		VERY HIGH
Forest Reserves in vicinity of Masindi	Forest Reserves	F		HIGH
Bugoma CFR & associated forest reserves	Forest Reserves Important Bird Area KBA	D		VERY HIGH
Murchison Falls – Albert Delta Ramsar site	Ramsar Wetland Important Bird Area	A	B	VERY HIGH

13.7.4 Project Elements and Activities

Having defined the receptors it is necessary to understand how the Project activities and components will be likely to interact with them. The Project includes a number of inter-linking components that will be constructed over a number of years and operated for even longer, with ultimately decommission and restoration at the end of the Project's life.

Many of the Project's component sites are similar and there is considerable repetition of processes and structures. For example the impacts of constructing and operating a well pad or flowline in a certain habitat are likely to be similar to construction and operation of a well pad or flowline elsewhere in similar habitat. The overall combined impact of those components also needs to be taken into account, particularly where such components are placed near each other in similar habitat. In such situations in-combination effects of Project infrastructure can have broader impacts over the Project's various landscapes and the populations of species that inhabit them.

Furthermore, there may be indirect impacts on identified receptors caused or induced by the Project, or by facilities or processes associated with the Project. Such impacts may occur well away from the actual footprint of the Project and may not be easy to identify or separate out from other impact-causing activities in the environment, which themselves may not be directly associated with the Project.

The full Project description is provided in ***Chapter 4: Project Description and Alternatives*** of this ESIA. However, it is necessary to isolate and describe those elements of the Project that are likely to interact with (and therefore impact on) the ecological receptors that have been identified in this chapter. The Project will have four phases comprising:

- **Site Preparation and Enabling Works**, expected to take approximately 5 years;
- **Construction and Pre-Commissioning**, expected to take around 7 years;
- **Commissioning and Operations**, expected to commence in Year 3. The lifetime of the Project is 25 years; and
- **Decommissioning**, planned for the end of the 25 year operation.

The Project activities that are likely to occur during each of the Project's four phases, derived from the Project Description are summarised in Table 13-20 below.

Table 13-20: Project Activities which may Impact Terrestrial Vegetation

Phase	Activity
Site Preparation and Enabling Works	Land acquisition for all Project components
	Mobilisation of plant and construction vehicles to the Project Site
	Transportation of personnel, construction material (e.g. Materials; murram, sand, stones etc.), waste, other materials and supplies (including fuel and other hazardous substances)
	Drilling of boreholes for water abstraction (Buliisa camp, Bugungu camp, Tangi Camp, well pads and Industrial Area)
	Abstraction of water from boreholes for potable, washing and dust suppression purposes
	Waste generation, storage and disposal (hazardous and non-hazardous)
	Disposal of treated waste water (grey and black)
	Storage of fuel and hazardous materials
	Refuelling of plant and machinery within Project Site
	Use of power generation plant (e.g. diesel generators)
	Excavation from borrow pits and quarries
	Resource use (i.e. construction materials)
	Restoration of borrow pits and quarries
	Physical movement of vehicles and plant (Industrial Area, well pads, WAS, Masindi Vehicle Check Point, Bugungu Airstrip and Victoria Nile Ferry Crossing Facilities)
	Clearance of vegetation and soils (Industrial Area, well pads, WAS, Masindi Vehicle Check Point, Bugungu Airstrip, Victoria Nile Ferry Crossing Facilities, Tangi camp extension)
	Demolition of existing buildings at the Industrial Area, well pads, WAS, if present
	Civil works activities at well pads and WAS sites
	Installation of structure around well pads in the north of the Victoria Nile
	Installation of temporary facilities at the Masindi Vehicle Check Point (i.e. containers)
	Construction of Victoria Nile Ferry Crossing Facility, including piling for the jetties
	Installation of facilities at Victoria Nile Ferry Crossing (i.e. containers)
	New access roads (W1,C1, C3, N1, N2 , inter field access roads south of the Victoria

Phase	Activity
	Nile) and upgrade works of existing roads (A1, A2, A3, A4, B1 and B2) including the installation of drainage Discharge of surface runoff from roads Construction activities at Tangi Camp
Construction and Pre-Commissioning	Mobilisation of plant and construction vehicles to the Project Site Transportation of personnel, construction material (e.g. Materials; murram, sand, stones etc.), waste, other materials and supplies (including fuel and other hazardous substances) Abstraction of water (ground and surface) for use at well pads, camps and Masindi Vehicle Check Point for potable, washing and dust suppression purposes Operation and discharge from temporary Sustainable Drainage System (SuDS) (including use of storm water facility) Discharge of treated waste water from Waste Water Treatment plant at camps Waste generation, storage and disposal (hazardous and non-hazardous) Refuelling of plant and machinery within Project Site Storage of fuel and hazardous materials Drilling of wells and Horizontal Directional Drilling (HDD) activities at the Victoria Nile Crossing Point (on a 24/7 basis); involving Night-time working at well pads and HDD Construction Area Use of temporary power generation plant (e.g. diesel generators) Construction activities at the Industrial Area, well pads and WAS Excavation of construction material from quarries Resource use (i.e. construction materials) Physical movement of construction vehicles and plant within the Project Site Clearance of vegetation and soils for Production and Injection Network Right of Way (RoW), WAS pipeline RoW and HDD Construction Area Painting and coating of pipeline at Tangi and Industrial Area Construction Support Base Construction of Production and Injection Network (i.e. Pipelines and Flowlines) and WAS pipeline RoW including trenching, welding, storage of material, backfilling etc. Pre-commissioning activities including use and disposal of treated water and associated chemicals Restoration of borrow pits and quarries, Projection and Injection Network RoW, WAS pipeline RoW and HDD Construction Area
Commissioning and Operations	Transportation of personnel, waste, other materials and supplies (including fuel and other hazardous substances Physical movement of vehicles and plant within the Project Site Abstraction of water from boreholes and surface water for industrial, potable, washing and dust suppression purposes Waste generation, storage and disposal (hazardous and non-hazardous) Discharge of treated waste water from Waste Water Treatment plant Storage of fuel and hazardous materials Refuelling of plant and machinery within Project Site Lighting emissions from Industrial Area, Tangi, well pads (during work over activities only) Power generation and flaring at CPF

Phase	Activity
	Operation of CPF plant and equipment Operation of plant and equipment at the well pads Well pad maintenance activities (including the use of work-over rig) Projection and Injection Network maintenance (e.g. pigging activities) Operation and maintenance of WAS Operation and maintenance of the Victoria Nile Ferry Discharge of surface runoff from all permanent facilities via SuDS
Decommissioning	Dependent upon Decommissioning strategy - but expected to be the similar to those for Construction and Pre-Commissioning

13.7.5 Potential Direct Impacts

As can be seen from Table 13-20 above, routine activities, which may impact on terrestrial vegetation, relate mainly to land clearance activities and water, fuel and chemicals management. However, there are also risks to terrestrial vegetation from unplanned or accidental activities that should be considered. Major events are discussed in more detail in ***Chapter 20: Unplanned Events.***

Based on the Project activities for each phase tabulated above these impacts on vegetation can ultimately be defined as two main impact types:

- Habitat or ecosystem loss, degradation or fragmentation; and
- Population changes.

The assessment considers these impacts on all identified receptors for all four stages of the assessment. Note that impacts on protected areas are described later in the chapter (see Section 13.8).

Note that there is a certain amount of overlap between impact types, for example where loss, degradation or fragmentation of habitats will have an effect on species populations. Based on the project activities for each phase listed above, Table 13-21 below summarises in general terms the types of potential direct impacts on terrestrial wildlife associated with the Project.

Table 13-21: Potential Direct Impacts

Potential Impacts on Terrestrial Vegetation (Covers All Phases)
<u>Habitat or ecosystem loss, degradation or fragmentation</u> **<u>Population changes</u>**
1. Direct loss of plant species 2. Direct loss of habitat from site clearance and establishment of well pads, roads and other components; 3. Soil erosion at adjacent habitats from site drainage or flooding; 4. Smothering of adjacent habitats from dust, concrete or other material; 5. Compaction of soils from works or off-road driving; 6. Changes to seasonal wetlands or other habitats due to surface and groundwater changes; 7. Changes to frequency of fires or where they might occur; and 8. Impacts due to unplanned events such as: - Introduction of alien or invasive plant species; - Contamination with oils or chemicals; - Waste management issues; and - Illegal land clearance.

13.7.6 Potential Indirect Impacts

In addition to the direct effects of Project's activities, there are likely to be indirect or induced impacts. These will relate mainly to increased pressures on natural resources due to the influx of workers and their social and economic dependents. Such an influx will attract people providing ancillary goods and services to those workers, and with improved access to the region this will exacerbate those pressures.

Indirect impacts may occur close to the Project Footprint, for example in the MFPA itself but also further afield in other PAs, landscape contexts and unprotected natural habitat that may lie some distance from the Project location. As with the direct impacts, indirect impacts can be summarised into two main impact types:

- Habitat or ecosystem loss, degradation or fragmentation; and
- Population changes.

Possible indirect impacts of the Project that may occur within the Project AoI as a whole are summarised in Table 13-22 below.

Table 13-22: Potential causes of Indirect / Induced Impacts within the Project AoI

Potential Indirect / Induced Impacts (All Phases)
1. Encroachment on protected areas from illegal land clearance;
2. Loss of natural habitat to farming, grazing or settlements or other infrastructure;
3. Illegal natural resource collection for firewood, fibres, food, medicines;
4. Fragmentation or degradation of natural habitat leading to lower connectivity between protected areas and/or areas of higher ecological value;
5. Clearing of trees and wood for charcoal or timber, illegal logging or farming;
6. Increased risk of fire (deliberate or accidental), e.g. from poachers fire setting;
7. Introduction/spreading of invasive species;
8. Pressure on water supply causing changes to hydrology/hydrogeology affecting water supply to habitats;
9. Illegal foraging for edible or medicinal plants;

These types of impacts will form the basis of the assessment for indirect impacts.

13.7.7 Embedded Mitigation

In undertaking an impact assessment it is necessary at all stages of the Project development and assessment process to consider the potential impacts of the Project. Such consideration should be used to recognise and design out these potential impacts as early in the design process as possible. This is one of the objectives of the FEED process, which has to consider many factors, including potentially significant impacts on the environment, in order to refine the Project design.

In developing the embedded or in-built design mitigation, the requirements of the mitigation hierarchy have been followed. This places avoidance at the first stage of mitigation. For the FEED process, within the limitations of the actual location of the Project Area, avoidance has therefore been the focus of much of the design.

To achieve this, several iterations of avoidance mapping for biodiversity have been undertaken to identify and map fixed features, which the Project design has sought to avoid. Following general identification of such features, detailed avoidance mapping was undertaken by Tilenga ESIA team in order to support refining of the locations for Project infrastructure (see Refs. 13-27 & 13-28) as well as studies on preferred habitats for a number of species (Ref 13.29). ***Chapter 4 Project Description and Alternatives*** presents an overview of the mitigation hierarchy applied by the Project Proponents, with avoidance being a prime consideration in the Project's design.

The positioning of Project infrastructure has included "micro-siting" of well-pads and other facilities and sensitive routing of access roads and flowlines in order to avoid important features that have been identified within the landscape.

For terrestrial vegetation this has included, in particular, the presence of features such as threatened habitats, micro-habitats (e.g. seasonal wetlands) and species (mainly trees) of conservation concern whenever practicable. The FEED design has been very successful in avoiding such features for well pads where there has been flexibility in positioning. However, inevitably for some locations, such as the Industrial Area in the South Nile area, which is very large, it has been more difficult to avoid features such as protected trees.

In addition to the actual siting of facilities, the construction and design details have taken environmental protection into consideration. Consequently, aspects such as the footprint of individual facilities have been reduced as far as practicable and drainage schemes have been designed in order to minimise the effects of run-off including escape of oil or chemicals should there be an accidental spill. Well pad design has also included features such as fencing and, for facilities within the MFPA, a surrounding bund is being considered to discourage human interactions with, and disturbance of, wildlife.

Details of the Project's in-built design and operational parameters are defined in ***Chapter 4: Project Description and Alternatives*** of this ESIA and the embedded mitigation has been taken into consideration when undertaking the assessment. The embedded mitigation measures of particular relevance to terrestrial vegetation that have been considered in the impact assessment are listed in Table 13-23 below.

Table 13-23: Embedded Mitigation

Embedded Mitigation for Terrestrial Vegetation
All fuels and hazardous materials will be stored with appropriate containment including impermeable areas, kerbing, bunding and drip trays
The top soils will be removed to a required depth; material will be temporarily stored within designated areas
It is planned to reuse removed soil onsite or for borrow pits restoration. Through detailed design, the Project will ensure the generation of excess material is minimised
Chemicals and hazardous liquids will be supplied in dedicated tote tanks made of sufficiently robust construction to prevent leaks/spills. Dedicated procedures will be developed for fuel and hazardous material transfers and personnel will be trained to respond. Spill kits will be available at all storage locations
Main refuelling facilities will be located within the Industrial Area, the camps and the Masindi Vehicle Check Point. Facilities will be located within bunded areas with appropriate capacity (110% tank containment). The refuelling pumps will be equipped with automatic shut off and there will be dedicated procedures and spill kits available. Bunds will be designed to minimise ingress of surface water, facilities roofed where practicable and any contaminated water collected will be trucked off site for disposal
With the exception of the CPF which has a bespoke drainage arrangement, drainage for the permanent facilities will be as follows: potentially contaminated areas (i.e. fuel and chemical storage areas) will be provided with local effluent collection (sumps, kerbing and bunding) whereby the potentially contaminated water will be collected and removed by road tanker to a licenced waste disposal facility; and uncontaminated areas which will drain naturally to the environment via Sustainable Drainage System (SuDS) comprising filter drains and soakaways. The SuDS design is subject to further detailed design.
The pipelines will comprise carbon steel with adequate corrosion allowance built into material specifications (wall thickness) to prevent leaks
The drainage arrangement of the CPF will be designed to segregate clean and potentially contaminated effluent streams.

Embedded Mitigation for Terrestrial Vegetation
Drainage channels will be installed along the edges of the upgraded roads to prevent excessive runoff and cross drainage culverts will be installed, as required. All drainage infrastructure will be designed taking into account the Uganda Ministry of Works and Transport - Road and Bridge Works Design Manual for Drainage (January 2010) (Ref. 4.2)
All site clearance activities will be undertaken in line with the Site Clearance Plan which will be developed by the Contractor(s) prior to commencing the Site Preparation and Enabling Works Phase to limit extent of vegetation clearance.
Surface water will be managed via temporary sustainable drainage systems (SuDS) to manage flood and contamination risk. The requirements for construction SuDS will be adapted depending on the nature of the activities utilising the principles as outlined in Chapter 23: Environmental and Social Management Plan
During site clearance, vegetation stripping will be undertaken using a phased approach to minimise sediment pollution from runoff
Buffer zones will be established to protect watercourses and habitats
Contaminated run off will be minimised by ensuring adequate storage facilities are in place for materials stockpiles, waste, fuels/chemicals/hazardous materials, vehicles/washing areas, parking facilities
Clean surface water will be diverted away from exposed soils with use of diversion drains and bunds
All dewatering from excavations or isolated work areas will be provided with appropriate level of treatment prior to discharge
Implementation of a Dust Control Plan, which will include: measures to include the application of dust suppressants (including water), on potentially dust generating sources, including on site and off site roads used by Project vehicles and material stockpiles.
Additional water supply boreholes will be installed during the Site Preparation and Enabling Works Phase and will be drilled to target deep water aquifer zones using water and bentonite
It is planned to reuse removed soil onsite or for borrow pits restoration. Through detailed design, the Project will ensure the generation of excess material is minimised
All borrow pits and quarries used by Project Proponents will be re-habilitated following completions of extraction in line with the Site Restoration Plan as developed by the Contractor
Laydown areas at each of the well pad sites will be located within the footprint of the well pad; there will be no additional site clearance required outside the well pad footprint during the Construction and Pre-Commissioning Phase
Construction activities for the Production and Injection Network will be contained within the permanent RoW which will have a width of 30 m and is designed to accommodate the pipeline trench(s), stockpile areas, laydown, welding, and the movement of construction equipment alongside the trench(s)
Ditch plugs will be installed on all trenches to prevent the pooling of water in the trenches
Material from trenching activities will be stored within the pipeline RoW and used as backfill. Options for the reuse of uncontaminated excess subsoil material will be assessed during detailed engineering e.g. borrow pit restoration
The temporary land required for the HDD Construction Areas will be restored following construction in line with the Site Restoration Plan as developed by the Contractor
Any residues and wastes generated from pre-commissioning activities will be managed in accordance with the site Waste Management Plan

Embedded Mitigation for Terrestrial Vegetation
For any chemical usage [with respect to pre-commissioning], a thorough Chemical Risk Assessment will be undertaken and lowest toxicity chemicals will be used wherever possible
The permanent RoW will be kept clear of trees, deep rooting vegetation, poles, structures and graves. Regular monitoring will be undertaken, which will include removal of vegetation overgrowth and uprooting tree seedlings
Depending on the final land use agreed with the Ugandan authorities, all or part of the site may need to be rehabilitated. In such circumstances, the Project Proponents will also develop a monitoring programme for completion criteria to verify that the sites are being returned to the agreed representative state
A Waste Management Plan will be developed and maintained to cover the duration of the Project; and will address the anticipated waste streams, likely quantities and any special handling requirements. The Project Proponent's will implement a waste tracking system to ensure traceability of all wastes removed off site.
Sewage produced from the camps and other Project Areas will be treated at the WWTPs located at the camps in compliance with regulatory requirements (refer to Chapter 10: Surface Water). Wastewater from the well pads will be collected and transferred by tanker to the nearest WWTPs
Avoidance of sensitive features to minimise the footprint when siting options for key facilities, taking into account both environmental and social sensitivities. The Project Proponents initiated their own avoidance protocol which was used by the FEED Engineers in the development of the Project's design.

13.7.8 Additional Mitigation

The agreed embedded mitigation will be implemented as part of the Project to the sequence of the mitigation hierarchy as set out in IFC PS6. However, further additional mitigation has been identified through the assessment process and, where relevant, this is discussed through the assessment sections below.

Taking both the embedded and the additional mitigation into account defines the residual environmental impacts of the Project.

Where required, further detail on mitigation measures will be given in Environmental and Social Management Plans as indicated in ***Chapter 23: Environmental Social Management Plan***. In some cases, further work (including surveys and monitoring) will be required to consider various mitigation options before selection and implementation of the most appropriate option. A detailed discussion of further survey information and possible mitigation is provided in the CHA interpretation report (see Ref. 13.24) and also the Net Gain Pre-Feasibility report (Ref 13.58). See Appendix O.2 for a summary of this.

Except where explicitly stated, mitigation for closure and decommissioning of the Project is not considered in detail in this assessment, because the necessary measures will be developed during the operational life of the field and are not known at the present time. In addition, the conservation status of various receptors and consequently their sensitivity is likely to have changed by the time decommissioning works actually take place.

It is intended that those mitigation measures, which will include restoration of Project sites, will be flexible and that feedback on the success of mitigation measures, will be reviewed in order to ensure that the defined and agreed mitigation objectives are actually achieved. These will also be reviewed during the detailed design phase to ensure their adequacy in mitigating the potential impacts.

Where it is determined through monitoring that overall the mitigation measures have not been successful or have fallen short of objectives, then remedial actions will be identified and undertaken as soon as practicable after the requirement for remedial action is identified.

13.7.9 Assessment of Impacts – Site Preparation and Enabling Works

13.7.9.1 Introduction

Potential impacts on plant species and threatened ecosystems receptors, i.e. those based on embedded mitigation (but not additional mitigation), considered to be likely during the 4 phases of the Project, are summarised below.

13.7.9.2 Potential Impacts

As noted above, the potential impacts on terrestrial vegetation can be divided into two main impact types (Habitat or ecosystem loss, degradation or fragmentation and Population changes), which are discussed further below.

During this phase there will be clearance of vegetation and preparation for the subsequent phases of the project. Access tracks will be built and the Industrial Area and well pads areas cleared, with soil and subsoil stockpiled for later use as required.

Such clearance will result in loss of vegetation and habitats. Potential damage to seasonal wetlands from access track crossings may affect the hydrology of these wetland areas that may affect water supply to plant species and habitats.

The introduction of human activity within the MFNP may impact on population levels of a number of species, though direct loss of individual species, which if rare may affect overall population and distribution of that species. Losses may be due to direct felling, burning, destruction or collection of species as well as habitat loss, as discussed above.

Furthermore, during the Site Preparation and Enabling Works phase there is potential for additional habitat to be affected by activities in case they spread into areas outside of the immediate project footprint. This may be as a result of the works or plant straying beyond the defined footprint of the works, or through run-off or spreading of dust or pollution.

The above potential impacts during the Site Preparation and Enabling Works phase have been assessed on identified terrestrial vegetation receptors, as summarised in Table 13-24 below. As previously discussed, the embedded mitigation developed through the FEED design process has actively sought to avoid locations were plant species of conservation concern have been recorded.

The assessment for this stage indicates that there are unlikely to be direct significant potential impacts on forest species or protected areas associated with Landscape Contexts D (Tropical High Forest) and F (Nebbi), because, as noted, no Project infrastructure is being built in these areas. Therefore direct impacts on the species associated with these landscape contexts are not considered. Conversely there are only two CHQS species present in MFPA that may incur direct impacts but these species are not present in other landscape contexts, therefore any impacts on these two species, if they occur, are considered to be ‘direct’.

The potential impacts on species are therefore concentrated in Landscape Contexts A (the MFNP), B (Savanna Corridor), C (Lake Albert and associated wetlands) and F (Mixed Landscapes).

This is mainly due to the presence of protected habitats and forest species of conservation concern scattered within these areas. Impacts on such species are not likely to be major or widespread because the proportion of these areas that will be directly affected by the Project is relatively small compared to their overall capacity. Where the significance of potential impacts for species or habitats is defined as moderate this is reflection of the relative sensitivity of these specific receptors.

Table 13-24: Potential Impacts on Species and Threatened Ecosystems: Site Preparation and Enabling Works

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Potential Impact significance
SPECIES				
Afrothismia winkleri (parasitic plant)	D	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Brazzeia longipedicellata (woody plant)	D	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Dialium excelsum (flowering plant – legume)	D	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Uvariodendron magnificum (small tree)	D	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Psilotrichum axilliflorum	D	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Encephalartos macrostrobilus	E	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Afzelia africana (tree)	A	HIGH	LOW	**MODERATE ADVERSE**
Khaya senegalensis (tree)	A	HIGH	LOW	**MODERATE ADVERSE**
Albizia ferruginea (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Antrocaryon micraster (woody plant)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Brachylaena huillensis (hard wood tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Chytranthus atroviolaceus (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Cordia millenii (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Encephalartos septentrionalis (cycad)	E	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma angolense (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma cylindricum (tree, sapele)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma utile (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Guarea cedrata (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Holarrhena floribunda (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Irvingia gabonensis (wild mango tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya anthotheca (tree, mahogany)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya grandifoliola(tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa swynnertonii (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa trichilioides (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Milicia excelsa (tree)	D F	HIGH	LOW	**MODERATE ADVERSE**
Citropsis articulata (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Efulensia montana (liana)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Guarea cedrata (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Millettialacus alberti (flowering plant – legume)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Uvariodendron magnificum (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Albizia spp. *[A. coriaria & A. grandibracteata]*	D F	MEDIUM	LOW	**LOW ADVERSE**

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Potential Impact significance
Aningeria altissima	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Aningeria adolfifriederici	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Canarium schweinfurthii	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Cordia millenii	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Dalbergia melanoxylon	A D F	HIGH	LOW	**MODERATE**
Entandrophragma (all species)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Erythrophleum guineense	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Fagara (all species)	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Faurea saligna	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Ficalhoa laurifolia	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Ficus spp.	D F	MEDIUM	LOW	**LOW ADVERSE**
Hallea rubrostipulata	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Juniperus procera	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Khaya (all species)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa (all species)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Maesopsis eminii	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Mangifera indica	D F	MEDIUM	LOW	**LOW ADVERSE**
Mildraediodemdron excelsum	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Morsus lactea	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Newtonia buchanani	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Ocotea usambarensis	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Olea hochstetteri	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Olea welwitschii	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Osyris spp.	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Piptadeniastrum africanum	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Podocarupus (all species)	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Prunus africana	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Pygeum africanum	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Symphonia globulifera	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Vittaleria paradoxa	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Warbugia ugandensis	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Threatened Ecosystems				
Dry Acacia Savanna	E	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Forest-Savanna Mosaic	D	HIGH	LOW	**MODERATE ADVERSE**
Moist Acacia Savanna	F	HIGH	LOW	**MODERATE ADVERSE**
Moist *Combretum* Savanna	A B	MEDIUM	LOW	**LOW ADVERSE**
Butyrospermum Savanna	E	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**

Receptor	Landscape Context(s)		Receptor Sensitivity	Impact Magnitude	Potential Impact significance
Palm Savanna (*Borassus* palms)	B	F	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Hyparrhenia Grass Savanna	A		MEDIUM	MEDIUM	**MODERATE ADVERSE**

The assessment of potential impacts for the Site Preparation and Enabling Works stage indicates that there are some potentially (**Moderate**) significant impacts on certain species within the MFNP and also in the Buliisa area.

In the MFNP, plant species of conservation concern have generally been avoided, through the avoidance process, although as some of these species are very sensitive (e.g. *Afzelia Africana* or *Khaya senegalensis*) there could be impacts on these species if management of works is not implemented to avoid affected areas adjacent to infrastructure footprint areas, where sensitive species may be present.

In the Buliisa area, some individual trees of conservation concern will be lost as they cannot be avoided, or may be lost if impacts from the site development spreads outside of the Project footprints. Most of these are forest tree species (and not CHQS) but which are present outside of protected areas and have been found within Transitional and Modified habitat.

Impacts on threatened ecosystems will be mainly on the *Hyparrhenia* Grass Savanna ecosystem which is present in the MFNP, where Project infrastructure will result in unavoidable direct loss of habitat within this ecosystem type.

In addition, there may be potential indirect impacts on Forest-Savanna Mosaic and Moist Acacia Savanna ecosystem types due to land use pressures caused by uncontrolled in-migration. As both these ecosystem types are EN, with consequently a high sensitivity, the potential impact level for these two ecosystems is defined as **Moderate Adverse**.

13.7.9.3 Additional Mitigation and Enhancement: Direct Impacts

The embedded mitigation measures presented in Table 13-23 will be supplemented with further 'additional' mitigation measures to control and reduce potential impacts on terrestrial wildlife. These are presented in Table 13-25 below. It should be noted that as many of the mitigation measures will be similar across different Project phases they are all shown in this table, with the Project phase(s) they relate to indicated in the columns on the right.

Each mitigation measure has been assigned a reference number for ease of reference throughout the ESIA. All mitigation measures will be outlined in the Environmental and Social Management Plan (ESMP) for the Project and a copy of the ESMP Mitigation checklist is included within Appendix T. As indicated above, these will be reviewed during the detailed design phase to ensure their adequacy in mitigating the potential impacts.

Table 13-25: Additional Mitigation (All Project Phases)

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TV1	A Biodiversity and Ecosystem Services Management Plan (BMP) will be developed, ensuring that impacts of site clearance on plant species of conservation concern will be minimised	X	X	X	X
TV2	The Site Clearance Plan will be developed to structure and schedule clearly site clearance activities, noting any constraints	X	X		
TV3	A Site Restoration Plan for the Project will be developed and will be updated prior to commencement of every stage of the Project	X	X	X	X
TV4	Works and traffic/plant movement will maintain strict adherence to agreed footprint design including access roads and other infrastructure	X	X	X	X
TV5	Materials to be used in forming platforms, bund walls and other site preparation works within Protected Areas will be locally sourced as much as possible (i.e. materials used in the MFNP should be from other sites within the MFNP), but away from sensitive biodiversity areas	X			
TV6	Where unavoidable, soil and/or other materials shall be brought from outside of Protected Areas for use within the Protected Areas only upon approval by the responsible government agency (i.e. UWA or NFA), and this process will be subject to a risk assessment process as described in the scope for the Alien/Invasive Species Management Plan	X			X
TV7	The design of the bund walls in the park will be optimised to minimise requirement for materials taken from outside of the park	X			
TV8	Topsoil will be stockpiled separately from subsoil, with all soils being reinstated in the reverse order to that in which they have been removed in order to initiate rehabilitation. All stockpiles will be stabilised, not being higher than 3 m, and where practicable blend in with the surrounding topography. Topsoils will also be monitored (e.g. for organic content)	X	X		X
TV9	There will be no smoking outside of any designated areas due to risk of fire and consequently loss of adjacent habitats	X	X	X	X
TV10	Access to areas outside of site boundaries by workers will be prohibited within the park	X	X	X	X
TV11	Dust control measures will be implemented at each site and access road to prevent smothering of adjacent habitats (as outlined within the Air Quality and Climate chapter). Dust emissions will be strictly controlled via adhering to the operating procedures set out in the Dust Control Plan	X	X	X	X
TV12	Landforms, slopes and drainage from sites and access roads will be designed to prevent erosion of adjacent soils and impacts on habitats, as discussed in Chapter 8: Geology and Soils	X	X	X	X

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TV13	Discussions will be held with UWA regarding the MFPA Management Plan in consideration of O&G development, burning regimes and animal species management initiatives to minimise further loss of suitable habitat and improve habitat quality in surrounding areas of habitat, similar to that which is lost	X	X	X	X
TV14	If there are proposed changes to locations, alignment, working areas or footprint of Project components, the Avoidance Protocol, including site selection survey and mapping, will be carried out before determining the configuration of these components	X	X		
TV15	Plant nurseries will be established to provide plant materials (e.g. seedlings and/or seeds) for restoration of impacted sites, as well as for replacement of felled trees as appropriate. This will include trees as well as common herbaceous species (i.e. grasses, herbs, etc.) for general coverage	X	X	X	X
TV16	All temporary facilities, including temporary access roads, will be restored after they are no longer required after use; in line with Site Restoration Plan	X	X		X
TV17	Land-based effluent / runoff will be controlled to prevent sedimentation and pollution as defined in Chapter 8: Geology and Soils and Chapter 10: Surface Water	X	X	X	X
TV18	Temporary 'bogmats', riprap bridges and other measures to reduce compaction or erosion of soils and habitat degradation during wet conditions will be utilised	X	X		X
TV19	Burning of vegetation waste following site clearance will be prohibited within MFPA but could be considered in areas outside MFPA when no other appropriate alternative has been identified, to avoid air emissions and reduce the risk of fires. This requirement will be included in the Site Clearance Plan	X	X		
TV20	Consideration will be given to making cleared wood from the Industrial Area, from well pads and flowline wayleaves, available to the local community to help lower the need and demand for wood from protected areas. However it will be communicated to local communities that this supply will not remain during Operations Phase in order not to create expectations	X	X		X
TV21	Soil spill, where soil spreads beyond the defined boundary of the component footprint, from well pad or other construction areas, will be minimised	X	X		X
TV22	Spill Prevention and Oil Spill Contingency Plans will be developed and implemented; as defined under Chapter 4: Project Description and Alternatives, Chapter 20: Unplanned Events and Chapter 23: ESMP	X	X	X	X

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TV23	Provision will be made for - the recruitment of Ecological Compliance Officers (ECOs); and - the training and capacity building of the ECOs.	X	X		X
TV24	The ECO will be present on site during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases where site clearance and excavations are required (e.g. construction of flow lines) to oversee the works and ensure compliance	X	X		
TV25	Prior to site clearance each site will be surveyed for the presence of plant species of conservation concern, as listed in the BMP. This is important because there may be considerable time between baseline/avoidance surveys and actual site works and species may move into the area (also animals) that were not present during baseline surveys. If any such species are found, these will be recorded and either avoided or transplanted to similar habitat under supervision of a botanist/ecologist. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts on those species.	X	X		
TV26	Where trees are to be felled, the species will be identified and recorded by a competent ecologist. Where recorded trees are listed in the schedules to the National Forestry and Tree Planting Act, the appropriate licences will be applied for prior to removal of trees	X	X		
TV27	Where it is necessary to remove trees (i.e. Mature trees of threatened species, NFA reserved trees and socially important trees) these will be identified to species level before felling. A replacement tree (or trees, or in some cases seedlings) will be planted at a suitable location to be agreed with UWA and/or NFA and other relevant stakeholder. The planted trees will be monitored to check that they have developed successfully and any failed trees will be replaced. Any additional requirement will be defined as part of the BMP to achieve NNL/NG	X	X		
TV28	Workers' instructions (e.g. either in the Labour Management Plan or in staff training/induction) will state that no plants are to be picked or collected at any time	X	X	X	X
TV29	Water abstraction and activities at other locations will ensure that they do not affect groundwater base-flow to wetlands (including wallows and watering holes) and other habitats resulting in degradation of those habitats. Flow rates and residual recharge rates will be sufficient to sustain sensitive habitats. To achieve this, water abstraction points will be carefully selected, as defined in Chapter 9: Hydrogeology. In addition, all water abstraction activities will comply with the requirements of water abstraction permits	X	X	X	X
TV30	Construction techniques will allow unimpeded shallow groundwater and surface water flow where they have to cross seasonal watercourses (for example between JBR-01 & JBR-10/Nile crossing; JBR-03 & JBR-04; around JBR-09; between JBR-08 and JBR-09), through use of culverts and permeable layers, avoiding compaction of soils	X	X		

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TV31	Care will be taken not to cause compaction of ground near wetlands resulting in hydrological or hydrogeological changes that may affect those habitats	X	X		X
TV32	Use of concrete or other impermeable surfacing material at sites will be minimised. These materials will be used only at those areas that absolutely require it	X	X		
TV33	Herbicide will not be used at any Project location. Control of 'weeds' will be undertaken by hand weeding or use of permeable matting or other standard weed control measures	X	X	X	X
TV34	A Biodiversity (and Ecosystem Services) Action Plan (BAP) will be developed in line with relevant IFC Performance Standards, and will include key mitigation actions aiming at achieving No Net Loss/Net Gain to biodiversity	X	X	X	X
TV35	Biodiversity codes of conduct for workers will be developed, which can be disseminated to economic dependents and others that may be able to enter Protected Areas. This may require punitive measures if not complied with	X	X	X	X
TV36	Workers will be prohibited from collecting shells, timber, firewood, fibres and other plant based resources. Fishing by workers will not be permitted. Ensure control at the camps and work sites	X	X	X	X
TV37	A Wetland Management Plan will be established to ensure no disruption to wetland areas. The main measures will comprise avoiding and minimising impacts on wetlands and restricted exclusion zones	X	X	X	X
TV38	Landscaping, including earth bunds around well pads within the park will be established, and will be covered with topsoil and plants associated with the immediate vicinity and monitored and maintained to ensure success and stability of these bunds. Consideration will be given to the need to avoid attracting animals (e.g. the oasis effect in dry seasons)	X			
TV39	Pre-construction surveys will be performed to confirm the extent and state of identified wetlands	X	X		
TV40	Further mitigation for the pipeline across the seasonal river between JBR-09 and JBR-08 will be considered. This is a deep gully and bridging may be required		X		
TV41	Pipeline trenches will be designed to ensure that they do not become preferential flow paths for groundwater, particularly where they cross seasonal wetland areas or terrain, which comprises catchment for wallows or waterholes. This could comprise placement of impermeable backfill (clay or similar) at certain locations within the trench to prevent lateral movement of water within the pipeline alignment		X		

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TV42	For Project areas that cross seasonal wetlands/rivers, construction works will take place in the dry season as much as possible . This is to prevent disruption of surface water / shallow groundwater flow thus affecting habitats as well as disturbing the animals relying on those wetlands. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts		X		
TV43	The detailed Site Restoration Plan will be implemented and at each site this will be monitored for success of vegetation establishment (i.e. where plants do not take successfully), erosion issues and presence of invasive species to ensure that all sites are effectively restored. Where such problems are encountered, further planting, site re-profiling and other remedial measures will be taken to ensure that site restoration is completed satisfactorily to the agreed standard or coverage and plant composition, which should match reasonably the sounding vegetation by the end of the restoration process		X		X
TV44	Decommissioning activities to be confined within the Project footprint				X
TV45	For areas of the Project that cross seasonal wetlands/rivers decommissioning works will take place in the dry season as much as possible. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts.				X
TV46	Materials used in restoration will be locally sourced, where possible (i.e. materials used in the MFNP should be from other sites within the MFNP), but away from sensitive biodiversity areas. Plants will be transplanted from nurseries to the site being restored (or from adjacent areas, as appropriate)				X
TV47	A pilot scheme for wetland restoration will be linked to the Restoration Plan - developed in partnership with WMD and DWRM	X	X	X	X
TV48	A risk-based Alien/Invasive Species Management Plan will be developed and implemented to include but not be limited to: • Developing a register of existing invasive species in the Area of Influence; • A risk assessment to identify existing and/or potential invasive species and/or threats/risks; • Definition of relevant control measures identified for each type of threat under project control e.g. bringing in topsoil from outside of Protected Areas, risk of vehicles introducing or spreading Alien/Invasive species. These could consist of dedicating a fleet of vehicles to serve activities in MFNP, implementing systematic checks on vehicles and considering washing as and where appropriate and practicable (at Masindi checkpoint and Tangi for instance); • Preparation of a 'risk map' showing areas of existing infestation; • Development of generic methods for incident management of broad groups of invasive species, as well as species specific measures; • On-site monitoring for invasive species; • Procedures for reporting and developing specific control measures for any new invasive alien species that are detected;	X	X	X	X

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
	• Procedures to contain or remove (as appropriate) any pre-existing invasive species on the Project site; and • Procedures to contain or remove pre-existing invasive species in areas close to the Project site.				
TV49	Construction activities within 200 m for lake (Lake Albert) and 100 m for a river (River Nile) will be avoided. Should they be unavoidable, a permit for use of river banks and lake shores will be applied for activities within those zones (for Water Abstraction System, HDD crossing, Nile River Ferry Crossing)	X	X		
TV50	Roads will be designed so that their permanent and construction footprint will be minimised	X			
TV51	Optimising the logistics to maximise use of available vehicles, reduce number of trips and reduce movements on more sensitive routes; using convoys when appropriate (e.g. via using one shared logistics service provider who can ensure appropriate planning across all parts of the Project and ensure efficiencies are made)	X	X	X	X
TV52	Sensitise drivers (as part of training), emphasising the need to adhere to designated routes and speed limits, and to avoid making wide turns at the edges of the site	X	X	X	X
TV53	For works taking place in or near the Ramsar site, a buffer will be established around identified sensitive features where no works will take place, as defined in the Avoidance Protocol. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts	X	X	X	X
TV54	An Environmental Monitoring Programme will be established. This will include comprehensive monitoring associated with water, noise, air quality, etc. as defined in the respective chapters of the ESIA	X	X	X	X
TV55	Ensure spill response equipment (including sampling and personal protective equipment) is readily available on site to contain and clean any spillages, and containment/clean up undertaken after the event	X	X	X	X
TV56	The footprint of the HDD will be minimised to avoid unnecessary loss of wetland/riparian habitat	X	X		

13.7.9.4 Additional Mitigation and Enhancement: Indirect Impacts

In addition to the mitigation measures for direct impacts listed above specific mitigation has been identified for indirect impacts. Mitigation for indirect impacts is of two types:

1. *Mitigation measures that operate by addressing factors that are under the control of the Project* – for example recruitment strategies, access control on project roads, location of workers' camps and other infrastructure (amenities, etc.) that might attract in-migrants;
2. *Strategic mitigation measures for impact pathways outside the Project's sphere of control* and which therefore need to be implemented in partnership with other actors, including, communities, government, NGOs and the private sector as appropriate.

Additional mitigation measures for indirect effects are listed in Table 13-26. These measures apply to all project phases, however since many are preventive it is important they are in place prior to the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases. As indicated above, these will be reviewed during the detailed design phase to ensure their adequacy in mitigating the potential impacts.

Implementation of the proposed mitigation measures discussed above and below, including the following relative Management Plans: **Biodiversity Management Plan**; **Stakeholder Communication Plan**; **Environmental and Social Management Plan**; **Road Safety and Transport Management Plan**; **Resettlement Action Plan; Community Impact Management Strategy; and Influx Management Strategy** will mitigate the likely residual impacts.

Table 13-26: Additional Mitigation for Indirect Impacts

Ref No.	Additional Mitigation for Indirect Impacts	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TV.57	Nurseries will be developed, to propagate plants/trees of economic importance to alleviate pressure on natural and protected environments for those resources in line with the Community Environmental Conservation Plan and at a scale and intensity proportional to Project impacts. This is not intended as a replacement for species lost during site clearance but as a measure to relieve pressure on natural resources within existing forests and other protected areas	X	X	X	X
TV58	As detailed in Chapter 16: Social, the Project Proponents will provide support to the Ministry of Lands Housing and Urban Development and Buliisa District Government to develop a District Land Use Plan through financing of a study that can be used as basis of such planning. The study will consider existing land use and land tenure, trends in land use, and future land use requirements including for Project infrastructure and for any mitigations required to off-set Project impacts, e.g. relocation land and land for biodiversity offsetting. The study will also identify areas that will benefit from improved accessibility across Buliisa District	X	X	X	X
TV59	Ensure that the Resettlement Action Plan (RAP) does not increase pressure on natural or critical habitats by moving people into or where practicable closer to sensitive habitats or Protected Areas	X	X	X	X
TV60	As detailed in Chapter 16: Social, a Community Environmental Conservation Plan will be developed which will contain	X	X	X	X

Ref No.	Additional Mitigation for Indirect Impacts	Relevant Phase: Site Preparation and Enabling Works	Relevant Phase: Construction and Pre-Commissioning	Relevant Phase: Commissioning and Operations	Relevant Phase: Decommissioning
	educational/information programmes to highlight importance of protected areas, identify plant species of conservation concern (and why they are important), and to explain how pressure on those will be alleviated				
TV61	As detailed in Chapter 16: Social dependence on firewood and charcoal will be used through development of the Community Environmental Conservation Plan, which will include promotion of alternative fuel use (e.g. briquettes, solar technology) and clean cook-stoves through partnership with local organisations and social enterprises. Support schemes to find alternative fuel sources, reduce reliance on charcoal will be developed. The potential to involve communities in biodiversity conservation as alternative livelihood options will be explored	X	X	X	X
TV62	As detailed in Chapter 16: Social, an Influx Management Strategy will be developed to mitigate in-migration impacts and maximise benefits for local communities. Implementation of the strategy will depend on joint coordination between the Project, government, other project developers, local communities and civil society. The Strategy will build on the recommendations provided in the In-Migration Risk Assessment (Ref. 16-11) and will set out the overarching approach and objectives for mitigating the negative impacts of influx and enhancing the benefits. The strategy will make reference to more detailed actions and procedures contained within other environmental and social management plans that are relevant to addressing influx. The strategy will also propose a specific monitoring & evaluation framework to measure project-induced in-migration trends, hotspots and key impacts	X	X	X	X
TV63	The Influx Management Strategy will also consider potential impacts of increased pressure on natural resources due to population growth including looking at ways to provide alternative sources of fuel, building materials, farming land and food (particularly protein)	X	X	X	X
TV64	As detailed in Chapter 16: Social, the Community Content, Economic development and Livelihood Plan will consider measures aimed at mitigating impact of population growth such as increased pressure on fisheries resources	X	X	X	X
TV65	The Community Environmental Conservation Plan will consider (but not be limited to) community based programmes for extension of tree nurseries, promotion of alternative fuel use, fisheries management and monitoring programme that will entail engagement of communities through BMUs in fisheries management as defined in Chapter 16: Social	X	X	X	X
TV66	Resettlement Action Plans will include livelihood restoration and will also provide alternative livelihoods/ income diversification programmes to ease dependence on natural resources or protected areas as a source of livelihood as defined in Chapter 16: Social	X	X	X	X
TV67	Project Recruitment Centres locations should be defined in consideration of potential impacts it may generate on protected areas and unprotected forest areas	X	X	X	X

Ref No.	Additional Mitigation for Indirect Impacts	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TV68	Regular monitoring of the extent and impacts of in-migration, generally on natural resources, will be carried out as part of the Biodiversity Monitoring and Evaluation Plan, including regular acquisition and analysis of satellite imagery to assess landuse/landcover changes	X	X	X	X
TV69	Strategic collaboration platforms will be established with local and regional authorities, UWA, NFA development and conservation NGOs and other stakeholders as appropriate to regularly evaluate and review the extent of indirect effects, share understanding of causes and identify adapted or additional mitigation requirements	X	X	X	X
TV70	Relevant authorities will be engaged with and consideration will be given to fostering development of a plan with them to strengthen the protection of Bugungu Wildlife Reserve and adjacent areas of transitional habitat with direct community involvement. The objective will be to provide legal safeguard for wildlife populations and maintain an effective north-south savanna corridor in the landscape	X	X	X	X
TV71	The in-migration risk assessment will be regularly updated based on monitoring data to assess which protected areas, species and habitats are most at risk of indirect impacts, both imminently and in the foreseeable future	X	X	X	X

13.7.9.5 Residual Impacts

Residual impacts on terrestrial vegetation receptors considered likely to occur during the Site Preparation and Enabling Works phase are defined in Table 13-27 below. These impacts are termed residual impacts because they take into account the embedded mitigation and the additional mitigation discussed above, which will be implemented during this phase.

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives.

Table 13-27: Residual Impacts on Species and Threatened Ecosystems: Site Preparation and Enabling Works

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Residual Impact
Species				
Afrothismia winkleri (parasitic plant)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Brazzeia longipedicellata (woody plant)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Dialium excelsum (flowering plant – legume)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Uvariodendron magnificum (small tree)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Psilotrichum axilliflorum	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Encephalartos macrostrobilus	E	VERY HIGH	NEGLIGIBLE	LOW ADVERSE

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Residual Impact
Afzelia africana (tree)	A	HIGH	NEGLIGIBLE	LOW ADVERSE
Khaya senegalensis (tree)	A	HIGH	NEGLIGIBLE	LOW ADVERSE
Albizia ferruginea (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Antrocaryon micraster (woody plant)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Brachylaena huillensis (hard wood tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Chytranthus atroviolaceus (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Cordia millenii (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Encephalartos septentrionalis (cycad)	E	HIGH	NEGLIGIBLE	LOW ADVERSE
Entandrophragma angolense (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Entandrophragma cylindricum (tree, sapele)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Entandrophragma utile (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Guarea cedrata (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Holarrhena floribunda (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Irvingia gabonensis (wild mango tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Khaya anthotheca (tree, mahogany)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Khaya grandifoliola(tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Lovoa swynnertonii (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Lovoa trichilioides (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Milicia excelsa (tree)	D F	HIGH	NEGLIGIBLE	LOW ADVERSE
Citropsis articulata (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Efulensia montana (liana)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Guarea cedrata (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Millettialacus alberti (flowering plant – legume)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Uvariodendron magnificum (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Albizia spp. *[A. coriaria & A. grandibracteata]*	D F	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Aningeria altissima	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Aningeria adolfifriederici	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Canarium schweinfurthii	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Cordia millenii	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Dalbergia melanoxylon	A D F	HIGH	NEGLIGIBLE	LOW ADVERSE
Entandrophragma (all species)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Erythrophleum guineense	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Fagara (all species)	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Faurea saligna	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Ficalhoa laurifolia	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Ficus spp.	D F	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Hallea rubrostipulata	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT

Receptor	Landscape Context(s)		Receptor Sensitivity	Impact Magnitude	Residual Impact
Juniperus procera	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Khaya (all species)	D		HIGH	NEGLIGIBLE	LOW ADVERSE
Lovoa (all species)	D		HIGH	NEGLIGIBLE	LOW ADVERSE
Maesopsis eminii	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Mangifera indica	D	F	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Mildraediodemdron excelsum	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Morsus lactea	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Newtonia buchanani	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Ocotea usambarensis	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Olea hochstetteri	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Olea welwitschii	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Osyris spp.	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Piptadeniastrum africanum	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Podocarupus (all species)	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Prunus africana	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Pygeum africanum	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Symphonia globulifera	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Vittaleria paradoxa	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Warbugia ugandensis	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Threatened Ecosystems					
Dry Acacia Savanna	E		HIGH	NEGLIGIBLE	LOW ADVERSE
Forest-Savanna Mosaic	D		HIGH	NEGLIGIBLE	LOW ADVERSE
Moist Acacia Savanna	F		HIGH	NEGLIGIBLE	LOW ADVERSE
Moist *Combretum* Savanna	A	B	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Butyrospermum Savanna	E		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Palm Savanna (*Borassus* palms)	B	F	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Hyparrhenia Grass Savanna	A		MEDIUM	LOW	LOW ADVERSE

Following implementation of mitigation, residual impacts on all species are defined as **Low** significance or **Insignificant**, therefore none of the residual impacts is considered likely to be significant. Impacts on plant species are not likely to be significant or widespread, following mitigation, because the proportion of these areas is relatively small compared to their overall extent. Impacts will be temporary and reversible.

However, as noted above there may be indirect impacts caused by population movements and in-migration pressures to the region. These indirect impacts may be more significant overall than the direct impacts and more complex to mitigate, because their exact extent and nature cannot be known until they start to develop.

Implementation of the proposed mitigation measures discussed above will mitigate such impacts, although there will need to be constant monitoring of both the impacts and the success of mitigation to review its effectiveness and to establish a flexible and adaptive mitigation strategy where and if necessary.

It should be noted that for the most sensitive species and some of the threatened ecosystems, it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation. This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain (for Critical Habitat and CHQS) is required. These measures are discussed at the end of this chapter (see Section 13.8).

13.7.10 Assessment of Impacts: Construction and Pre-Commissioning

13.7.10.1 Introduction

This section describes the assessment of impacts during the Construction and Pre-Commissioning phase. It is likely that the potential impacts, additional mitigation and residual impacts will be similar to the Site Preparation and Enabling Works phase.

Although this phase does not include site clearance generally, it does include construction of flowlines, the HDD (which will be partially within the Ramsar) and the Water Abstraction System (WAS). All of these will require some site clearance and excavation, although by the end of this Project stage the excavated areas will have been infilled and the restoration/revegetation stage will be under way.

13.7.10.2 Potential Impacts

Note that the potential impacts on terrestrial vegetation are in essence similar to those for the previous Phase, i.e. Habitat or ecosystem loss, degradation or fragmentation and Population changes.

The assessment of potential impacts on identified terrestrial vegetation receptors considered likely during the Construction and Pre-Commissioning phase is summarised in Table 13-28 below.

There are unlikely to be direct potential impacts on forest plant species or threatened ecosystems during this Phase of the Project.

However, potential impacts will be concentrated in Landscape Contexts A (the MFNP), B (Savanna Corridor), C (Lake Albert and associated wetlands) and F (Mixed Landscapes). This is mainly due to the presence of sensitive habitats and plant species of conservation concern in these areas, where construction activities will be taking place.

Impacts on species are not likely to be major or widespread because the proportion of these landscapes that will be affected is relatively small compared to their overall capacity.

In addition, the embedded mitigation developed through the FEED process has sought to avoid locations were plant species of conservation concern have been recorded and which may be impacted by construction of access roads or pipelines.

Table 13-28: Potential Impacts Species and Threatened Ecosystems: Construction and Pre-Commissioning

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Potential Impact Significance
SPECIES				
Afrothismia winkleri (parasitic plant)	D	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Brazzeia longipedicellata (woody plant)	D	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Dialium excelsum (flowering plant – legume)	D	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Uvariodendron magnificum (small tree)	D	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Psilotrichum axilliflorum	D	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Encephalartos macrostrobilus	E	VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Potential Impact Significance
Afzelia africana (tree)	A	HIGH	LOW	**MODERATE ADVERSE**
Khaya senegalensis (tree)	A	HIGH	LOW	**MODERATE ADVERSE**
Albizia ferruginea (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Antrocaryon micraster (woody plant)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Brachylaena huillensis (hard wood tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Chytranthus atroviolaceus (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Cordia millenii (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Encephalartos septentrionalis (cycad)	E	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma angolense (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma cylindricum (tree, sapele)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma utile (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Guarea cedrata (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Holarrhena floribunda (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Irvingia gabonensis (wild mango tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya anthotheca (tree, mahogany)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya grandifoliola(tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa swynnertonii (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa trichilioides (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Milicia excelsa (tree)	D F	HIGH	LOW	**MODERATE ADVERSE**
Citropsis articulata (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Efulensia montana (liana)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Guarea cedrata (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Millettialacus alberti (flowering plant – legume)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Uvariodendron magnificum (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Albizia spp. *[A. coriaria & A. grandibracteata]*	D F	MEDIUM	LOW	**LOW ADVERSE**
Aningeria altissima	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Aningeria adolfifriederici	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Canarium schweinfurthii	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Cordia millenii	D	HIGH	NEGLIGIBLE	**INSIGNIFICANT**
Dalbergia melanoxylon	A D F	HIGH	LOW	**MODERATE ADVERSE**
Entandrophragma (all species)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Erythrophleum guineense	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Fagara (all species)	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Faurea saligna	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Potential Impact Significance
Ficalhoa laurifolia	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Ficus spp.	D F	MEDIUM	LOW	**LOW ADVERSE**
Hallea rubrostipulata	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Juniperus procera	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Khaya (all species)	D	HIGH	NEGLIGIBLE	**INSIGNIFICANT**
Lovoa (all species)	D	HIGH	NEGLIGIBLE	**INSIGNIFICANT**
Maesopsis eminii	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Mangifera indica	D F	MEDIUM	LOW	**LOW ADVERSE**
Mildraediodemdron excelsum	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Morsus lactea	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Newtonia buchanani	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Ocotea usambarensis	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Olea hochstetteri	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Olea welwitschii	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Osyris spp.	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Piptadeniastrum africanum	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Podocarupus (all species)	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Prunus africana	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Pygeum africanum	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Symphonia globulifera	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Vittaleria paradoxa	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Warbugia ugandensis	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Threatened Ecosystems				
Dry Acacia Savanna	E	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Forest-Savanna Mosaic	D	HIGH	MEDIUM	**MODERATE ADVERSE**
Moist Acacia Savanna	F	HIGH	LOW	**MODERATE ADVERSE**
Moist *Combretum* Savanna	A B	MEDIUM	LOW	**LOW ADVERSE**
Butyrospermum Savanna	E	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Palm Savanna (*Borassus* palms)	B F	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Hyparrhenia Grass Savanna	A	MEDIUM	MEDIUM	**MODERATE ADVERSE**

As in the previous Project stage potential impacts are possible in certain species of conservation concern as well threatened ecosystems.

It is considered that at this stage of the Project potential indirect impacts caused by induced population changes in the region will be greater than in the Site Preparation and Enabling Works Phase, as there will probably be a lag between the start of the Project and a gradual increase in in-migration. This is reflected in the potential impact levels for threatened ecosystems being higher than in the previous Project stage.

In terms of threatened ecosystems, *Hyparrhenia* Grass Savanna, Forest-Savanna Mosaic and Moist Acacia Savanna are particularly at risk. Direct impacts may occur on the *Hyparrhenia* Grass Savanna but for the other two ecosystems these may be subject to induced impacts created by land use changes and loss of habitats.

These ecosystems have elevated sensitivity and are therefore more vulnerable to increased pressures on all aspects of these landscape contexts, ranging from population changes and likely increased competition to direct pressure on natural habitats.

Note that even though the legal status of protected areas within these landscapes is likely to afford some level of protection, without defined mitigation, there will be significant pressure on intervening natural habitats that will reduce connectivity and species diversity, which will have an overall impact on protected areas (see Section 13.7.13).

13.7.10.3 Additional Mitigation and Enhancement

As in the previous project phase, the assessment of potential impacts indicates that additional mitigation will be required in order to reduce or avoid significant impacts from the Project. The additional mitigation for direct and indirect impacts is presented in Sections 13.7.9.3 and 13.7.9.4 above.

13.7.10.4 Residual Impacts

Residual impacts on terrestrial vegetation receptors considered likely during the construction and pre-commissioning phase are defined in Table 13-29 below. These impacts are defined as residual impacts because they take into account the embedded mitigation as well as the additional mitigation to be implemented during this phase.

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives.

Table 13-29: Residual Impacts Species and Threatened Ecosystems: Construction and Pre-Commissioning

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Residual Impact
SPECIES				
Afrothismia winkleri (parasitic plant)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Brazzeia longipedicellata (woody plant)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Dialium excelsum (flowering plant – legume)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Uvariodendron magnificum (small tree)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Psilotrichum axilliflorum	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Encephalartos macrostrobilus	E	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Afzelia africana (tree)	A	HIGH	NEGLIGIBLE	LOW ADVERSE
Khaya senegalensis (tree)	A	HIGH	NEGLIGIBLE	LOW ADVERSE
Albizia ferruginea (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Antrocaryon micraster (woody plant)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Brachylaena huillensis (hard wood tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Chytranthus atroviolaceus (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Cordia millenii (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Encephalartos septentrionalis (cycad)	E	HIGH	NEGLIGIBLE	LOW ADVERSE
Entandrophragma angolense (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Residual Impact
Entandrophragma cylindricum (tree, sapele)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma utile (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Guarea cedrata (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Holarrhena floribunda (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Irvingia gabonensis (wild mango tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya anthotheca (tree, mahogany)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya grandifoliola(tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa swynnertonii (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa trichilioides (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Milicia excelsa (tree)	D F	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Citropsis articulata (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Efulensia montana (liana)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Guarea cedrata (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Millettialacus alberti (flowering plant – legume)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Uvariodendron magnificum (tree)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Albizia spp. *[A. coriaria & A. grandibracteata]*	D F	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Aningeria altissima	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Aningeria adolfifriederici	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Canarium schweinfurthii	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Cordia millenii	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Dalbergia melanoxylon	A D F	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma (all species)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Erythrophleum guineense	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Fagara (all species)	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Faurea saligna	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Ficalhoa laurifolia	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Ficus spp.	D F	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Hallea rubrostipulata	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Juniperus procera	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Khaya (all species)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa (all species)	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Maesopsis eminii	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Mangifera indica	D F	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Mildraediodemdron excelsum	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Morsus lacteal	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Newtonia buchanani	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Ocotea usambarensis	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**

Receptor	Landscape Context(s)		Receptor Sensitivity	Impact Magnitude	Residual Impact
Olea hochstetteri	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Olea welwitschii	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Osyris spp.	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Piptadeniastrum africanum	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Podocarupus (all species)	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Prunus Africana	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Pygeum africanum	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Symphonia globulifera	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Vittaleria paradoxa	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Warbugia ugandensis	D		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Threatened Ecosystems					
Dry Acacia Savanna	E		HIGH	NEGLIGIBLE	LOW ADVERSE
Forest-Savanna Mosaic	D		HIGH	LOW	MODERATE ADVERSE
Moist Acacia Savanna	F		HIGH	NEGLIGIBLE	LOW ADVERSE
Moist *Combretum* Savanna	A	B	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Butyrospermum Savanna	E		MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Palm Savanna (*Borassus* palms)	B	F	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Hyparrhenia Grass Savanna	A		MEDIUM	LOW	LOW ADVERSE

Following implementation of mitigation, residual impacts on all species are defined as **Low** significance or **Insignificant** and are therefore not considered significant. Residual impacts on threatened ecosystems are mainly defined as **Low** significance to **Insignificant**, with the exception of Forest-Savanna Mosaic, where the residual impact is defined as being of **Moderate** significance, due mainly to land use changes and loss of habitats.

However, as noted above there may be indirect impacts caused by population movements and in-migration pressures to the region. It is considered that these indirect impacts may be more significant overall than the direct impacts and more complex to mitigate, because their exact extent and nature cannot be known until they start to develop.

As noted above, there is likely to be more and increasing pressure on forest and other habitats outside of the Project Footprint due to induced in-migration, causing land use changes and pressure on natural resources and habitats. This is reflected in the slightly elevated residual impact on Forest-Savanna Mosaic ecosystems.

Implementation of the proposed mitigation measures discussed above will mitigate such impacts, although there will need to be constant monitoring of both the impacts and the success of mitigation to review its effectiveness and to establish a flexible and adaptive mitigation strategy where and if necessary.

It should be noted that for the most sensitive species and some of the threatened ecosystems, it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation. This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain for Critical Habitat and CHQS is required. These measures are discussed at the end of this chapter (section 13.8).

13.7.11 Assessment of Impacts: Commissioning and Operations

13.7.11.1 Introduction

This section describes the assessment of impacts during the Commissioning and Operations phase of the Project. This phase does not involve land take or clearance as this has already been completed during the previous two phases. Consequently there is likely to be a low magnitude of direct potential and residual impact on plant species and habitats during this phase. However, there will be continued, and possibly, growing pressure on the regional landscape and habitats due to induced in-migration, as well as improved access to the area.

13.7.11.2 Potential Impacts

Potential impacts on identified terrestrial vegetation receptors are considered to be likely to be similar to the Construction and Pre-Commissioning phase as shown on Table 13-28 above.

As before, the potential impacts are concentrated in Landscape Contexts A (the MFNP), B (Savanna Corridor), C (Lake Albert and associated wetlands) and F (Mixed Landscapes) during this phase. In addition, there will be potential impacts on receptor species and habitats in areas associated with Landscape Contexts D (Tropical High Forest) and Forest-Savanna Mosaic ecosystems generally.

Overall, most potential direct impacts will not be significant as effects on species and habitats are not likely to be widespread because the proportion of these areas that will be affected by the Project is relatively small compared to their overall area. In addition, the embedded mitigation developed through the FEED process has sought to avoid locations were plant species of conservation concern have been recorded. As in the previous Project stage, potential direct impacts are possible on certain species of conservation concern as well as threatened ecosystems. However, such potential impacts are likely to be greatly reduced from previous stages of the Project as no new land clearance will be undertaken during this stage.

It is considered that at this stage of the Project that potential indirect impacts caused by induced population changes in the region will be greater than in the previous stages, as there will likely be a lag between in-migration from the start of the Project to these later phases. This could generate potential impacts on other areas outside of the Project Footprint and additional pressures on natural resources. This is reflected in the potential impact levels for threatened ecosystems being higher than in the previous Project stage.

In terms of threatened ecosystems, *Hyparrhenia* Grass Savanna, Forest-Savanna Mosaic and Moist Acacia Savanna are more likely than others to experience potential adverse impacts. Direct impacts may occur on the *Hyparrhenia* Grass Savanna but for the other two ecosystems these may be subject to potential induced impacts created land use changes and loss of habitats.

This is because these ecosystems have elevated sensitivity and they are therefore more vulnerable to increased pressures on all aspects of these landscape contexts, ranging from population changes and likely increased competition to direct pressure on natural habitats. Note that even though the legal status of Protected Areas within these landscapes is likely to afford some level of protection, without defined mitigation, there will be significant pressure on intervening natural habitats that will reduce connectivity and species diversity, which will have an overall potential impact on protected areas.

13.7.11.3 Additional Mitigation and Enhancement

As in the previous project phase, the assessment of potential impacts indicates that additional mitigation will be required in order to reduce or avoid significant impacts from the Project. The additional mitigation for direct and indirect impacts is presented in Sections 13.7.9.3 and 13.7.9.4 above. All mitigation measures will be outlined in the ESMP Mitigation Checklist.

13.7.11.4 Residual Impacts

Residual impacts on terrestrial vegetation receptors considered likely during the Commissioning and Operations phase are defined in Table 13-30 below. These impacts are termed residual impacts because they take into account the embedded mitigation and the additional mitigation discussed above, to be implemented during this phase.

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives.

Table 13-30: Residual Impacts Species and Threatened Ecosystems: Commissioning and Operations

Receptor	Landscape Context(s)		Receptor Sensitivity	Impact Magnitude	Residual Impact
SPECIES					
Afrothismia winkleri (parasitic plant)	D		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Brazzeia longipedicellata (woody plant)	D		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Dialium excelsum (flowering plant – legume)	D		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Uvariodendron magnificum (small tree)	D		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Psilotrichum axilliflorum	D		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Encephalartos macrostrobilus	E		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Afzelia africana (tree)	A		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya senegalensis (tree)	A		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Albizia ferruginea (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Antrocaryon micraster (woody plant)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Brachylaena huillensis (hard wood tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Chytranthus atroviolaceus (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Cordia millenii (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Encephalartos septentrionalis (cycad)	E		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma angolense (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma cylindricum (tree, sapele)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma utile (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Guarea cedrata (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Holarrhena floribunda (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Irvingia gabonensis (wild mango tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya anthotheca (tree, mahogany)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya grandifoliola(tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa swynnertonii (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa trichilioides (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
*Milicia excelsa (tree)**	D	F	HIGH	NEGLIGIBLE	**LOW ADVERSE**
Citropsis articulata (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Efulensia montana (liana)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Guarea cedrata (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Millettialacus alberti (flowering plant – legume)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Uvariodendron magnificum (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Albizia spp. *[A. coriaria & A. grandibracteata] **	D	F	MEDIUM	NEGLIGIBLE	**INSIGNIFCANT**

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Residual Impact
Aningeria altissima	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Aningeria adolfifriederici	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Canarium schweinfurthii	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Cordia millenii	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Dalbergia melanoxylon **	A D F	HIGH	NEGLIGIBLE	LOW ADVERSE
Entandrophragma (all species)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Erythrophleum guineense	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Fagara (all species)	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Faurea saligna	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Ficalhoa laurifolia	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Ficus spp. *	D F	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Hallea rubrostipulata	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Juniperus procera	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Khaya (all species)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Lovoa (all species)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Maesopsis eminii	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Mangifera indica *	D F	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Mildraediodemdron excelsum	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Morsus lactea	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Newtonia buchanani	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Ocotea usambarensis	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Olea hochstetteri	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Olea welwitschii	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Osyris spp.	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Piptadeniastrum africanum	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Podocarupus (all species)	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Prunus africana	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Pygeum africanum	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Symphonia globulifera	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Vittaleria paradoxa	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Warbugia ugandensis	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Threatened Ecosystems				
Dry Acacia Savanna	E	HIGH	NEGLIGIBLE	LOW ADVERSE
Forest-Savanna Mosaic	D	HIGH	LOW	MODERATE ADVERSE
Moist Acacia Savanna	F	HIGH	NEGLIGIBLE	LOW ADVERSE
Moist *Combretum* Savanna	A B	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Butyrospermum Savanna	E	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Palm Savanna (*Borassus* palms)	B F	MEDIUM	NEGLIGIBLE	INSIGNIFCANT

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Residual Impact
Hyparrhenia Grass Savanna	A	MEDIUM	LOW	LOW ADVERSE

Following implementation of mitigation, impacts on all species are defined as **Low** or **Insignificant** and are therefore not considered significant. Residual impacts on threatened ecosystems are mainly defined as **Low** to **Insignificant**, with the exception of Forest-Savanna Mosaic, which is defined as **Moderate**, due mainly to land use changes and loss of habitats.

Residual impacts on plant species are not likely to be significant or widespread, following mitigation, because the proportion of these areas is relatively small compared to the overall area. In addition, this is because most of the impacts on vegetation will take place during the previous phases of the Project where sites are being cleared and habitat will be lost.

However, as noted above there may be residual indirect impacts caused by population movements and in-migration pressures to the region. In addition, there is likely to be more and increasing pressure on forest and other habitats outside of the Project Footprint due to induced in-migration, causing land use changes and pressure on natural resources and habitats. This is reflected in the slightly elevated residual impact on Forest-Savanna Mosaic ecosystems.

Implementation of the proposed mitigation measures discussed above will mitigate such impacts, although there will need to be constant monitoring of both the impacts and the success of mitigation to review its effectiveness and to establish a flexible and adaptive mitigation strategy where and if necessary.

It should be noted that for the most sensitive species and some of the threatened ecosystems, it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation. This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain (for Critical Habitat and CHQS) is required. These measures are discussed at the end of this chapter (section 13.8).

13.7.12 Assessment of Impacts: Decommissioning

13.7.12.1 Introduction

This section describes the assessment of impacts during the decommissioning phase of the Project.

The details of this phase are not known but are likely to include many of the elements relating to site works, earth movement and other intensive activities. However, the objective of this phase is to restore habitats at well-pads, access roads and other sites within the MFPA.

As part of decommissioning it is understood that all well pads and other sites will be restored and all above ground infrastructure will be removed. Flowlines will be left *in situ* after being emptied, cleaned and sealed.

An important consideration in preparing this assessment is that the sensitivity of receptors is likely to have changed since the current assessment. This change may be for the better, where conservation status has improved, or in some cases for the worse, where the conservation status of certain species and habitats has deteriorated.

In addition, the details of the decommissioning techniques and priorities at the end of the Project are uncertain at this stage. It is likely that there will be technological changes in the intervening years that will change how decommissioning will be done and the objectives and effectiveness of that work.

Finally, the end goal of decommission is to remove infrastructure and to restore habitats, once the actual restoration works have been completed.

13.7.12.2 Potential Impacts

Potential impacts on identified terrestrial vegetation receptors considered to be likely during the decommissioning works stage are considered to be the same as in the Construction and Pre-Commissioning phase and these are shown in Table 13-28 above.

The potential impacts are concentrated in Landscape Contexts A (the MFNP), where most of the works will take place, in addition to the Buliisa area. There may be indirect impacts on other receptors caused by induced increases in population that may put pressure on natural resources and habitats. The assessment of potential impacts for the decommissioning works phase indicates that there are some potentially significant impacts on certain species within the MFNP and also in the Buliisa area, due to the requirement to undertake earthworks again within the park.

However, in the MFNP plant species of conservation concern have generally been avoided, through the avoidance and design process described above, although as some of these species are very sensitive (e.g. *Afzelia Africana* or *Khaya senegalensis*) care will be taken to ensure that the works are managed so as not to impact on these species.

In the Buliisa area, some individual trees of conservation concern may be lost as they are close to working areas impacts from the site development spreads outside of the Project footprints. Most of these are forest tree species but which are present outside of protected areas and have been found within transitional and modified habitat.

Impacts on threatened ecosystems will be mainly on the *Hyparrhenia* Grass Savanna ecosystem which is present in the MFNP and where Project infrastructure will be placed resulting in unavoidable loss of habitat within this ecosystem type.

In addition, there may be potential indirect impacts on Forest-Savanna Mosaic and Moist Acacia Savanna ecosystem types elsewhere in the landscape due to continued land use pressures caused by uncontrolled in-migration to the region.

13.7.12.3 Additional Mitigation and Enhancement

As in the previous project phase, the assessment of potential impacts indicates that additional mitigation will be required in order to reduce or avoid significant impacts from the Project. The additional mitigation for direct and indirect impacts is presented in Sections 13.7.9.3 and 13.7.9.4 above.

13.7.12.4 Residual Impacts

Residual impacts on terrestrial vegetation receptors considered likely during this phase as detailed in Table 13-31

*Table 13-31*to below. The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives.

Table 13-31: Residual Impacts Species and Threatened Ecosystems: Decommissioning

Receptor	Landscape Context(s)		Receptor Sensitivity	Impact Magnitude	Residual Impact
SPECIES					
Afrothismia winkleri (parasitic plant)	D		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Brazzeia longipedicellata (woody plant)	D		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Dialium excelsum (flowering plant – legume)	D		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Uvariodendron magnificum (small tree)	D		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Psilotrichum axilliflorum	D		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Encephalartos macrostrobilus	E		VERY HIGH	NEGLIGIBLE	**LOW ADVERSE**
Afzelia africana (tree)	A		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya senegalensis (tree)	A		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Albizia ferruginea (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Antrocaryon micraster (woody plant)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Brachylaena huillensis (hard wood tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Chytranthus atroviolaceus (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Cordia millenii (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Encephalartos septentrionalis (cycad)	E		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma angolense (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma cylindricum (tree, sapele)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Entandrophragma utile (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Guarea cedrata (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Holarrhena floribunda (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Irvingia gabonensis (wild mango tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya anthotheca (tree, mahogany)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Khaya grandifoliola(tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa swynnertonii (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Lovoa trichilioides (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
*Milicia excelsa (tree)**	D	F	HIGH	**LOW ADVERSE**	**LOW**
Citropsis articulata (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Efulensia montana (liana)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Guarea cedrata (tree)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Millettialacus alberti (flowering plant – legume)	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Residual Impact
Uvariodendron magnificum (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Albizia spp. *[A. coriaria & A. grandibracteata]* *	D F	MEDIUM	INSIGNIFCANT	INSIGNIFICANT
Aningeria altissima	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Aningeria adolfifriederici	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Canarium schweinfurthii	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Cordia millenii	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Dalbergia melanoxylon **	A D F	HIGH	NEGLIGIBLE	LOW ADVSERE
Entandrophragma (all species)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Erythrophleum guineense	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Fagara (all species)	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Faurea saligna	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Ficalhoa laurifolia	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Ficus spp. *	D F	MEDIUM	INSIGNIFCANT	INSIGNIFICANT
Hallea rubrostipulata	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Juniperus procera	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Khaya (all species)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Lovoa (all species)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Maesopsis eminii	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Mangifera indica *	D F	MEDIUM	INSIGNIFCANT	INSIGNIFICANT
Mildraediodemdron excelsum	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Morsus lactea	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Newtonia buchanani	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Ocotea usambarensis	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Olea hochstetteri	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Olea welwitschii	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Osyris spp.	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Piptadeniastrum africanum	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Podocarupus (all species)	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Prunus africana	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Pygeum africanum	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Symphonia globulifera	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Vittaleria paradoxa	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Warbugia ugandensis	D	MEDIUM	NEGLIGIBLE	INSIGNIFCANT
Threatened Ecosystems				
Dry Acacia Savanna	E	HIGH	NEGLIGIBLE	LOW ADVERSE
Forest-Savanna Mosaic	D	HIGH	LOW	MODERATE ADVERSE
Moist Acacia Savanna	F	HIGH	NEGLIGIBLE	LOW ADVERSE
Moist *Combretum* Savanna	A B	MEDIUM	INSIGNIFCANT	INSIGNIFICANT

Receptor	Landscape Context(s)		Receptor Sensitivity	Impact Magnitude	Residual Impact
Butyrospermum Savanna	E		MEDIUM	NEGLIGIBLE	**INSIGNIFCANT**
Palm Savanna (*Borassus* palms)	B	F	MEDIUM	**INSIGNIFCANT**	**INSIGNIFICANT**
Hyparrhenia Grass Savanna	A		MEDIUM	LOW	**LOW ADVERSE**

Following implementation of mitigation, residual impacts on all species are defined as being of **Low** significance or **Insignificant** and are therefore not considered significant. Residual impacts on threatened ecosystems are mainly defined as **Low** to **Insignificant**, with the exception of Forest-Savanna Mosaic, which is defined as **Moderate** significance, due mainly to land use changes and loss of habitats.

As noted above there may be indirect impacts caused by population movements and in-migration pressures to the region. It is considered that these indirect impacts may be more significant overall than the direct impacts and more complex to mitigate, because their exact extent and nature cannot be known until they start to develop.

As noted above, there is likely to be more and increasing pressure on forest and other habitats outside of the Project Footprint due to induce in-migration, causing land use changes and pressure on natural resources and habitats. This is reflected in the residual impacts on Forest-Savanna Mosaic ecosystems and protected areas.

Implementation of the proposed mitigation measures discussed above will mitigate such impacts, although there will need to be constant monitoring of both the impacts and the success of mitigation to review its effectiveness and to establish a flexible and adaptive mitigation strategy where and if necessary.

It should be noted that for the most sensitive species and some of the threatened ecosystems, it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation. This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain for Critical Habitat and CHQS is required. These measures are discussed at the end of this chapter (section 13.8).

13.7.13 Assessment of Impacts – Protected Areas

Potential and residual impacts on protected area receptors considered to be likely during the four phases of the Project are summarised in Table 13-32 to Table 13-36 below.

For each protected area, the magnitude of the potential direct and indirect impacts are firstly defined and discussed and an overall assessment of the Potential Impacts made for each Project phase. The risk of in-combination effects is also stated. Mitigation is then discussed and, taking the additional mitigation as discussed in detail in the previous sections, the residual direct and indirect impacts are defined.

Table 13-32: Potential Impacts on MFNP and Karuma Wildlife Reserve (All Phases)

Murchison Falls National Park (MFNP) [with Karuma Wildlife Reserve (KWR)]							
Designation/Category							
Type of Designation:	**National**	**Legal status:**	**National Park**	**IUCN:**	**II**	**KBA:**	**Yes**
	International		**IBA**		**A1, A3, A4i**		
Project Potential Impacts:							
Potential Direct Impacts	• Direct loss of individuals or communities species resulting in populations changes of priority species from vegetation clearance, construction works and other activities • Direct loss of habitat or ecosystem loss, degradation or fragmentation due to						

	vegetation clearance, construction works and other activities. • Loss of integrity of the PA due to significant loss of priority species populations and communities as well as reduction in area, functionality or connectivity of habitats and ecosystems from Project related activities. • Loss integrity of the PA due to increase in fires, introduction of invasive species, diseases and other vegetation/land cover changes resulting from Project related activities. • Disruption to community relations and monitoring and research programs within the PA resulting from Project related activities.			
Potential Indirect Impacts	• Indirect loss of individuals or communities species resulting in populations changes of priority species from induced human population changes putting pressure on the park, through collection/hunting of species. • Indirect loss of habitat or ecosystem loss, degradation or fragmentation due to vegetation loss, fire setting, poaching activities and land clearance for farming, illegal logging, firewood collection, settlements, etc. • Loss of integrity of the PA due to increase in fires, introduction of invasive species, diseases and other vegetation/land cover changes resulting from influx of people to the area. • Disruption to community relations and monitoring and research programs within the PA resulting from influx of people to the area.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Magnitude of Potential Direct Impact	**MEDIUM**	**MEDIUM**	**MEDIUM**	**MEDIUM**
Magnitude of Potential Indirect Impact	**HIGH**	**HIGH**	**HIGH**	**HIGH**
Summary justification for impact magnitude	Direct Impacts (all phases): Magnitude of potential direct impacts is **Medium** because, although the footprint of the Project within the MFNP is limited and defined, without additional mitigation there is likely to be a significant loss of habitat and consequent impact on species populations. Indirect Impacts (Site Preparation and Enabling Works): Magnitude of potential indirect impacts is **High** because, although the potential level of influx and increased pressure on the PA are unknown and, in contrast to the direct Project impacts, could be widespread affecting all areas of the PA. Such indirect impact could affect the integrity of the PA and significantly compromise the management objectives of the PA. However, at this early stage of the Project is it assumed that the levels of influx and therefore indirect pressures are likely to be lower than at later stages of the Project. Indirect Impacts (Construction and Pre-Commissioning, Commissioning and Operations, Decommissioning): Magnitude of potential indirect impacts is **High** because, although the potential level of influx and increased pressure on the PA are unknown and, in contrast to the direct Project impacts, could be widespread affecting all areas of the PA. Such indirect impact could affect the integrity of the PA and significantly compromise the management objectives of the PA.			
Potential Impacts significance	**CRITICAL ADVERSE**	**CRITICAL ADVERSE**	**CRITICAL ADVERSE**	**CRITICAL ADVERSE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**HIGH**	**HIGH**	**HIGH**	**HIGH**

Justification of in-combination sensitivity	The identified associated infrastructure, comprising 'oil roads', the Tilenga Feeder Pipeline and EACOP are likely to increase indirect pressures on the PA. The oil roads, will enable easier access to the vicinity of the PA and into the PA itself. This will increase likelihood of poaching, fire-setting, fuel/wood collection and other activities that will reduce the integrity of the PA.			
Mitigation				
Mitigation for Potential Direct Impacts	• Detailed mitigation for direct impacts is set out in Table 13-23 • See also mitigation set out in ***Chapters 14: Terrestrial Wildlife*** and ***15: Aquatic Life*** of the ESIA.			
Mitigation for Potential Indirect Impacts	• Detailed mitigation for indirect (induced) impacts is set out in • Table 13-25 • In addition, a number of mitigation strategies to achieve no net loss (for Natural Habitat) and net gain (for Critical Habitat and CHQS) have been defined under 13.8.2			
Mitigation for Potential in-combination effects	• The Project Proponents will invite other developers, local and national government and other relevant stakeholders to participate in joint planning initiatives to address influx. Feasibility of jointly sponsoring a regional level Influx Management Strategy will be assessed			
Mitigation Discussion	• Detailed mitigation measures for direct impacts on Protected Areas correspond to those for specific activities that will be associated with the Project. Effective management of these impacts will help to reduce the level of impact on the species, habitats and management objectives that support the maintenance of the integrity of the PA. To achieve this, the Project Proponents will establish a collaborative platform with UWA and agree and set up monitoring and data-sharing processes to enable rapid adaptation if impacts are greater than expected.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	There will be direct residual impacts on grassland habitats within the MFNP where 10 well pads, flowlines and other Project related infrastructure (access tracks) will be constructed and operated over an extended period. This will mean that there will be direct loss of the threatened ecosystem Hyparrhenia Grass Savanna, as a receptor in its own right. In addition, there are unlikely to be direct losses of the two CHQS plant species associated with the MFNP. However, indirect impacts on the park may be significant unless managed effectively. This may include loss of habitat due to firewood or plant collection, fire setting, poaching activities and land clearance and settlement activities.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Direct Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Residual Indirect Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	The assessment assumes effective implementation of management plans to mitigate direct/indirect and in-combination impacts. Direct Impacts: Overall, considering the area of the PA is large and the relatively small footprint of the Project footprint within it, the residual direct impacts can be reduced to a **Moderate** level. Indirect impacts: these will be more diffuse though probably more long term and difficult to			

	manage. Overall a residual impact of **Moderate** has been defined.			
Residual Direct Impacts significance	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**
Residual Indirect Impacts significance	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**

Table 13-33: Potential Impacts on Bugungu Wildlife Reserve (All Phases)

Bugungu Wildlife Reserve (BWR)							
Designation/Category							
Type of Designation:	**National**	**Legal status:**	**Wildlife Reserve**	**IUCN:**	**III**	**KBA:**	**No**
Project Potential Impacts:							
Potential Direct Impacts	• There are no potentially direct impacts on the BWR.						
Potential Indirect Impacts	• Indirect loss of individuals or communities of species resulting in population changes of priority species from induced human population changes putting pressure on the site, through collection/hunting of species. • Indirect loss of habitat or ecosystem loss, degradation or fragmentation due to vegetation loss, fire setting, poaching activities and land clearance for farming, illegal logging, firewood collection, settlements, etc.. • Loss of integrity of the site due to increase in fires, introduction of invasive species, diseases and other vegetation/land cover changes resulting from influx of people to the area. • Disruption to community relations and monitoring and research programs within the BWR resulting from influx of people to the area.						
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**			
Receptor Sensitivity	**VERY HIGH**						
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**			
Magnitude of Potential Indirect Impact	**HIGH**	**HIGH**	**HIGH**	**HIGH**			
Summary justification for impact magnitude	Potential indirect impacts magnitude is **High** because, although the potential level of influx and increased pressure on the PA are unknown and, in contrast to the direct Project impacts, could be widespread affecting all areas of the PA. Such indirect impact could affect the integrity of the PA and significantly compromise the management objectives of the PA. However, at the early stage of the Project (Site Preparation and Enabling Works) it is assumed that the levels of influx and therefore indirect pressures are likely to be lower than at later stages of the Project.						
Potential Impacts	**CRITICAL**	**CRITICAL**	**CRITICAL**	**CRITICAL**			

significance	**ADVERSE**	**ADVERSE**	**ADVERSE**	**ADVSERSE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**HIGH**	**HIGH**	**HIGH**	**HIGH**
Justification of in-combination sensitivity	The identified associated infrastructure, comprising 'oil roads', the Tilenga Feeder Pipeline and EACOP are likely to increase indirect pressures on the PA. The oil roads, will enable easier access to the vicinity of the PA and into the PA itself. This will increase likelihood of poaching, fire-setting, fuel/wood collection and other activities that will reduce the integrity of the PA.			
Mitigation				
Mitigation for Potential Direct Impacts	• There are no direct impacts predicted and therefore no mitigation is identified			
Mitigation for Potential Indirect Impacts	• Mitigation will be similar to those referred to under MFPA and BWR PA above • In addition, a number of mitigation strategies to achieve no net loss (for Natural Habitat) and net gain (for Critical Habitat and CHQS) have been defined under 13.8.2			
Mitigation for Potential in-combination effects	• Mitigation will be similar to those referred to under MFPA and BWR PA above			
Mitigation Discussion	• Discussion of mitigation will be similar to that presented under MFPA and BWR PA above			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	There will be no direct residual impacts on the BWR from Project activities. However, indirect impacts on the BWR may be significant unless managed effectively. This may include loss of habitat due to firewood or plant collection, fire setting, poaching activities and land clearance and settlement activities.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Direct Impact Magnitude	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Residual Indirect Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	The assessment assumes effective implementation of management plans to mitigate direct/indirect and in-combination impacts. Direct Impacts: Overall, because there will be no direct impacts on the BWR the Project within it, the residual direct impacts are a **Low** level significance. Indirect impacts: they will be more diffuse in origin although probably more long term and difficult to manage, particularly as the BWR is adjacent to the Buliisa area where infrastructure will be placed including the industrial area and CPF, which are likely to generate a significant influx of people throughout the Project's life. Overall a residual			

	impact of **Moderate** significance has been defined.			
Residual Direct Impacts significance	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**
Residual Indirect Impacts significance	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**

Table 13-34: Potential Impacts on Budongo Central Forest Reserve (All Phases)

Budongo Central Forest Reserve (CFR)							
Designation/Category							
Type of Designation:	**National**	**Legal status:**	**Forest Reserve**	**IUCN:**	**-**	**KBA:**	**Yes**
	International		**IBA**		**A1, A3**		

Project Potential Impacts:				
Potential Direct Impacts	• There are no potentially direct impacts from the Project on the Budongo CFR.			
Potential Indirect Impacts	• Indirect loss of individuals or communities of species resulting in population changes of priority species from induced human population changes putting pressure on the forest, through collection/hunting of species. • Indirect loss of habitat or ecosystem loss, degradation or fragmentation due to vegetation loss, fire setting, poaching activities and land clearance for farming, illegal logging, firewood collection, settlements, etc. • Loss of integrity of the Budongo CFR due to increase in fires, introduction of invasive species, diseases and other vegetation/land cover changes resulting from influx of people to the area and use of the R3 road. • Disruption to community relations and monitoring and research programs within the Budongo resulting from influx of people to the area.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Magnitude of Potential Indirect Impact	**MEDIUM**	**HIGH**	**HIGH**	**HIGH**
Summary justification for impact magnitude	Site Preparation and Enabling Works: Potential indirect impacts are of **Medium** magnitude at this stage because, although the potential level of influx and increased pressure on the PA are unknown and, in contrast to the direct Project impacts, could be widespread affecting all areas of the PA. Such indirect impact could affect the integrity of the PA and significantly compromise the management objectives of the PA. However, at this early stage of the Project the levels of influx and therefore indirect pressures are likely to be lower than at later stages of the Project. Construction and Pre-Commissioning, Commissioning and Operations, Decommissioning: Potential indirect impacts are of **High** magnitude because, although			

	the potential level of influx and increased pressure on the PA are unknown and, in contrast to the direct Project impacts, could be widespread affecting all areas of the PA. Such indirect impact could affect the integrity of the PA and significantly compromise the management objectives of the PA.			
Potential Impacts significance	**HIGH ADVERSE**	**CRITICAL ADVERSE**	**CRITICAL ADVERSE**	**CRITICAL ADVERSE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**HIGH**	**HIGH**	**HIGH**	**HIGH**
Justification of in-combination sensitivity	The identified associated infrastructure, comprising 'oil roads', the Feeder Pipeline and EACOP are likely to increase indirect pressures on the PA. The oil roads will enable far easier access to the vicinity of the PA and into the PA itself. This will increase likelihood of poaching, fire-setting, fuel/wood collection and other activities that will reduce the integrity of the PA. Oil roads (including the Masindi-Kisanja Park junction, Masindi-Biiso road) will also have a direct impact on the Kaniyo-Pabidi block of the Budongo CFR.			
Mitigation				
Mitigation for Potential Direct Impacts	• There are no direct impacts predicted from the Project and therefore no mitigation is identified			
Mitigation for Potential Indirect Impacts	• Mitigation are similar to those referred to under MFPA and BWR PA • In addition, a number of mitigation strategies to achieve no net loss (for Natural Habitat) and net gain (for Critical Habitat and CHQS) have been defined under 13.8.2			
Mitigation for Potential in-combination effects	• Mitigation are similar to those referred to under MFPA and BWR PA.			
Mitigation Discussion	• Refer to discussion under MFPA and BWR PA			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	There will be no direct residual impacts on the Budongo CFR from Project activities. However, indirect impacts on the Budongo CFR may be significant unless managed effectively. This may include loss of habitat due to firewood or plant collection, fire setting, poaching activities and land clearance and settlement activities. However, these potential impacts will be identified and managed through the proposed mitigation measures. Nevertheless, there are likely to be significant residual impacts relating to the management objectives of the Budongo CFR as a result of the combined direct/indirect and in-combination effects of the Project, unless managed effectively.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Direct Impact Magnitude	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**

Residual Indirect Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	The assessment assumes effective implementation of management plans to mitigate direct/indirect and in-combination impacts. Direct Impacts: Overall, because there will be no direct impacts on the Budongo CFR the Project within it, the residual direct impacts are a **Low** level significance. Indirect impacts: they will be more diffuse in origin although probably more long term and difficult to manage, particularly as the Budongo CFR is adjacent to the Buliisa area where infrastructure will be placed, including the Industrial Area and CPF, which are likely to generate a significant influx of people throughout the Project's life. Overall a residual impact of **Moderate** significance has been defined.			
Residual Direct Impacts significance	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**
Residual Indirect Impacts significance	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**

Table 13-35: Potential Impacts on Forest Reserves in the Masindi Area (All Phases)

Forest Reserves in the Masindi Area							
Designation/Category							
Type of Designation:	**National**	**Legal status:**	**Forest Reserves**	**IUCN:**		**KBA:**	**No**
Project Potential Impacts:							

Potential Direct Impacts	• There are no potentially direct impacts on these forests			
Potential Indirect Impacts	• Indirect loss of individuals or communities and species resulting in potential population changes of priority species from induced human population changes putting pressure on the forests, through collection/hunting of species. • Indirect loss of habitat or ecosystem loss, degradation or fragmentation due to vegetation loss, fire setting, poaching activities and land clearance for farming, illegal logging, firewood collection, settlements, etc.. • Loss integrity of the forests due to increase in fires, introduction of invasive species, diseases and other vegetation/land cover changes resulting from influx of people to the area. • Disruption to community relations and monitoring and research programs within the forests resulting from influx of people to the area.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Magnitude of Potential Indirect	**MEDIUM**	**HIGH**	**HIGH**	**HIGH**

Impact				
Summary justification for impact magnitude	Site Preparation and Enabling Works: Potential indirect impacts are of **Medium** magnitude at this stage because, although the potential level of influx and increased pressure on the forests are unknown and, in contrast to the direct Project impacts, could be widespread affecting all areas of the forests. Such indirect impact could affect the integrity of the forests and significantly compromise the management objectives of the forests. However, at this early stage of the Project the levels of influx and therefore indirect pressures are likely to be lower than at later stages of the Project. Construction and Pre-Commissioning, Commissioning and Operations, Decommissioning: Potential indirect impacts are of **High** magnitude because, although the potential level of influx and increased pressure on the forests are unknown and, in contrast to the direct Project impacts, could be widespread affecting all areas of the forests. Such indirect impact could affect the integrity of the forests and significantly compromise the management objectives of the forests.			
Potential Impacts significance	**HIGH ADVERSE**	**HIGH ADVERSE**	**HIGH ADVERSE**	**HIGH ADVERSE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
Justification of in-combination sensitivity	The identified associated infrastructure, comprising, the Feeder Pipeline and EACOP are unlikely to increase indirect pressures on the forests as they are too far away and below the escarpment. The oil roads will enable far easier access to the vicinity of the forests. This may increase likelihood of poaching, fire-setting, fuel/wood collection and other activities that will reduce the integrity of the forests.			
Mitigation				
Mitigation for Potential Direct Impacts	• There are no direct impacts predicted and therefore no mitigation is identified			
Mitigation for Potential Indirect Impacts	• Mitigation are similar to those referred to under MFPA and BWR PA • In addition, a number of mitigation strategies to achieve no net loss (for Natural Habitat) and net gain (for Critical Habitat and CHQS) have been defined under 13.8.2			
Mitigation for Potential in-combination effects	• Mitigation are similar to those referred to under MFPA and BWR PA			
Mitigation Discussion	• Refer to discussion under MFPA and BWR PA. Different stakeholders than UWA are likely to be involved.			
RESIDUAL IMPACTS: ALL PROJECT PHASES				
Summary of Residual Impact	There will be no direct residual impacts on the Masindi FRs from well pads, flowlines and other Project related infrastructure. However, indirect impacts on the Masindi FRs may be significant unless managed effectively. This may include loss of habitat due to firewood or plant collection, fire setting, poaching activities and land clearance and settlement activities. However, these potential impacts will be identified and managed through the proposed mitigation measures. Nevertheless, there are likely to be residual impacts relating to the management objectives of the Masindi FRs as a result of the combined direct/indirect and in-			

	combination effects of the Project, unless managed effectively.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**HIGH**			
Residual Direct Impact Magnitude	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Residual Indirect Impact Magnitude	**LOW**	**LOW**	**LOW**	**LOW**
Summary justification for residual impact assessment	The assessment assumes effective implementation of management plans to mitigate direct/indirect and in-combination impacts. Direct Impacts: Overall, because there will be no direct impacts on these forests the Project within it, the residual direct impacts are a **Low** level significance Indirect impacts: they will be more diffuse in origin although probably more long term and difficult to manage, particularly as the Project is likely to generate a significant influx of people throughout the Project's life. Overall a residual impact of **Moderate** significance has been defined.			
Residual Direct Impacts significance	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**
Residual Indirect Impacts significance	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**

Table 13-36: Potential Impacts on Bugoma Forest Reserve (All Phases)

Bugoma Forest (and Related Southern Forest Reserves)							
Designation/Category							
Type of Designation:	**National**	**Legal status:**	**Forest Reserves**	**IUCN:**	**-**	**KBA:**	**Yes**
Project Potential Impacts:							
Potential Direct Impacts	• There are no potentially direct impacts on these forests						
Potential Indirect Impacts	• Indirect loss of individuals or communities and species resulting in potential population changes of priority species from induced human population changes putting pressure on the forests, through collection/hunting of species. • Indirect loss of habitat or ecosystem loss, degradation or fragmentation due to vegetation loss, fire setting, poaching activities and land clearance for farming, illegal logging, firewood collection, settlements, etc. • Loss of integrity of the forests due to increase in fires, introduction of invasive species, diseases and other vegetation/land cover changes resulting from influx of people to the area. • Disruption to community relations and monitoring and research programs within the forests resulting from influx of people to the area.						
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre**	**Commissioning & Operations**	**Decommissioning**			

		Commissioning		
Receptor Sensitivity	**VERY HIGH**			
Magnitude of Potential Direct Impact	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Magnitude of Potential Indirect Impact	**MEDIUM**	**HIGH**	**HIGH**	**HIGH**
Summary justification for impact magnitude	Site Preparation and Enabling Works: Potential indirect impacts are of **Medium** magnitude at this stage because, although the potential level of influx and increased pressure on the forests are unknown and, in contrast to the direct Project impacts, could be widespread affecting all areas of the forests. Such indirect impact could affect the integrity of the forests and significantly compromise the management objectives of the forests. However, at this early stage of the Project the levels of influx and therefore indirect pressures are likely to be lower than at later stages of the Project. Construction and Pre-Commissioning, Commissioning and Operations, Decommissioning: Potential indirect impacts are of **High** magnitude because, although the potential level of influx and increased pressure on the forests are unknown and, in contrast to the direct Project impacts, could be widespread affecting all areas of the forests. Such indirect impact could affect the integrity of the forests and significantly compromise the management objectives of the forests.			
Potential Impacts significance	**HIGH ADVERSE**	**CRITICAL ADVERSE**	**CRITICAL ADVERSE**	**CRITICAL ADVERSE**
IN-COMBINATION EFFECTS				
Risk of in-combination effects	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**
Justification of in-combination sensitivity	The identified associated infrastructure, comprising, oil roads, the Feeder Pipeline and EACOP may increase indirect pressures on the forests if influx of people is not managed. The oil roads will enable far easier access to the vicinity of the forests. This may increase likelihood of poaching, fire-setting, fuel/wood collection and other activities that will reduce the integrity of the forests.			
Mitigation				
Mitigation for Potential Direct Impacts	• There are no direct impacts predicted and therefore no mitigation is identified			
Mitigation for Potential Indirect Impacts	• Mitigation are similar to those referred to under MFPA and BWR PA • In addition, a number of mitigation strategies to achieve no net loss (for Natural Habitat) and net gain (for Critical Habitat and CHQS) have been defined under 13.8.2			
Mitigation for Potential in-combination effects	• Mitigation are similar to those referred to under MFPA and BWR PA			
Mitigation Discussion	• Refer to discussion under MFPA and BWR PA. Different stakeholders than UWA are likely to be involved			
RESIDUAL IMPACTS: ALL PROJECT PHASES				

Summary of Residual Impact	There will be no direct residual impacts on these forests from Project activities. However, indirect impacts may be significant unless managed effectively. This may include loss of habitat due to firewood or plant collection, fire setting, poaching activities and land clearance and settlement activities. However, these potential impacts will be identified and managed through the proposed mitigation measures. Nevertheless, there are likely to be residual impacts relating to the management objectives of the forests as a result of the combined direct/indirect and in-combination effects of the Project, unless managed effectively.			
Project Phase	**Site Preparation & Enabling Works**	**Construction & Pre Commissioning**	**Commissioning & Operations**	**Decommissioning**
Receptor Sensitivity	**VERY HIGH**			
Residual Direct Impact Magnitude	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**	**NEGLIGIBLE**
Residual Indirect Impact Magnitude	**MODERATE**	**MODERATE**	**MODERATE**	**MODERATE**
Summary justification for residual impact assessment	The assessment assumes effective implementation of management plans to mitigate direct/indirect and in-combination impacts. Direct Impacts: Overall, because there will be no direct impacts on these forests the Project within it, the residual direct impacts are a **Low** level significance. Indirect impacts: they will be more diffuse in origin although probably more long term and difficult to manage, particularly as the Project is likely to generate a significant influx of people throughout the Project's life. Overall a residual impact of **Moderate** significance has been defined.			
Residual Direct Impacts significance	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**
Residual Indirect Impacts significance	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**

13.8 Biodiversity Loss/Gain Accounting and Measures to Achieve Net Gain

13.8.1 Overview

In consideration of the objectives of PS6 there is a requirement to achieve no net loss of natural habitat and net gain of Critical Habitat. From the above impact assessment, it should be noted that for the most sensitive species, particularly those that comprise CHQS it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation.

This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain for Critical Habitat lost or compromised as a result of the Project and CHQS is required. Further details on Biodiversity Loss/Gain Accounting and measures to achieve Net Gain are provided in ***Chapter 14: Terrestrial Wildlife*** (section 14.8).

13.8.2 Measures to achieve Net Gain

Addressing impacts that are out of the Project's immediate sphere of control and which may be only partially attributable to the Project requires a collaborative strategic approach involving multiple stakeholders (e.g. regional government, local communities, UWA, NFA and other partners and stakeholders as appropriate).

The Project has developed a number of mitigation concepts for dealing with likely residual indirect impacts. These concept strategies (also referred to as 'Biodiversity Conservation Initiatives') form the core of the approach to achieving net gain / no net loss for the Project in line with requirements of IFC PS6, and are part of the Net Gain Strategy (that some may refer to as "Offset Strategy") and Implementation Plan.

These strategic programmes to mitigate indirect impacts will be implemented in a timely way and will start early in the Project cycle, both because significant adverse impacts may occur early Project phases, and because there is a lead-in time associated with negotiating and developing collaborative approaches involving multiple stakeholders. Early commencement will mean that their effectiveness can be monitored throughout the life of the Project and remedial actions taken as appropriate in order to achieve mitigation objectives (Ref 13.98).

A short list of three concept strategies has therefore been agreed with the Project Proponents at this stage, which will be developed in more detail. These concept strategies are relevant to all stages of the Project and are summarised below.

13.8.2.1 Reducing human pressures and increasing resilience of the Murchison Falls Protected Area (MFPA)

Measures to reduce human pressures and increase resilience of the MFPA: through enhanced park protection and community-based management. This will also include measures to protect and maintain connectivity of the savanna corridor outside the MFNP and including Bugungu Wildlife Reserve: manage in-migration impacts to savanna habitat and associated species by addressing threats and maintaining connectivity within and around Bugungu Wildlife Reserve. The following will be considered (Subject to feasibility study):

- In-kind Support to UWA for:
  - Equipment needed to enhance its ability to protect the MFPA;
  - Recruitment, training and deployment of a rapid reaction team (RRT) for MFPA;
  - Training in community conservation; and
  - Strategic and tactical support to UWA including training, capacity building and independent data management, analysis and reporting.
- Community-based interventions including:
  - Establishing community governance structures such as Village Saving and Loans Associations (VSLAs) and Community Land Associations (CLAs) assisting local communities to establish and develop PES or micro-credit schemes or animal husbandry and promote alternative wildlife-friendly enterprises
  - Recruitment and training of village wildlife scouts to empower and involve communities in park management;
  - Promotion of alternative fuel use and clean cooking stoves to reduce level of fuelwood harvesting;
  - Identify areas with high incidence of human-wildlife carnivore conflict and assess means to address this, for example community-based insurance schemes linked to land-use planning; and
  - Assist local communities to establish and develop simple wildlife-friendly management plans.

13.8.2.2 Conserving and Restoring Wetlands and Riparian Vegetation

Actions to manage and restore wetlands along the southern shore of the Albert Delta Ramsar site: manage anticipated impacts of in-migration on wetland habitat, fisheries and associated biodiversity around the Albert Delta Ramsar site through community-based management. The following will be considered (Subject to feasibility study):

- Organisation/establishment of wetland user groups/management committees;
- Developing agreed community management rules and regulation approaches;
- Environmental awareness raising in local communities;
- Establishing nurseries for revegetation of papyrus (and/or applying ecological engineering approaches to restoration);
- Participatory monitoring and evaluation of wetland areas and resources; and
- Micro-credit schemes to support livelihood diversification.

13.8.2.3 Conserving and Restoring Forests [Landscape Contexts D & F]

Measures to conserve and restore forests and forest connectivity along the eastern shore of Lake Albert (including Budongo and Bugoma FRs). As part of reduction effort of in-migration impacts on forests, in order to maintain and restore key forest corridors and enhance protection of threatened species; the following will be considered (Subject to feasibility study):

- Establishing agroforestry systems (combining shrub/tree planting with agricultural practices to create more diverse, healthy, productive and profitable sustainable land-use);
- Support establishment of CLAs through which to coordinate and implement PES and micro-credit schemes to support livelihood diversification;
- Promotion of alternative fuel use and clean cooking stoves fuel-efficient stoves to reduce rate of firewood collection;
- Establishing nurseries for community reforestation and sustainable resource extraction (e.g. wood production and NTFPs);
- Specific activities to target the conservation of high priority species (e.g. actions to reduce hunting pressures (e.g. removal of snares) and activities that combat illegal hunting and trading will be important); and
- Enhanced management of existing FRs will require support to the Government for enforcement activities (e.g. improved patrolling and boosting community conservation efforts).

13.9 Monitoring

There are a significant number of mitigation measures that will be implemented as part of this Project. These are necessary to ensure that potential impacts are managed and that significant impacts are controlled and reduced.

In order to understand the effectiveness of these mitigation measures it will be necessary, as part of the various proposed Management Plans, to undertake monitoring to determine whether the mitigation measures are being successful and that targets set are being achieved. The monitoring will build on existing baseline and/or new baseline studies and will then consist of monitoring of defined parameters, for example land-cover types, habitat quality, population numbers, and species distributions.

In this way, the feedback mechanisms can be employed to ensure that any deterioration of the status of defined indicators can be monitored and timely corrective actions taken.

In addition, the forecasts of both losses and gains discussed above are based on available data which is imperfect. In particular, both direct disturbance impacts and indirect impacts have the potential to be highly significant – and hence difficult or impossible to compensate for – but forecasts of both are associated with broad confidence intervals.

Targeted monitoring and research to validate the assumptions used in the forecast (for example about disturbance distances) is therefore appropriate to narrow these confidence intervals and ensure that the nature, scale and intensity of mitigation are appropriate. This research will be useful if conducted on a timeline that realistically allows for adaptation of mitigation measures prior to significant impacts occurring.

13.10 In-Combination Effects

As described in ***Chapter 4: Project Description and Alternatives***, the Project has a number of supporting and associated facilities that are being developed separately (i.e. they are subject to separate permitting processes and separate ESIAs or EIAs). These facilities include:

- Tilenga Feeder Pipeline;
- East Africa Crude Oil Export Pipeline (EACOP);
- Waste management storage and treatment facilities for the Project;
- 132 kV Transmission Line from Tilenga Central Processing Facility to Kabaale Industrial Park; and
- Critical oil roads.

As these facilities are directly linked to the Project and would not be constructed or expanded if the Project did not exist, there is a need to consider the in-combination impacts of the Project and the supporting and associated facilities. This is distinct from the Cumulative Impact Assessment (CIA) which consider all defined major developments identified within the Project's Area of Influence (and not just the associated facilities) following a specific methodology which is focussed on priority Valued Environmental and Social Components (VECs) (see ***Chapter 21: Cumulative Impact Assessment***).

The in-combination impact assessment considers the joint impacts of both the Project and the supporting and associated facilities. The approach to the assessment of in-combination impacts is presented in ***Chapter 3: ESIA Methodology***, Section 3.3.5.

The identified residual impacts of the Project listed in Table 13-37 below have the potential to be exacerbated by in-combination impacts from supporting and associated facilities. Comment is provided below on the potential in-combination impacts and the need for collaborative mitigation between the different Project proponents to address these impacts.

Table 13-37: In-Combination Effects

Description of potential effect of Project	Comment on potential In-combination effects with associated facilities
Habitat or ecosystem loss, degradation or fragmentation and Population changes – direct and indirect *Direct loss and degradation of habitats and species due to site clearance and construction of Project facilities.* *Direct loss and degradation of habitats and species due to fire risk.* *Project-associated induced access and in-migration leading to land-use change.* *Indirect and degradation of habitats*	Site preparation (clearance) and construction of the supporting and associated facilities may impact directly on species and their habitats protected areas and forests, leading to habitat loss and degradation. The activities might also exacerbate the risk of fire outbreaks. The oil roads will further improve access within the region and allow more people to travel to previously isolated areas (Bugungu Wildlife Reserve, Budongo Central Forest Reserve and the southern part of the MFPA). This will exacerbate the Project's effects with respect to increased human settlement and land-use change, increased demand for natural resources and woodfuel in particular, increased fire risk, leading to habitat loss and degradation. Small unprotected forests will be especially at risk of deforestation and degradation. Those most at risk include the southern part of MFPA, Bugungu Wildlife Reserve, Budongo Central Forest Reserve and other Forest Reserves

Description of potential effect of Project	Comment on potential In-combination effects with associated facilities
and species due to fire risk	in the Masindi Area.

Addressing impacts that are out of the Project's immediate sphere of control and which may be only partially attributable to the Project requires a collaborative strategic approach involving multiple stakeholders. The following collaborative approach is proposed:

- Project Proponents will invite other developers to participate in joint planning initiatives with local government and other relevant stakeholders, and will continue to share best practices to allow other developers to learn from successful implementation of mitigation measures addressing impacts on terrestrial vegetation habitats and ecosystems for the Project;
- The Project Proponents will invite other developers, local and national government and other relevant stakeholders to participate in joint planning of the mitigation concepts for dealing with likely residual indirect impacts (as presented in section 13.8.2);
- Strategic collaboration platforms will be established with local and regional authorities, UWA, NFA development and conservation NGOs and other stakeholders as appropriate to regularly evaluate and review the extent of impacts, share understanding of causes and identify adapted or additional mitigation requirements; and
- The Project Proponents will invite other developers, local and national government and other relevant stakeholders to participate in joint planning initiatives to address influx. Feasibility of jointly sponsoring a regional level Influx Management Strategy will be assessed.

13.11 Unplanned Events

Further details on unplanned events relevant to the Project are detailed in ***Chapter 20: Unplanned Events***.

13.12 Cumulative Impact Assessment

Chapter 21: Cumulative Impact Assessment provides an assessment of the potential cumulative effects of the Project together with other defined developments in the Project AoI. The CIA focussed on VECs that were selected on the basis of set criteria including the significance of the potential effects of the Project, the relationship between the Project and other developments, stakeholder opinions and the status of the VEC (with priority given to those which are of regional concern because they are in poor or declining condition).

On the basis of the selection process, two relevant VECs (Critical and Natural Habitat and Associated Species and Sustainable Woodland) were considered to be priority VECs and are considered further in the CIA.

13.13 Conclusions

This chapter has assessed the potential and residual impacts of the Project on terrestrial vegetation within the Project AoI. In consideration of the objectives of PS6, there is a requirement to achieve no net loss of natural habitat and net gain of Critical Habitat. The assessment has identified certain plant species as receptors, based on whether they are CHQS and/or reserved species defined by Schedule 8 to the National Forestry and Tree Planting Regulations (Ref 13-8); some receptors species belong to both categories. These are referred to as priority species. In addition, threatened ecosystems and protected areas are also defined as receptors in this assessment.

The assessment has been based on a consideration of how the Project as planned is likely to interact with those identified receptors through each stage of the Project. Having identified the receptors the potential impacts on those receptors have been defined. Potential impacts have been considered as being direct, i.e. those impacts that may occur as a consequence of the Project design or activities, or indirect, which may occur as a result of induced effects, for example an associated increase in human population that puts pressure on biodiversity through habitat loss or direct loss of species.

The assessment of potential impacts takes into account embedded mitigation that has been designed into the Project, as described in ***Chapter 4: Project Description and Alternatives***. This embedded mitigation addresses the requirements of the mitigation hierarchy with a strong emphasis on avoidance as a first stage in the hierarchy and therefore the Project design. To this end, extensive surveys have been undertaken of all Project components within the Project Area, including well pads, camps, flow lines, access roads, borrow pits and all other identified Project elements, in order to ensure that sensitive features have been mapped, evaluated and where possible avoided.

However, in any project it is not possible to avoid all impacts (particularly where these are more intangible, such as seasonal restrictions) and therefore, on an iterative basis, further additional mitigation has been identified. This additional mitigation comprises generic mitigation as well as some species specific mitigation where appropriate.

13.13.1 Species and threatened ecosystems

The findings from the assessment of direct impacts indicate that, taking all embedded and additional mitigation into account, the residual impacts on species and on threatened ecosystems will generally not be significant. This is because most of the species have been avoided or are not present within the Project Area and are therefore unlikely to be subject to direct impacts. Various NFA reserved species were recorded particularly within the Buliisa area, outside of the MFNP and Ramsar site; again, the avoidance process has allowed the Project to avoid significant impacts to those species.

The one exception to this is the Forest-Savanna Mosaic threatened ecosystem. This ecosystem represents the remnant forest patches within the overall savanna landscapes, which are generally outside of protected forests. This ecosystem is already under threat particularly due to rapid loss of its remaining forest patches. Indirect impacts of the Project, due to induced influx of people to the area, are likely to increase as the Project progresses and this will mean increasing pressure on remaining forested areas as they are cleared for subsistence farming and for fuel. The impact on this receptor is defined as Moderate significance and is a significant adverse impact. Table 13-38 below provides a summary of the residual impacts on species and threatened ecosystems for each stage of the Project, taking embedded and additional mitigation into account.

Table 13-38: Summary of Residual Impacts on Species and Threatened Ecosystems (All Phases)

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Residual Impact
Species				
Afrothismia winkleri (parasitic plant)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Brazzeia longipedicellata (woody plant)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Dialium excelsum (flowering plant – legume)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Uvariodendron magnificum (small tree)	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Psilotrichum axilliflorum	D	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Encephalartos macrostrobilus	E	VERY HIGH	NEGLIGIBLE	LOW ADVERSE
Afzelia africana (tree)	A	HIGH	NEGLIGIBLE	LOW ADVERSE
Khaya senegalensis (tree)	A	HIGH	NEGLIGIBLE	LOW ADVERSE
Albizia ferruginea (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Antrocaryon micraster (woody plant)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Brachylaena huillensis (hard wood tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE

Receptor	Landscape Context(s)	Receptor Sensitivity	Impact Magnitude	Residual Impact
Chytranthus atroviolaceus (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Cordia millenii (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Encephalartos septentrionalis (cycad)	E	HIGH	NEGLIGIBLE	LOW ADVERSE
Entandrophragma angolense (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Entandrophragma cylindricum (tree, sapele)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Entandrophragma utile (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Guarea cedrata (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Holarrhena floribunda (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Irvingia gabonensis (wild mango tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Khaya anthotheca (tree, mahogany)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Khaya grandifoliola(tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Lovoa swynnertonii (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Lovoa trichilioides (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Milicia excelsa (tree)	D F	HIGH	NEGLIGIBLE	LOW ADVERSE
Citropsis articulata (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Efulensia montana (liana)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Guarea cedrata (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Millettialacus alberti (flowering plant – legume)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Uvariodendron magnificum (tree)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Albizia spp. *[A. coriaria & A. grandibracteata]*	D F	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Aningeria altissima	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Aningeria adolfifriederici	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Canarium schweinfurthii	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Cordia millenii	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Dalbergia melanoxylon	A D F	HIGH	NEGLIGIBLE	LOW ADVERSE
Entandrophragma (all species)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Erythrophleum guineense	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Fagara (all species)	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Faurea saligna	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Ficalhoa laurifolia	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Ficus spp.	D F	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Hallea rubrostipulata	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Juniperus procera	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Khaya (all species)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Lovoa (all species)	D	HIGH	NEGLIGIBLE	LOW ADVERSE
Maesopsis eminii	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT
Mangifera indica	D F	MEDIUM	NEGLIGIBLE	INSIGNIFICANT

Receptor	Landscape Context(s)		Receptor Sensitivity	Impact Magnitude	Residual Impact
Mildraediodemdron excelsum	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Morsus lactea	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Newtonia buchanani	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Ocotea usambarensis	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Olea hochstetteri	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Olea welwitschii	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Osyris spp.	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Piptadeniastrum africanum	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Podocarupus (all species)	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Prunus africana	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Pygeum africanum	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Symphonia globulifera	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Vittaleria paradoxa	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Warbugia ugandensis	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Threatened Ecosystems					
Dry Acacia Savanna	E		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Forest-Savanna Mosaic	D		HIGH	LOW*	**MODERATE ADVERSE***
Moist Acacia Savanna	F		HIGH	NEGLIGIBLE	**LOW ADVERSE**
Moist *Combretum* Savanna	A	B	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Butyrospermum Savanna	E		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Palm Savanna (*Borassus* palms)	B	F	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**
Hyparrhenia Grass Savanna	A		MEDIUM	LOW	**LOW ADVERSE**

* Note: For the Site Preparation and Enable Works Phase the impact magnitude on forest savanna mosaic will be negligible with a LOW residual impact. However, in later stages of the Project the impact magnitude will increase to LOW and the residual impact to MODERATE.

13.13.2 Protected Areas

In addition to potential and residual impacts on plant species and on threatened ecosystems the impact of the Project on protected areas has also been assessed. This has considered the direct and indirect impact of the Project separately. The significance of residual impacts is summarised in Table 13-39 below.

Table 13-39: Summary of Residual Impacts on Protected Areas (All Phases)

Protected Area	Residual Impact Type	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
MFNP & Karuma WR	***Direct***	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**
	Indirect	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**
Bugungu WR	***Direct***	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**
	Indirect	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**
Budongo CFR	***Direct***	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**
	Indirect	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**
Forest Reserves in Masindi Area	***Direct***	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**
	Indirect	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**
Bugoma Forest	***Direct***	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**	**LOW ADVERSE**
	Indirect	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**	**MODERATE ADVERSE**

For most protected areas the nature of residual impacts described above are similar and there are unlikely to be significant direct impacts because Project infrastructure will not be present within them. The exception is for the MFNP (& Karuma WR) where direct residual impacts on grassland habitats within the MFNP could occur where 10 well pads, associated flowlines and other Project related infrastructure (e.g. access tracks), will be constructed and operated over an extended period.

This would result in direct loss of the threatened ecosystem *Hyparrhenia* Grass Savanna receptor. However, there are unlikely to be direct losses of the two CHQS plant species associated with the MFNP, as these have been identified and considered through the avoidance process. Indirect impacts on the MFNP may also be significant. This may include loss of habitat due to firewood or plant collection, fire setting, poaching activities and land clearance and settlement activities.

Overall the assessment assumes effective implementation of management plans in relation to the MFNP to mitigate potential direct/indirect and in-combination impacts. Although the area of the park is large and the relatively small footprint of the Project within it, the residual direct adverse impacts are still expected to be Moderate significance.

For the other protected areas there will be no direct residual impacts from well pads, flowlines and other Project related infrastructure. The assessment assumes effective implementation of management plans to mitigate potential direct/indirect and in-combination impacts. Overall, because there will be no direct impacts on the other protected areas, as there will be no Project elements placed within them, the residual direct impacts is insignificant.

However, potential indirect impacts on the protected areas are expected to be more diffuse in origin although probably more long term and difficult to manage, particularly as the protected areas are located with the Project AoI and in some cases some associated infrastructure will be placed close by, which are likely to generate a significant influx of people throughout the Project's life. Overall a residual impact of Moderate adverse has been defined for protected areas due to this risk of induced impacts from influx of people to the region.

13.13.3 Residual Impact and No Net Loss/Net Gain

From the above impact assessment, it should be noted that for the most sensitive species, particularly those that comprise CHQS it is difficult to mitigate down to an insignificant condition using standard Project level mitigation.

This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain for Critical Habitat lost or compromised as a result of the Project and CHQS is required. These actions consist of the concept strategies (biodiversity conservation initiatives) (summarised in Section 13.8.2 above), which will be scoped and developed to achieve the quantitative targets presented in the report. These will be organised around three main priority areas aiming at improving protection of existing protected areas, particularly savanna, wetlands and forests; improving connectivity between areas of natural habitat; and improving the quality of existing habitats.

These initiatives will include working together with other developers, local and national government agencies and other relevant stakeholders through partnerships and other arrangements. The success of these initiatives relies therefore heavily on an optimum multiple Parties partnership. Given the complexity of the Project, the Project Proponents will adopt a practice of adaptive management in which the implementation of defined mitigation and management measures will be responsive to changing conditions. Long term monitoring of agreed indicators will be required to ensure that the identified requirements for no net loss / net gain and fulfilment of all defined mitigation management objectives have been achieved.

13.14 References

Ref. 13-1 Republic of Uganda, *The Constitution of the Republic of Uganda*, (1995).

Ref. 13-2 Republic of Uganda, *The National Environment Act, Cap. 153* (1995).

Ref. 13-3 Republic of Uganda, *The Uganda Wildlife Policy,* (2014)

Ref. 13-4 National Environment Management Authority, Uganda, *Guidelines for Environmental Impact Assessment in Uganda,* (1997).

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14 – Terrestrial Wildlife

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14 Terrestrial Wildlife

14.1 Introduction

This chapter of the Environmental and Social Impact Assessment (ESIA) sets out the baseline and impact assessment relating to terrestrial wildlife, which in this assessment means the fauna present (or likely to be present) within the Project Area. This chapter should be read and considered in conjunction with ***Chapter 13: Terrestrial Vegetation*** and ***Chapter 15: Aquatic Life***.

The chapter identifies the relevant sensitive receptors within the Project's Area of Influence (AoI) and in the assessment considers the potential for these receptors to be impacted by Project activities. The approach to the assessment follows the recommendations of the *International Finance Corporation (IFC) Performance Standard 6 (PS6): Biodiversity Conservation and Sustainable Management of Living Natural Resources* (Ref 14-15) and other applicable standards.

An overview of the scoping process that was undertaken is briefly described, during which receptors were initially identified through an analysis of available survey data and a review of local, national and international requirements and standards, and the potential impacts identified.

The chapter describes the existing baseline conditions within the AoI including presence (or likely presence) of what is referred to in this assessment as "priority species" of mammals, herpetiles (reptiles and amphibians), birds and insects, specifically butterflies and dragonflies[1]. There are a very large number of species present within the Project AoI but it is not feasible for the assessment to assess the impact of the Tilenga Project on all of them individually. Therefore the assessment prioritises those species that are considered to be of particular importance.

Priority species are consequently defined in this assessment as those species identified as Critical Habitat Qualifying Species (CHQS) as well as certain other species that, although not CHQS, are regarded by stakeholders as being of conservation concern. The baseline is based on review of previous studies and the results of fieldwork undertaken directly for this ESIA by the Project ESIA team.

The assessment then presents the potential impacts, both direct and indirect, on the identified receptors (priority species), which take the embedded mitigation into account. Assuming successful application of the additional mitigation for potential direct and indirect impacts, the residual impacts on the identified receptors are evaluated.

Based on the assessment of residual impacts further mitigation may be required in line with the overall commitment for this project to comply with the requirements of IFC PS6, to ensure no net loss of natural habitat and net gain of critical habitat that is lost or compromised by the project, even after all additional mitigation is taken into account.

The outline for the agreed and further mitigation is included within the ESMP Mitigation Checklist and discussed in ***Chapter 23: Environmental and Social Management Plan (ESMP)***. In addition, the potential for cumulative impacts with other projects in the Project's AOI is considered separately in ***Chapter 21: Cumulative Impact Assessment***.

The Project has adhered to the 'mitigation hierarchy' as defined in IFC PS6, i.e. that potential impacts should be progressively avoided, minimised and restored, or measures taken to achieve net gain if necessary (see below and also section 14.8 of this chapter where this latter stage is discussed in more detail), with priority given to the actions which are earliest in the hierarchy and consequently least disruptive to the receptor. A full description of the process in place is included in ***Chapter 4:***

[1] *It is acknowledged that many other macro-invertebrate taxa could have been used to represent invertebrate fauna in these studies (such as arachnids). However, previous surveys within the Albertine Graben, that actually included invertebrates, have concentrated particularly on Lepidoptera and Odonata and it was decided to continue that focus in this study.*

Project Description and Alternatives. Therefore, the Project has sought and will continue to seek to avoid impacts on biodiversity.

When avoidance of potential impacts has not been possible, measures to reduce impacts to an acceptable level and to restore biodiversity will be implemented. Measures to achieve net gain are only considered if there are residual impacts even after implementing the earlier actions in the mitigation hierarchy.

Given the complexity of the Project, the Project Proponents will adopt a practice of adaptive management in which the implementation of defined mitigation and management measures will be responsive to changing conditions. Long term monitoring of agreed indicators will then be required to ensure that the identified requirements for no net loss / net gain and fulfilment of all defined mitigation management objectives have been achieved.

14.2 Scoping

ESIA Scoping was undertaken and produced a detailed document summarising all available ecological (and other) studies relating to the Project AoI. The objective of scoping was to identify potentially significant impacts on all receptors, including terrestrial wildlife, in order to develop an agreed focus for the subsequent impact assessment.

The Scoping report summarised background information regarding terrestrial wildlife receptors associated with the project, based on information available at that time. This comprised mainly information based on the CA-1 and LA-2 Baseline Study reports as well as other ESIAs that had been prepared for previous activities such as individual test drilling sites, seismic surveys, etc. Reference was also made to on-going studies, the main findings of which, now available, are summarised in the baseline section below.

Potential impacts on terrestrial wildlife identified during scoping are summarised in Table 14-1, which for clarity also includes impacts on habitats. This is because the presence and sensitivity of terrestrial wildlife species are habitat dependent and therefore potential impacts on habitats are likely to have impacts on the animal species associated with them. It is worth noting that the Project phasing and identified list of potential impacts have evolved during the completion of this ESIA and consequently build and expand on those originally identified in Table 14-1 during the Scoping phase.

Table 14-1: Potential Terrestrial Wildlife Impacts identified in the Scoping Report

Potential Impact	Potential Cause	Potential Sensitivity	Phase
Potential impacts on terrestrial habitats (e.g. loss and/or fragmentation of habitat, population impacts, disturbance, barrier effects) associated with priority species	Site preparation and construction activities including vegetation clearance.	Natural Habitats and Critical Habitat-qualifying biodiversity in the Project Area, including threatened ecosystems and protected areas (e.g. MFNP and Bugungu Wildlife Reserve).	Construction
Potential impact on priority species (e.g. loss of habitat or fragmentation, population impacts, disturbance, barrier effects)	Site preparation and construction activities including vegetation clearance.	Habitats in the Project Area, including protected areas likely to comprise Protected Areas supporting priority species including CHQS (e.g. MFNP and Bugungu Wildlife Reserve).	Construction
Potential indirect impacts (e.g. loss and/or fragmentation of habitats, population impacts though species exploitation, disturbance, barrier effects) resulting from in-migration	Increase in presence and movements of personnel and numbers of people	Natural Habitats, Protected Areas, CHQS and other priority species associated with these habitats.	Construction and Operation

Potential Impact	Potential Cause	Potential Sensitivity	Phase
and induced access. This may also include introduction or spread of invasive or alien species.	supplying/ supporting personnel.		

14.3 Legislative Framework

This Section summarises the main legislation and standards pertaining to terrestrial wildlife receptors. These include those applicable to environmental protection issues in Uganda, relevant international conventions and agreements and the provisions of recognised environmental standards and guidelines. For the purposes of this study, a consistent set of standards are required to frame the interpretation of the results of field surveys, where appropriate.

The Constitution of the Republic of Uganda (1995), sets out the concepts of sustainable development and environmental rights, specifically National Objective XXVII (Ref. 14-1) relating to sustainable development, the natural environment, energy policy and national parks; and National Objective XIII relating to protection of important natural resources, including land, water, wetlands, minerals, oil, fauna and flora on behalf of the people of Uganda.

It should be noted that a consistent set of standards are generally required to frame the discussion of the results of field surveys and/or assessments. However, in the context of terrestrial wildlife surveys there are no 'standards' as such to compare results against and therefore the legislation identified above is presented mainly to put this element of the assessment into legislative context.

A detailed analysis of national legislation is presented in ***Chapter 2: Policy, Regulatory & Administrative Framework*** of this ESIA. Of these national legislative instruments, a number are directly relevant to the terrestrial wildlife as listed in Tables Table 14-2 and Table 14-3.

Table 14-2: National Legislation and Guidance

Legislation/ Guidelines/ Standard	Key Provisions/ Requirements	Application to the ESIA and limitations
Policies		
The Wildlife Policy (2014). (Ref 14-3)	Recognises that wildlife is a key socio-economic resource for Uganda. Outlines the status and threats to wildlife in Uganda and defines the protected areas in Uganda and their conservation importance.	Refers to protected areas used to define scope of surveys.
National Policy for the Conservation and Management of Wetland Resources (1995) (Ref 14.75)	The policy aims at curtailing the loss of wetland resources and ensuring that benefits from wetlands are sustainable and equitably distributed to all people of Uganda.	Relate to protection of wetland resources which are a significant potential receptor for Project Activities
Acts		
Uganda Wildlife Act, Cap 200 (2000). (Ref 14-6)	Designed to protect wildlife resources and enable derivation of benefits.	Identifies restrictions on collection of species from the wild.
The National Forestry and Tree Planting Act (2003). (Ref 14-7)	Provides for the conservation, sustainable management and development of forests for the benefit of the people of Uganda.	Framework for conservation of forests, including formation of the National Forest Authority (NFA). Important because forests and the trees they contain are regarded as receptors in the ESIA.

Legislation/ Guidelines/ Standard	Key Provisions/ Requirements	Application to the ESIA and limitations
Prohibition of the Burning of Grass Act (Cap. 33). (2000) (Ref 13-53)	Act sets out that the burning of grass by any person is prohibited in all areas of Uganda, except under authority and under the supervision of specified public officers.	Relates to legal management of grassland areas.
Regulations		
The National Forestry and Tree Planting Regulations (2016). (Ref 14-8)	Statutory instrument related to The National Forestry and Tree Planting Act (2003)	Lists NFA Reserved Species that represent potential receptor species in the assessment.
Uganda Wildlife (Murchison Falls National Park) Bylaws- S.I 200-3 (Ref 13.55)	Sets out bylaws for prohibited activities within MFNP.	Defines prohibited activities within MFNP.
The National Environment (Wetlands, River Banks And Lake Shores Management) Regulations, No. 3 (2000) (Ref 13.54)	Provides for the conservation and wise use of wetlands and their resources in Uganda, ensuring water catchment conservation, control of pollution, flood control, sustainable use of wetlands for ecological and tourist purposes.	Defines protection of wetland habitats in Uganda
Guidelines		
The ESIA Guidelines published by NEMA in 1997 (and Energy Sector EIA Guidelines in 2004). Ref 14-4; Ref 14-5)	Define the ESIA process and procedures to be undertaken.	General requirements for good practice in baseline data collection.
Operational Guidelines for Oil and Gas Exploration and Production In Wildlife Protected Areas, UWA January 2014)	The guidelines are intended to act as a guiding tool to oil companies working within the protected areas to minimise impacts from their activities.	Objectives of the guidelines are to minimize long and short - term negative impacts of oil and gas developments on the integrity of protected areas and associated ecological processes and on tourism; to regulate activities of oil companies within protected areas; and to enhance awareness and appreciation of conservation among the oil companies. Has applicability to development of mitigation measures although these relate to minimisation of impacts rather than avoidance or offsetting.
TEP Uganda Biodiversity Charter (2013). (Ref 14-16)	Defines TEP Uganda's biodiversity objectives.	This document sets out the requirement for protection of biodiversity and implementation of appropriate mitigation. See ***Chapter 2: Policy*** which discusses this is in more detail.
Management Plans		
Murchison Falls National Park, Karuma Wildlife Reserve & Bugungu Wildlife Reserve (Murchison Falls Protected Area) General Management Plan (GMP) (2012-2022)	Sets out the management objectives for the MFPA until 2022. The GMP has been structured into different programs including; Resource Conservation and Management, Monitoring and Research, Community Conservation, Tourism Development and Park Operations.	Ten of the well pads plus associated roads and flowlines are located within the MFNP. Development of mitigation needs to take management objectives into account. There may also be indirect impacts on the Bugungu wildlife reserve.
The National Forest Plan 2011/12 – 2021/22. Ministry Of Water And Environment Directorate Of	The National Forest Plan (NFP) is a sector-wide national instrument for managing and utilising the forestry resources in Uganda.	General overview of how forests are to be managed. Key strategies for restoration and conservation of natural forests comprise:

Legislation/ Guidelines/ Standard	Key Provisions/ Requirements	Application to the ESIA and limitations
Environmental Affairs. January 2013	The strategic objectives are to: 1. Increase economic productivity and employment through forest production, processing and service industries; 2. Raise incomes for households through forest-based initiatives; 3. Restore and improve ecosystem services derived from sustainably managed forest resources.	1. Restore / rehabilitate degraded and deforested natural forests in CFRs and wildlife conservation areas 2. Promote the restoration / rehabilitation of natural forests on private and communal lands 3. Restore / rehabilitate water catchment areas and fragile ecosystems (bare hills, river banks, lakeshores, wetlands) 4. Build capacity for community based natural resource/forest management (CBNRM) and collaborative forest management (CFM) 5. Promote the development of natural forest related enterprises 6. Promote conservation of biodiversity in priority forest reserves and wildlife conservation areas 7. Promote management of important biodiversity corridors on private and communal land.
Forest Management Plan for Budongo Central Forest Reserves (Budongo, Siba, Biiso, Kitigo, Busaju and Kaniyo-Pabidi Blocks) 2011–2021 (2012), Ministry of Water and Environment	The Management Plan has been prepared to ensure that the Budongo Central Forest Reserve is sustainably managed, with high quality forest related products and services supplied to Government, local communities, the private sector and the international community on a sustainable basis.	Objectives are to: Enhance biodiversity conservation of the Budongo Forest Resource Increase supply of timber and non-timber forest products for local and national requirements. Integrate communities in the management of Budongo CFR and their livelihoods improved. Improve stock levels through gap and enrichment planting in the forest. Enhance Budongo CFR ecological systems capacity to sequester carbon and provide other environmental services. Budongo CFR is actively managed by NFA. Tourism is an important feature of Budongo CFR. Main threats include illegal logging activities, habitat clearance and poaching, including from the chimpanzee population. Current threats to the Budongo CFR may be exacerbated by population changes in the vicinity, induced by this project.
Forest Management Plan For Bugoma Central Forest Reserves Area 2012-2022 (2012) Ministry Of Water And Environment	Objectives include: To conserve “in-situ” forest biodiversity and ecological conditions; To produce economically and sustainable hardwood timber and non-timber products; To integrate local communities adjacent to the forest in participatory management of the forest reserve; To promote commercial tree planting using quick growing species that will supply timber to supplement naturally growing trees;	These forests are actively managed by NFA. Main threats include illegal logging/pitsawing activities, pole cutting, habitat clearance, poaching and resource collection including firewood and fibres, and illegal removal of herbs. The management plan identifies current threats to the Bugoma CFR which may be exacerbated by population changes in the vicinity, induced by this project.

Legislation/ Guidelines/ Standard	Key Provisions/ Requirements	Application to the ESIA and limitations
	To carry out research in order to obtain information on various aspects of forest ecosystem dynamics; and To develop recreational facilities for the people of Uganda and others.	

Table 14-3: International Legislation and Guidance

Legislation/ Guidelines/ Standard	Key Provisions/ Requirements	Application to the ESIA and limitations
Conventions (to which Ugandan Government is a signatory)		
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) – UNESCO (1971). (Ref 14-9)	Defines criteria for the designation of Ramsar sites.	General controls on activities in the Victoria Nile Ramsar Site.
Convention on Biological Diversity (CBD) – United Nations (1993). (Ref 14-10)	International convention to protect biological diversity.	Identifies restrictions on collection of species from the wild.
Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) – United Nations Education Scientific Organisation (UNESCO) (1972). (Ref 14-11)	International convention to protect biological diversity and World Heritage Sites.	Refers to protected areas used to define scope for surveys.
African Convention on the Conservation of Nature and Natural Resources – Organisation of African Unity (OAU) (1968). (Ref 14-12)	International convention relating to protection of natural resources.	Identifies restrictions on collection of species from the wild and the damage to habitats.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1975). (Ref 13-13)	International convention to prevent or control trade in certain endangered species.	Identifies restrictions on collection of species from the wild.
Guidelines		
IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. (Ref 14-14)	Requirement for (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement; and (iii) the client's management of environmental and social performance throughout the life of the project.	This Performance Standard sets the overall approach to undertaking the ESIA for the Project.
IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. (Ref 14-15)	PS6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The objectives of PS6 are: • To protect and conserve biodiversity. • To maintain the benefits from ecosystem services. • To promote the sustainable	Identification of potential impacts on qualifying features related to and which define modified, natural and critical habitat, as well as legally protected and internationally recognised areas. Protection and conservation of biodiversity through implementation of the mitigation hierarchy.

Legislation/ Guidelines/ Standard	Key Provisions/ Requirements	Application to the ESIA and limitations
	management of living natural resources through the adoption of practices that integrate the conservation needs and development priorities.	
IFC EHS Guidelines for Onshore Oil and Gas Development (2007/2017)	Includes information relevant to seismic exploration, exploration and production drilling, development and production activities, transport activities including flowlines and pipelines, other facilities including pump stations, metering stations, pigging stations, compressor stations and storage facilities, ancillary and support operations, and decommissioning.	Directly applicable to the impacts associated with the project and therefore to inform the ESIA. This guideline was published in 2007 but a new version is currently in draft with the second round of consultations undertaken April-May 2017. The final version has not yet been published.
Cross Sector Biodiversity Initiative (CSBI) Cross Sector Guide for Implementing the Mitigation Hierarchy (2015)	Provides guidance on the mitigation hierarchy in relation to biodiversity and ecosystem services. It describes a sequence of four key actions – ‘avoid’, ‘minimise’, ‘restore’ & ‘offset’. It provides a best practice approach for sustainable management and works as a guide for the practical implementation of the mitigation hierarchy.	Identifying and agreeing mitigation is crucial to defining the residual impacts of the project. The principles of the mitigation hierarchy have been followed in the project design and will inform the development of further mitigation as identified through this impact assessment.

14.4 Spatial and Temporal Boundaries

14.4.1 Spatial Boundaries

For the purposes of this assessment, the Project Area covers the entire area of Block CA-1, EA-1A and LA-2 (northern part) and is defined to include terrestrial and wetland habitats that may be affected by changes during the different phases of the Project. Two spatial boundaries are considered for the purpose of this assessment:

- The **Primary Study Area** comprises the actual footprint of the Project’s infrastructure, including well pads, the Central Processing Facility (CPF)/Industrial area, flowlines, camps, access roads, etc., as set out in ***Chapter 4: Project Description and Alternatives.*** This is referred to as the Primary Study Area and therefore includes MFNP, the Murchison Falls-Albert Delta Wetland System Ramsar site and the community areas south of the Victoria Nile; and
- The Secondary Study Area comprises locations outside of the Primary Study Area but which may be affected by indirect or induced impacts associated with the Project. This is referred to as the **Project AoI** where it is considered that, even though it extends some distance from the Project Area and so there will not be any direct impacts, there may still be some impacts on sensitive receptors (such as protected areas and species associated with them). The AoI therefore includes locations where there may be indirect (induced) impacts, such as increased pressures on biodiversity e.g. from changes in local human populations associated with the Project. Furthermore, the secondary area contain areas where elements such as the feeder pipeline and refinery will be placed, as well as some associated Project infrastructure, such as new critical oil roads constructed by others. It is considered that areas that lie outside of the AoI are not likely to be subject to direct or indirect impacts caused by the Tilenga Project. The dashed line across

Lake Albert indicates that it is considered that the Tilenga Project is not likely to impact the southern part of the lake but acknowledges that there is connectivity across the whole waterbody.

The Project AoI therefore includes all of Murchison Falls National Park (MFNP), where the project infrastructure will be, the Murchison Falls-Albert Delta Wetland System Ramsar site and areas south of the Victoria Nile within both CA1 and LA2 (North). The AoI extends to the south of the primary area, where other Project associated (midstream) infrastructure is planned. The extent of the entire Project AoI is shown on Figure 14-1.

14.4.2 Temporal Boundaries

The proposed timescales for the Project are set out in ***Chapter 4: Project Description and Alternatives***. Impacts associated with Site Preparation and Enabling Works, Construction and Pre-Commissioning and Decommissioning phases may be different from those that may occur during Commissioning and Operations phase, although this may be difficult to define precisely as different phases will overlap for several years after commencement of Commissioning and Operations Phase (for example drilling will continue at some well pads when others are already operational).

The majority of site clearance, preparatory works, building of new roads, laying of pipelines and construction of well pads and the CPF will fall within the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases. The Commissioning and Operations phase will include on-going extraction of oil as well as maintenance of infrastructure. Decommissioning will take place during the final phase of the project. Decommissioning will comprise the final phase of the Project, and activities will be similar to those of Construction and Pre-Commissioning Phase, in terms of earthworks and changes vegetation.

The timescales and activities are discussed in ***Chapter 4: Project Description and Alternatives*** of this ESIA. Long term environmental planning and management should take any potential future impacts into account in determining and prioritising mitigation in good time in relation to the Project.

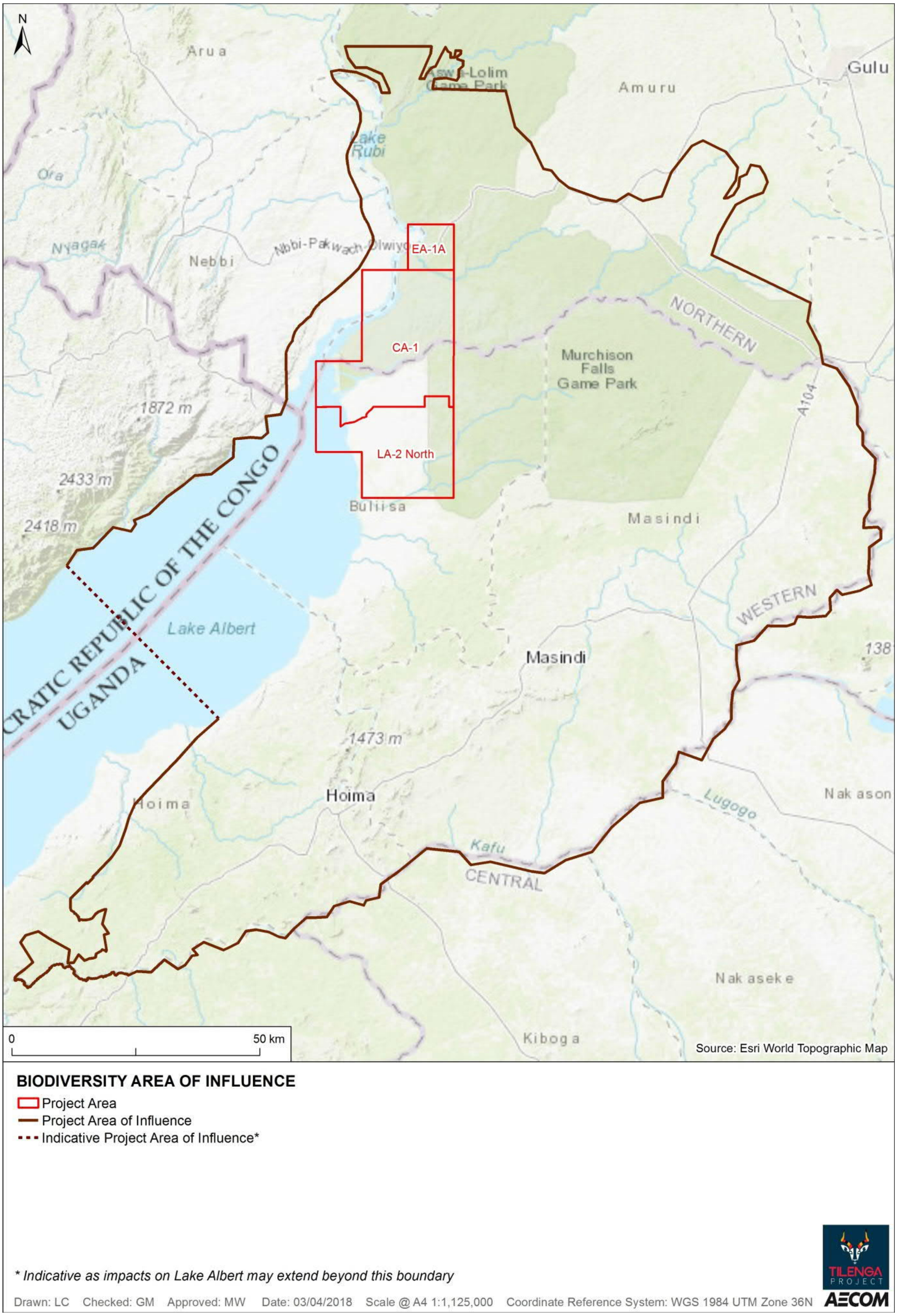

Figure 14-1: Project Area and Biodiversity Area of Influence

14.5 Baseline Data Collection

14.5.1 Introduction

The baseline element of this chapter is derived from two types of data, comprising a desk study review of previous reports ("secondary data"), and a summary of field survey results ("primary data") based on surveys commissioned for this project.

14.5.2 Desk study – Secondary data

A full review of previous studies was undertaken for this assessment, primarily as part of the Scoping Report / ToR (Ref 14.17), discussed above and also during preparation of an internal gap analysis report. A full documentary review was also undertaken as part of the Environmental Baseline Study (EBS) for EA-1 (CA-1) in 2015 (Ref 14.18) and the WCS gap analysis (Ref 14.24). The Baseline Characteristics description (section 14.6) incorporates findings from secondary data review and it is not proposed or necessary to reproduce all of those findings again here.

For the document review and gap analysis reports mentioned, the objective was to review the available information supplied by the Project Proponents and from elsewhere, to help inform the assessment of environmental impact within the Project AoI, to identify data gaps and to justify requirements for additional studies to inform the baseline and assessment. Available reports were reviewed to gain an understanding of the data and the information available for the assessment. This data gap assessment identified additional information considered necessary to complete the Project baseline characterisation.

The documentary study and the gap analysis referred to includes a full list of all of the reports and data sources reviewed as shown in Table 14-4 below.

The findings of the principal reports, relevant to terrestrial wildlife, which were reviewed as part of the Scoping exercise and gap analysis, are summarised in the following sections of this chapter.

Table 14-4: Secondary Data Sources

Document Title	Date	ESIA-Relevant Content and Limitations
Environmental Sensitivity Atlas for Murchison Falls National Park UWA	September 2017	The report is intended to be used by developers operating in the protected area to enable them to avoid and minimise loss of ecologically sensitive areas in the park. The atlas will also help managers focus their efforts in relation to any impact from the developments and provide appropriate responses. The atlas identifies sensitive areas that should be avoided in future development. The atlas is arranged in four chapters. Chapter 1: Provides background on the MFNP and highlights the features within the protected area that make it important for conservation. It gives the general background of oil exploration in Uganda, with specific information on oil and other developments in the park. Chapter 2: Gives information on the biophysical environment including flora and fauna, climate, soils, water, and tourism facilities. It provides information on the socio-economic environment and activities in and around the park. Chapter 3: Presents the different sensitivities of the park's ecosystem to developments. Different ecosystem components are ranked basing on drivers of change resulting from developments to determine the level of sensitivity. Chapter 4: Sets out conclusions based on the outcome of the sensitivity analysis and highlights recommendations to guide decision making.

Document Title	Date	ESIA-Relevant Content and Limitations
Environmental Baseline in Exploration Area 2 Review Report (AECOM) Volumes 1 – 3	2013	Summarises the findings of the first part of the Phase 1 Environmental Baseline Study (EBS) for Block EA-2 (now known as LA-2). The study purpose was to identify and characterise important biodiversity that might be affected by development in the vicinity of EA-2, both as a result of impacts resulting from oil-related activity within it, and from any development of offsets. In addition, this report identifies important biodiversity and gaps in Critical Habitat assessment in order to inform the scope of a Critical Habitat assessment of Block EA-2 and the detailed updated land cover land use analysis across the development undertaken by TUOP/WCS.
Assistance to Lake Albert Development Pre-Project Group (AECOM)	June 2012	'Short Report' Identification of High Level Environmental and Social Constraints to Inform Preliminary Development of Design Philosophies, covering high level constraints mapping in the Albertine Graben, covering Blocks 1, 2 & 3. Useful introductory review, including discussion of IFC PS6 issues.
Proposed East Nile 3D Seismic Survey - Revised ESIA - Volume I and II, (BIMCO Consult Limited, 2012)	Surveys were undertaken in the period June to September 2011	Presents an assessment of a proposed 3D seismic survey project in the East Nile area of Block EA-1. It provides an overview of the project, the legislative framework, the stakeholders involved, the social and environmental aspects in the project area and an assessment of the potential impacts of the project. The document provides survey information on the North and South Nile areas, collated on the basis of both secondary data sources and primary data gathered during field surveys in June and September 2011 and during consultations. A total of 27 field survey locations in the North Nile area and 18 field survey locations in the South Nile area were chosen to confirm available desktop information on vegetation, habitats, species (mammals, birds, herpetofauna & invertebrates). A total of six water sampling points were also identified to carry out aquatic surveys.
EIA/PBs from exploration and appraisal phase in the North Nile area (21 Reports) Atacama	2012	Each report provides a description of the proposed project, the legislative framework, the environmental and social baseline, and an assessment of the potential impacts of the project. A description of the biological environment that provides site specific information related to flora, fauna and avifauna around the well pad (within a 2 km radius) is included. The information provided in each report is site specific and only gives a short description of the fauna and flora species recorded near each well pad. Surveys undertaken as follows: Mpyo Field (May to Nov 2012); Til-A (April to July 2012); Raa-A (May to July 2012); Lyec-A (April to July 2012); Jobi-East Field (May to Dec 2012).
EIA/PBs from exploration and/ appraisal phase in the South Nile area (17 reports) Atacama	2012	Each report provides a description of the proposed project, the legislative framework, the environmental and social baseline and an assessment of the potential impacts of the project. A description of the biological environment that provides site specific information related to flora, fauna and avifauna around the site (within a 2 km radius) is included. The information provided in the report is site specific and only gives a short description of the fauna and flora species recorded near each well pad and the CPF. Surveys were undertaken: CPF (July 2012); Gunya Field (May, June, Dec 2012); Ngiri-C (May-June 2012).

Document Title	Date	ESIA-Relevant Content and Limitations
EIA/PBs from exploration/ appraisal phase in the West Nile area (6 reports) AWE	2012	Each report describes the proposed project, the legislative framework, the environmental and social baseline and an assessment of the potential impacts of the project. A description of the biological environment that provides site specific information related to flora, fauna and avifauna around the well pad (within a 2 km radius) is included. The information provided in the report is site specific and only gives a short description of the fauna and flora species recorded near each study site. These comprise well pads at Riwu-A, Ondyek-A, Alwala-A, Omuka-A, Okuma-A, and the camp sites at Adundu and at Pakech. Surveys were undertaken in April 2012.
TEP Uganda GIS Dataset	Various	Information related to sensitive vegetation, protected or vulnerable fauna and other specific features such as areas where a high prevalence of poaching has been recorded, rig paths, wildlife corridors, tourist areas are geo-referenced for the North and South Nile areas.
Kasamene Field Development EIA Scoping Report (Atkins/AWE)	2010	EIA scoping report covering well pads in Buliisa District.
An assessment of Impacts of Oil Exploration and Appraisal on Elephants in Murchison Falls National Park, Uganda WCS (A.J.Plumptre, S. Ayebare and T. Mudumba) (2015)	Jan 2014-June 2014 July 2014-Feb 2015	Analysis of elephant movements between September 2013 and February 2015 in the oil and gas exploration area in the Murchison Falls National Park. This report presents results that start to bring together the responses of elephants to individual oil and gas exploration activities into an analysis of combined impacts to assess whether oil and gas exploration activity had influence on elephant movements. Distance to drilling or testing sites were particularly influential in many of these models contributing a large percentage influence to the model. These analyses also show that natural factors are important in predicting the elephant distribution within their home ranges. Distance to water. Vegetation type and distance to the park boundary were often found to be important variables in the model outputs. The interesting finding that elephants tend to move to the north east of their ranges (north of Paraa lodge and south of the Tangi River) around the end of the December-February dry season and for much of the wet season in March-May is something that was not known previously. One possible reason this might be happening is that the grasslands may get burnt heavily during the dry season which would lead the elephants to move to the bushier north east. Eight individuals were collared in the period 11-13 September 2013. In addition, data relating to five individual collared in 2008 was also included.
Elephant Ranging Behaviours and Stress levels in Murchison Falls National Park, Uganda WCS (A.J. Plumptre, J. Mabonga, M. Ocaido, G. Mwedde, and S. Nampindo) (2017)	Nov. 2017	Report summarises an analysis of elephant movements, behaviours and stress level assessments between March 2016 and November 2017 for fifteen elephants collared in March 2016. This study increased the number of monitored individuals from 8 (during previous phase) to 15 to provide data for future monitoring of impacts from oil related activities on elephants. Information on ranges of individuals was mapped across seasons. The results show that ranging of the elephants is fairly consistent between seasons in the Buligi area and that range size doesn't vary very greatly between three month periods. Only the June-August

Document Title	Date	ESIA-Relevant Content and Limitations
		2017 ranges were larger than other times after the prolonged dry period. Bulls had significantly larger ranges than cows for most seasons attributed to the search for mates. The five cows that had been monitored over four years were fairly consistent in the areas they use in each season between years. Assessments of stress showed a marked difference between March-November 2016 and December 2016-November 2017 due to a prolonged dry season during the period December 2016-May 2017. This showed that natural events, such as climate change induced by can have a major effect on the baseline measures of stress and body condition.
Kingfisher Scoping Report Golders for Tullow	2014	ESIA scoping report covering EA-3. Of particular use in terms of format and approach to scoping undertaken.
Uganda–Tanzania crude oil feeder and export pipelines Environmental and social screening report (RSK)	2016	ESIA screening report covering the feeder pipeline to Hoima and the export pipeline (EACOP) from Hoima to Tanga on the Tanzanian coast.
Buliisa Development Pre-project ENVID Report (RGL)	April 2015	Report on Buliisa Development Environmental Impact Identification (ENVID) workshop held in the Total offices in Paris on 8th and 9th October 2014. Mentions some potential biodiversity receptors.
Surveying Crocodiles in the Victoria Nile / Ramsar Site of the MFNP.Geo-Texon Consult Ltd	March 2013 to April 2014	Objectives of the survey were to: update historic information on crocodile populations in the area by undertaking a comprehensive survey of the Ramsar site, focusing particularly on locating nesting areas, and determining seasonality of breeding and determine priority species/ ecological guilds for future research and monitoring. Undertaken with specific reference to the seismic ‘zippers’ in MFNP. Includes locations of crocodile roosts on the Nile banks over a twelve month period between March 2013 and April 2014. [See also Kaija-Baguma, R. 1996. Some ecological aspects of the Nile crocodile (*Crocodylus niloticus* Laurenti 1768) in the Murchison Falls National Park, Uganda. Progress Report No.2/96 for a M.Sc. of Makerere University].
Surveying Birds In The Ramsar Site Area Of Murchison Falls National Park. Nature Uganda	October 2014	Report on bird surveys in the Ramsar, relating to seismic surveys undertaken by TEP Uganda. The objective of this study was to obtain baseline data on priority species of birds in the Ramsar site i.e. threatened, protected, and resident and migratory species that aggregate and breed there. The study sought to provide the following information: • Distribution of the different bird species along the River. • Listing of concentration points for priority species. • Estimates of bird densities provided by the counts. • Mapped areas found with nests • The breeding bird species in the area. • Characterization and marking of important or special features (in relation to bird ecology) found in the area.

Document Title	Date	ESIA-Relevant Content and Limitations
Measuring responses of wildlife to oil operations in Murchison Falls National Park, (Prinsloo, P. et al., 2011)	Surveys were undertaken as follows Feb 2010 to June 2011	The report summarises the effects of oil exploration activities on large mammals and birds in four drill pads located in the MFNP. In particular the report assesses how animals respond to pad construction and pad maintenance between activities, and the impacts of drilling at a pad up to 2 km from the pad or drill site. The results show that activities at the oil pads are driving lower densities of large mammals and birds in MFNP in the vicinity of the well pads. The survey focused around four active oil sites, Buffalo East-1(BE-1), Buffalo East-3 (BE-3), Buffalo East-5 (BE-5) and Buffalo East (BE-4). Six 2 km transects were established at each of the four selected oil sites, for a total of 24 transects.
Kasemene Field Development - Ecology Site Walkover Surveys, (AWE)	June 2010	Basic account of ecology field surveys in the Buliisa area.
Aerial surveys of Murchison Falls Protected Area, Uganda, March 2010. Pachyderm, 47, (Rwetsiba, A. and Nuwamanya, E., 2010)	2010	Presents results of aerial survey of elephants and other medium and large sized mammals of MFNP and presents density maps for four species of mammals (elephant, giraffe, buffalo and Uganda kob). The paper presents results of the survey that suggested a general recovery and increase of major species, especially elephants, following a huge decline in numbers as a result of accelerated poaching that followed the breakdown of law and order in the 1970s and early 1980s.
Aerial Surveys of Murchison Falls National Park and Bugungu Wildlife Reserve. Lamprey, R.H. (FFI)	Sept. 2016 Surveys were undertaken between June 2015 and April 2016	Four quarterly aerial surveys were to determine seasonal wildlife numbers and distributions, with high sample intensity in the main exploration area (CA-1/EA-1A), and at lower sample intensity throughout the MFNP and Bugungu WR. These datasets will form the baseline against which the effectiveness of mitigation actions can be measured. The key species and variables to be counted and mapped were as follows: Primary goal species: elephant, buffalo, giraffe, hartebeest, kob, waterbuck, oribi and warthog. Opportunistic species/variables: vulture nests, shoebill, ground hornbill, crocodiles (inland ponds and wallows), dead animals (old, recent) and carnivores. Hippopotamus and details on burning were later added.
Aerial sample counts in Kidepo and Murchison Falls National Parks. Unpublished works. Report to Uganda Wildlife Authority. (Rwetsiba, A. and Wanyama, F., (2005)	2005	Aerial survey results for large mammals in the two parks; presents aerial survey counts results for large mammals that can be easily seen.
Ecological Surveys of Rothschild's Giraffe (*Giraffa camelopardalis rothschildi*) in Murchison Falls National Park, Uganda. Fennessy, J. & Brown, M.	Sept. 2016	Ongoing studies consisting primarily of non-invasive photographic surveys of giraffe over the entire extent of MFNP north of the Victoria Nile River. The data collected during these surveys were used to provide insights into baseline conditions of; population size, age composition, sex ratios, seasonal shifts in spatial dispersion of the population, individual movements and associated habitat types as well as information on foraging behaviour. There were seasonal shifts in habitat associations from post wet season surveys (July 2015 and December 2015) to the post dry

Document Title	Date	ESIA-Relevant Content and Limitations
		season survey (March 2016). Recognising these shifts in habitat associations, the key habitat categories for giraffe across seasons included: open grassland, dense woodland, wooded grassland with thicket and wooded grassland. In addition, giraffe tend to inhabit the east of the oil development area during late dry season.
Murchison Falls National Park, Karuma Wildlife Reserve, Bugungu Wildlife Reserve: Community-Based Wildlife Crime Prevention Action Plan (2017-2023) - UWA	April 2017	The aim of the Community Based Wildlife Crime Prevention Action Plan (WCPAP) is to provide a strategic vision to address wildlife crime within the boundaries of Murchison Falls Protected Area and surrounding communities.
Environmental Sensitivity Atlas for the Albertine Graben (NEMA, 2010)	2009	It contains information on the physical environment (geology, soils, surface and ground waters), receptors such as forest reserves, biodiversity and species of special importance, socio-economics like fishing, agriculture etc., coastal features and bathymetry of Lake Albert and the climate of the area. The Atlas mainly provides aggregate information related to the Albertine Graben; however, some maps contain useful data on the MFNP. The Atlas identifies those areas that may need special consideration in the event of an oil spill within the Albertine Graben area, i.e. shoreline wetlands which may harbour aquatic species of special importance; rare and threatened species; special habitats for migratory fish in search of breeding/nursery and feeding grounds. Zones of ecosystem services. There is incomplete information regarding fish species in relation to their specific habitats and breeding areas.
A Cumulative Impact Assessment (CIA) Framework for Proposed Oil Development Activities in the Albertine Rift, Uganda (eCountabilty and Community Insights Group, 2014)	2014	Rivers, wetlands and soil stability have been identified as potential priority Valued Environmental Components for further consideration in the cumulative impact assessment. The document is of importance for the Buliisa ESIA and CIA process (in relation to IFC PS1).
Ecosystem Services Review: Proposed Oil Development Activities in the Albertine Rift, Uganda (Treweek Environmental Consultants, 2015)	2015	Risks to ecosystem services, as a result of oil-related activity in the Albertine Graben, have been identified in several previous studies. The Partners' planned activities, as well as operators of associated development, notably the refinery, also depend on ecosystem services. The future sustainability of supply of these services could be affected by Partner operations and by third party actions, as well as by underlying social and environmental trends.
Phase 2 Biodiversity Study Land cover Mapping For The Albertine Rift Oil Development Basin, Exploration Areas EA-1-3 Interim Report (TUOP/WCS)	Feb 2015	Report summarising land cover/land uses over blocks EA-1A, CA-1, LA-2 and Kingfisher Development Area (KFDA) (formerly EA-3), expanding work done within LA-2. Objectives were to create a map that will support the following tasks: 1. Assist in the delineation of critical habitat and understand the biodiversity associated with different land cover types, including species distribution. 2. Provide a basis for mapping modified and natural habitat, species distribution thereby informing the placement of infrastructure, identification of opportunities for conservation gain and potential

Document Title	Date	ESIA-Relevant Content and Limitations
		Critical Habitat. 3. Provide a basis for monitoring land cover change. This includes creating a land cover classification with nested tiers to ensure compatibility with broader land cover maps (e.g. the NFA biomass series) as well as with finer scale biotope or vegetation association classes (specifically with Langdale Brown et al 1964). 4. Ground-truthing to ensure that observed differences detected on the imagery relate to distinct difference on the ground and use expert knowledge of the area in question to ensure that results are dependable.
Lake Albert Development Project, Uganda Ecosystem Services Assessment Study	2014	The purpose of the ecosystem services review is to provide information on trends in patterns of ecosystem service use and supply which will be addressed at landscape level and to identify data gaps for future data collection. It is intended to provide information relevant to the ESIA as well as other existing efforts. The report includes concerns raised during consultation meetings. It is anticipated that the following ecosystem services should be assessed provided that reliable data can be obtained: Capture fisheries; Trends in fish catches. Woody biomass for building materials and fuel; Wildlife--related ecosystem services including ecotourism, and wild food; and, Livestock-related ecosystem services including access to grazing land. The information will be useful to provide input into the characterisation of the baseline for ecosystem services. It is not possible at this stage to identify gaps in the study as they pertain to the ESIA. Follow up on the final Ecosystem Assessment Report – important for consideration in the Buliisa ESIA.
Draft Albertine Graben Physical Development Plan CPCS International Ltd	May 2014	A study to provide a physical development planning framework to promote and guide the development process in the Albertine Graben region in a sustainable manner through preparation of a 25 year integrated Physical Development Plan. Includes some environmental background.
Final Report: Nile Basin Initiative Nile Equatorial Lakes Subsidiary Action Program Environment And Social Management Plan For The Lakes Edward And Albert Fisheries And Water Resources Project Mid-Term Diagnostic Report, Lakes Edward and Albert fisheries pilot project (Development Consultants International Ltd., 2007)	2007	This report provides key findings as baseline information on the ecosystem functions in Lake Albert and Lake Edward, their fisheries and biodiversity, in-lake pollution status, catchment degradation processes, hydrological processes, fisheries, socio-economics of the fisheries, fisheries biostatistics, fish landing infrastructure, hygiene and fish quality problems and the status of policies, laws and institutions in the basins of the two lakes. It provides measurements of lake water quality and characteristics in both lakes and at selected stations in order to see prospects for pollution threats and pollution hot spots.

Document Title	Date	ESIA-Relevant Content and Limitations
Nile Basin Initiative Nile Equatorial Lakes Subsidiary Action Program Environment And Social Management Plan For The Lakes Edward And Albert Fisheries And Water Resources Project	April 2011	ESMP Action Program for poverty reduction and sustainable livelihoods for local fishing communities through effective control and management of Lakes Edward and Albert (LEA) Basin water and fisheries resources and the protection of its environment. Provides information on setting mainly from a socio-economic standpoint.
Albertine Rift (Plumptre A, et al., 2004) in Hotspots Revisited – Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions (eds. Mittermeier, R.A., et al.)	2004	The report evaluates the known levels of biodiversity in the different protected areas in the Albertine Rift (for plants, mammals, birds, butterflies, fish, amphibians and reptiles) and ranks the different protected areas for their biodiversity value. It identifies the presence of endemic or near endemic species and forms the basis for the subsequent designation of the Albertine Rift as a Biodiversity Hotspot among the Earth's biologically richest and most endangered terrestrial ecoregions. Information provided is on a park wide basis combining primary research data from a multitude of experts on the different taxa and their knowledge of MFNP biodiversity as well as secondary information on the park.
An analysis of socioeconomics of bush meat hunting at major hunting sites in Uganda, WCS working paper n.38, 2009, Olupot, W., et al.)	2009	The report presents the results of research into illegal bush meat hunting patterns and the reasons behind illegal hunting in and around some conservation areas, reserves or parks in Uganda, including the Murchison Falls Conservation Area (MFCA). The assessment presents data on the types of species that are hunted and their use (also in relation to local behaviour and traditions), on the reasons for hunting and on the locations where bush meat is supplied. The document provides some general background information relating to some of the pressures on biodiversity in the region, which may be useful for consideration of cumulative impact, particularly in terms of the effects of influx of people to the area during full development. www.wcs.org/science.
Strategic Environmental Assessment (SEA) of oil and gas activities in the Albertine Graben, Uganda, draft SEA report (PEPD and NEMA, 2013)	2013	An Albertine Graben wide report giving brief and general overviews of wetland flora, aquatic fauna, specifically on fish, and identifies data gaps on these regarding biodiversity, economic valuation, temporal and spatial hydrodynamics data. It also gives a general overview of the terrestrial flora and fauna as well as protected and sensitive sites in the Albertine Graben. The report provides general data for Lake Albert and general information for aquatic flora and fauna. http://www.petroleum.go.ug/documents.php?id=27
The IUCN Red List website	Last update: unknown	The International Union for Conservation of Nature (IUCN) aims to identify threatened and endangered species around the world. A recently introduced search tool allows identification of threatened species according to different criteria (location, species group and habitat). The site provides a list of threatened animal species and vegetation species of conservation concern. The Red List is constantly being updated but there are clear situations where species are data deficient (DD) and which therefore may not be accurately identified on the list, even though they are significant species, either because data concerning threats to them are not well recorded or because they may be locally rather than globally threatened. http://www.iucnredlist.org/

Document Title	Date	ESIA-Relevant Content and Limitations
Conservation Research in Uganda's Savannas, (Olupot W., et al., 2010	2010	Provides general information about the Park including about its history of gazettment, size, location, environment, mammal populations. The book is a savannas park wide assessment for the four savanna parks of Uganda (Queen Elizabeth, Lake Mburo, Kidepo Valley and Murchison Falls). It summarises different fauna and flora and conservation issues for each of the parks. A particular chapter of interest reviews population trends of large mammal species, eight of which occur in MFNP.
The National Biodiversity Data Bank (NBDB) website	Last update: unknown.	The National Biodiversity Data Bank (NBDB) aims to provide data and information on the country's biodiversity to scientists, conservationists, researchers, policy makers and other parties interested in the conservation and sustainable use of biological resources. The Biodiversity unit is based in the Makerere University Institute of Environment and Natural Resources (MUIENR) that acts as a central repository for biodiversity information within Uganda. The NBDB web site provides datasets related to plants, birds, mammals, amphibians, reptiles, insects and fish. Since 2000, biennial reports on the "State of Uganda's Biodiversity" are published by NBDB and to complement NEMA's "State of the Environment" reports. Specific request can be made to the MUIENR for data available on the web site. The biennial reports present general data and indices at country level, thus no specific data related to the project area are available. The last available report is dated 2008. http://nbdb.mak.ac.ug/
The Uganda Wildlife Authority (UWA) web site	Last update: unknown.	The Uganda Wildlife Authority (UWA) website provides general information on National Parks, accommodation, natural attractions and activities in Uganda. The site is focused on tourist information and provides a quick overview and contact information on natural attractions or tourist facilities in Uganda. The Google interactive map, updated July 2012, is a useful tool to obtain general georeferenced information. More specific information for each protected area is available from UWA directly and is available on request to the Monitoring and Research Unit, which provides the following services: • Information on wildlife management areas; • A Management Information System (MIST) (although these represent opportunistic data rather than systematic surveys and are therefore skewed to where the observations were made, rather than there being systematic recording of sightings and associating species with habitats, etc.); • A library; and • A research database for easy retrieval of information on all research projects, research organisations and personnel. http://ugandawildlife.org/
The Wildlife Conservation Society (WCS) - Uganda website	Last update: unknown.	The WCS website provides general information about its activities and projects all over the world, including Uganda. The WCS library and archives provide a list of references providing further and more detailed information related to specific topics (species, parks, etc.).

Document Title	Date	ESIA-Relevant Content and Limitations
State of the environment report for Uganda, (NEMA, 2010)	2014	After discussing environmental, social and economic issues in the country, the report presents the state of the environment through an assessment of the major natural resources: land resources; atmospheric resources; freshwater and aquatic resources; biodiversity resources; energy resources; and environmental vulnerability. In the concluding remarks, the report proposes future outlooks and policy options to address the identified challenges.
Important Bird Areas in Uganda, Status and Trends Report 2009, (NatureUganda, 2010)	2010	The report provides general information related to all of Uganda's IBAs, including some specific data concerning the IBA within MFNP, although it contains lists of species but no systematic survey data.
Birdlife International website	Assessment year 2012	The MFNP has been recognised as an Important Bird Area (IBA) since 2001. A general description of the site is provided and a list of birds identified in the area is presented. Provides information on presence of species in a certain defined area, such as the whole MFNP. http://www.birdlife.org/datazone/sitefactsheet.php?id=7060
Global Biodiversity Information Facility (GBIF) website	N/A	The website promotes and facilitates the mobilisation, access, discovery and use of information about the occurrence of organisms over time and across the planet. A Google Earth file is available with georeferenced information about occurrences of species within the MFNP. Sources of data are from different Institutions, Universities, Research Centres, etc.
Maintaining The conservation and tourism value of protected areas in petroleum development zones of the Albertine Rift, (Uganda Wildlife Society (UWS), 2009)	2009	The document underlines the importance of sustainable development where economic, environmental and social aspects can find a compromise. The document outlines a number of actions that both government and oil companies may consider and implement in order to minimise the ecological and tourist impacts of petroleum activities in the Albertine Rift region.
Uganda biodiversity and tropical forest assessment, (USAID Uganda, 2006)	2006	Apart from providing a general overview of the main biodiversity features in Uganda, the document highlights the main threats to conservation of natural areas. It also addresses: Ugandan legislation for the environment and biodiversity; Institutional framework for the protection of the environment; and Websites for environmental information.
Uganda's Forests, functions and classification, (NFA, 2005)	2005	The document presents information on the Forest Reserves in Uganda, their functions and, accordingly, their classification. Policies related to forest management are provided, together with a trend of the conservation status.
Murchison Falls – Albert Delta Wetland System Ramsar - Information sheet, (Byaruhanga, A. and Kigoolo, S., 2005	2005	The physical and ecological features of the Ramsar Site are described at a general level. A description of the social and cultural characteristics of the wetland site is also provided. Provides information on the Ramsar Site in general but is not site specific.

Document Title	Date	ESIA-Relevant Content and Limitations
Murchison Falls National Park - Karuma Wildlife Reserve - Bugungu Wildlife Reserve - (Murchison Falls Protected Area) - General Management Plan (2012-2022)	2012	The plan has several relevant chapters including figures and tables to enable conservation and management actions. It also has animal population numbers for various areas. The plan spells out the different use zones in the Park, recognising the need for Tourism, Wilderness, and Resource Use, Administrative and Alternative Management Areas and the fact that oil has been discovered in the MFNP.
MFPA Survey Results, unpublished data; personal communication Rwetsiba, 2014b	2010	Numbers of various large mammals.
Bird and mammal checklists for ten national parks in Uganda (Wilson, S.E., 1995)	1995	Checklists birds and mammals for Uganda's 10 national parks at the time of publication. Checklist is useful for providing a list of the then known mammals species for MFNP. It is reasonably complete for the birds and medium and large sized mammals.
The Atlas of Uganda, 1967	1967	The Atlas provides information on: physical environment, climate, vegetation and fauna, human geography, rural economy, industry and trade and town maps. Includes a map depicting vegetation types on a countrywide basis and provides a broad view of vegetation that would be expected to be found in Block CA-1.
Biodiversity of MFNP Tushabe,H. and Pomeroy, D.,	2000	The map was produced from field surveys and satellite imagery analysis. It shows five different levels of biodiversity, from Low to Very High. Open water and infrastructure are also shown. The data were collected from 18 sites well spread, and these were for plants, butterflies, birds and mammals. Also shown are species richness for each taxon, site rankings and mean ranks for each land use/cover type and Langdale-Brown vegetation type.
The Biodiversity of the Albertine Rift (Plumptre, A.J., et al, 2003)	2003	Assessments of levels of biodiversity for mammals, birds, reptiles, amphibians, butterflies and plants for various Protected areas of the Albertine Rift (AR). The report evaluates the known levels of biodiversity in the different protected areas (PAs) in the Albertine Rift (for plants, mammals, birds, butterflies, fish, amphibians and reptiles) and ranks the different PAs for their biodiversity value. It identifies the presence of endemic or near endemic species and forms the basis for the subsequent designation of the Albertine Rift as a Biodiversity Hotspot among the Earth's biologically richest and most endangered terrestrial ecoregions. The information provided is on a park wide basis combining primary research data from a multitude of experts on the different taxa and their knowledge of MFNP Biodiversity as well as secondary information for the park. Highlights species richness, levels of endemism and threatened species that were known for the different protected areas of the AR. Also lists species that are classified threatened by IUCN.

Document Title	Date	ESIA-Relevant Content and Limitations
The Biodiversity of the Albertine Rift. Biological Conservation, (Plumptre, A.J., et al, 2007)	2007	Assessments of levels of biodiversity for mammals, birds, reptiles, amphibians, butterflies and plants for various protected areas of the Albertine Rift. Highlights species richness, levels of endemism and threatened species that were known for the different protected areas of the Albertine Rift. Also lists species that are classified threatened by IUCN.
The effects of oil and gas exploration in the Albertine Rift region on biodiversity; A case of protected areas (Murchison Falls National Park) Review report Prepared for Nature Uganda (Kityo, R.M., 2011)	2011	A general overview of the oil exploration activities at the time, the known levels of biodiversity, highlights some potential impacts on Biodiversity as a result of the industry and makes suggestions for advocacy actions to mitigate the impacts. The report has summary figures on the species richness of parks in the Albertine Rift area including MFNP, graphs population trends of some species of large mammals in MFNP from aerial counts, lists important protected areas. http://www.natureuganda.org/downloads
Albertine rift conservation status report Albertine Rift Conservation Series No 1, (Kanyamibwa, S., 2013)	2013	Highlights the challenges for conservation and what conservation and policy actions are needed. Contains summary overviews on biodiversity status and trends on large mammals in general and a special focus on gorillas and chimpanzees, birds, amphibians and plants. www.researchgate.net
Estimating Population sizes of Lions *Panthera leo* and Spotted Hyena in Uganda's savannah parks, using lure count methods Oryx, 48(3), 394–401), (Okot, E.O, et al., 2013)	2013	Paper reports on the use of a lure count analysis method of call-up counts to estimate populations of lion and spotted hyena in three Uganda National parks. It reports estimated totals of 408 lions and 324 hyenas for the three conservation areas and suggests a general decline for lion population in the country.
Patterns in the species/environment relationship depend on both scale and choice of response variables Oikos 105: 117/124, (Cushman, S.A. and McGarigal, K., 2004)	2004	Review of strength of data for understanding animal community relations with their environment. Paper shows the merits of either using quantitative data or presence/absence data for understanding animal community relations with their habitats. www.jstor.org/stable/3547890
Vegetation change induced by elephants and fire in Murchison Falls National Park, Uganda. Ecology 42(4) ,752-766, (Buechner, H.K. and Dawkins, H.C., 1961)	1961	The paper presents evidence for hypotheses about the causes of the vegetation changes and the probable future vegetation under prevailing pressures. The paper showed that the luxuriant wooded grasslands, Terminalia woodlands, Cynometra rainforests, and riparian forests were in the process of conversion to treeless grassland through the combined action of elephants and fire. Field observations were combined with analysis of aerial photographs taken in 1932 and 1956 which photographs showed 55-59% reduction in trees with crown diameters greater than 9 m. The paper showed that none of the living trees was free from scars resulting from debarking by elephants, and nearly all were in a low state of vigour. Grassland vegetation characterised by Hyparrhenia filipendula, Brachiaria brizantha, and Andropogan canaliculatus increased in distribution following the destruction of woodlands. The basic cause of the conspicuous, rapid changes in vegetation was attributed to an extraordinary increase in the population of elephants.

Document Title	Date	ESIA-Relevant Content and Limitations
		http://www.jstor.org/stable/pdfplus/1933504.pdf?acceptTC=true&jpdConfirm=true
The biodiversity of the Murchison Falls Conservation Area. Kampala: MUIENR, (Pomeroy, D. (compiler), 2002).	2002	Highlights the importance of MFCA for conservation of biodiversity. The report has extensive lists of species of plants, birds and mammals recorded in different survey areas from which all data were collected.
Biodiversity and vegetation types in MFNP, (Kabesime, E., and Pomeroy, D., 1997)	1997	Highlights species of plants that dominated in the various Langdale Brown et al (1964) vegetation classification categories.
Report on Murchison Falls National Park waterfowl counts from 1992 to 2001. Kampala: MUIENR, (Nalwanga, D., 2001)	2001	Presents a synthesis of data on waterfowl counts conducted in MFNP from 1992 to 2001. Compares graphically the trend in numbers for four species but also gives extensive tables of the summary results.
Uganda National Parks (1971). Uganda National Parks Handbook. (5th ed.). Kampala: Longman Uganda.	1971	Information on mammals, birds, reptiles, fish insects and vegetation in the park also specific information for evidence of early human habitation in the area. Details species of birds and mammals known for the MFNP at the time, maps the vegetation types of the park, shows the Borassus Palm restricted to a small area near Pakwach. Provides some details Middle and Late stone age, as well as Iron age civilisations in the Chobe area of MFNP.
UWA MIST Database	Mid 1980s and continuing	Database contains records of mammals, poachers, poaching activities, fires, etc., that rangers on routine monitoring patrols record. Records are georeferenced.
Endemic Bird Areas of the World. Priorities for biodiversity conservation. BirdLife Conservation Series 7. Cambridge: BirdLife International, (Stattersfield, A.J., et al., 1998).	1998	Description of the Endemic Bird Areas (EBAs) of the world. Lists three EBAs - Albertine Rift mountains, Eastern Zaïre lowlands and Kenyan mountains for which only the first has some relevance for MFNP. Describes rationale of recognising an EBA. http://www.birdlife.org/datazone/info/pubEBAs
Bird atlas of Uganda. London: British Ornithologists' Union, (Carswell, M., et al., 2005)	2005	Details knowledge on occurrence of over 1000 species of birds for Uganda with maps of their known and potential range of occurrence. Makes mention where known of breeding status in country, residence status, habitat preference and conservation status for the species.
Land Cover Map, Wildlife Conservation Society, Uganda, 2013	2013	The map provides information about vegetation, land cover, physical features and land use for most of Block CA-1. The information includes vegetation classification variably based on density, age or height.

Document Title	Date	ESIA-Relevant Content and Limitations
NEMA Strategic Plan 2013-2018 Ugandan Government	2013	NEMA's strategic plan to 2013/14. Background information.
National Biodiversity Strategy and Action Plan II (NBSAP II) (2015-2025) NEMA	2016	The goal of the NBSAP II is to enhance biodiversity conservation, management and sustainable utilisation and fair sharing of its benefits by 2025 and support the Uganda Government's vision to maintain a rich biodiversity benefiting the present and future generations for socio-economic development. NBSAP II is the main instrument for implementing the Convention on Biological Diversity (CBD) at country level. NBSAP II provides Government with a framework for implementing its obligations under the CBD as well as the setting of conservation priorities, channelling of investments and building of the necessary capacity for the conservation and sustainable use of biodiversity in the country.
Environmental Risk Assessment – Oil and Gas Exploration in the Albertine Graben Norconsult	July 2014	Relates to development of oil spill contingency plans.
Report on Biodiversity Conservation Opportunities in the Albertine Rift. Tullow Uganda Operations Pty Ltd	February 2013	Quite high level but useful review of conservation opportunities in the Block EA 2 area, relying on IFC PS6.
"Developing a List of Nationally Threatened Species for Uganda" Red list workshop report 15/01/15 WCS	2015	Notes from Uganda Regional Red list workshop. General overview of process for red listing. Also, various species lists in preparation for all major taxonomic groups.
WCS & eCountability, (2016). Nationally Threatened Species for Uganda: National Red List for Uganda (Ref. 14.22).	2016	This list identifies and lists Ugandan species considered to be threatened at a national level and is extremely useful in determining sensitivity of receptor species.
Karuma hydro-power project (KHPP) ESIA Energy Infratech Private Limited (India) and WSS Service Uganda Ltd. (Uganda)	2011	Section 7 has a high level discussion of biodiversity within Karuma WR that provides some ecological context.

Document Title	Date	ESIA-Relevant Content and Limitations
Environmental & Social Impact Statement for the upgrade of: Kisanja-Park junction; Sambiya-Murchison Falls; Buliisa-Paraa; Paraa-Pakwach; Wanseko-Kasenyi-Kirango-Bugungu Camp Roads and associated bridges. UNRA	September 2017	In order to achieve first oil production by 2020 in Uganda, enabling road networks have to be in place to support Oil and Gas infrastructural developments and this ESIA covers the 'oil roads' located in Masindi, Buliisa and Nwoya districts. A total of 169 Km length of roads is proposed to be upgraded to bituminous standard within the whole project area. Of which 122km falls within MFNP. Following desk-study and scoping, baseline data on environmental characteristics of the area of influence of the proposed road upgrade project including biological (amphibians, reptiles, fish, mammals, plants, birds and butterflies), physical (air quality, hydrology, water quality, noise and vibrations) and socio-economic conditions were collected using authentic methods.
WCS & eCountability, (2016). Phase 2 Biodiversity Study, Volume 2 – Critical Habitat Assessment, (Ref. 14.19),	2016	Critical Habitat Assessment covering the Albertine Graben. Basis for subsequent TBC / FFI interpretative report (see below). Gives detailed reasoning for identification of CHQS and provides a lot of background information on CHQS in its appendix.
Phase 2 Biodiversity Study, Biodiversity Survey Volume 3 WCS (2017)	Surveys between Oct. 2014 & July 2015	Using the land-cover map digitised by WCS, and information on features of the Lake Albert lakeshore highlighted by field surveys, a number of representative sampling sites in Block 2 were identified based on the major habitat types' e.g. marginal and floating vegetation, rocky areas, lagoons, river mouths, sand/or muddy bottoms. Surveys were undertaken as follows: • First field campaign (October - December 2014) • Second field campaign (January 2015 to March 2015) • Third field campaign (May – July 2015) The survey covered plants, amphibians, reptiles, butterflies, dragonflies, large and small mammals. Although the survey recorded did not include CA-1 and LA-2 (north) directly these data were useful for ecological context and identification of Critical Habitat to inform the ESIA.
WCS & eCountability, (2016). Phase 2 Biodiversity Study: Volume 4, Land-Cover Mapping for the Albertine Rift Oil Development Basin, Exploration Areas EA-1-3	2017	Summarising land cover/land uses over blocks EA-1 to EA-3 (now known as EA-1A, CA-1, LA-2 and KFDA), expanding work done within LA-2.
TBC and FFI (2017) Critical Habitat Assessment: Interpretation of Results and Provision of Recommendations for ESIA. Report on behalf of Total E&P Uganda. The Biodiversity Consultancy and Fauna & Flora International, Cambridge, UK (Ref. 14.20).	2017	Report on behalf of Total E&P Uganda, Block EA-1, EA-1A and EA-2 North (now known as CA-1, EA-1A and LA-2 North, respectively). Identifies and refines Critical Habitat Qualifying Species (CHQS) and other features covering all PS6 criteria. Defines Landscape Context indicating presence and sensitivity of CHQS and other criteria.

Document Title	Date	ESIA-Relevant Content and Limitations
Biodiversity Surveys of Murchison Falls Protected Area WCS/UWA (2015) [A. J. Plumptre, A.J., et al.*]*	August 2015	Summarises the findings of a biodiversity survey of Murchison Falls Protected Area (MFPA - including Murchison Falls National Park, Bugungu and Karuma Wildlife Reserves).
Conserving Uganda's Biodiversity: Identifying critical sites for threatened species and habitats. WCS (2017)	2017	This study maps the variation in biodiversity richness across the country we then analyse which sites would qualify as Key Biodiversity Areas (KBAs). KBA criteria include assessment thresholds for globally threatened species (found on the IUCN red list) as well as restricted range species and important sites for congregations of a species. A total of 36 terrestrial/wetland KBA sites and nine freshwater sites are identified for Uganda. Thirty six KBA sites were identified for Uganda of which 10 are not currently protected. These include Budongo and Bugoma Forests and MFNP.
UWA (2010) Strategic Action Plan for Large Carnivore Conservation in Uganda. Uganda Wildlife Authority, Kampala, Uganda.	2010	Report covers the status of lion, leopard, spotted hyena, cheetah and African wild dog in Uganda. The report identifies the pressures on these species and sets out a strategy and action plan for the following objectives: 1. Habitat Loss and Degradation; 2. Poaching of carnivores/prey; 3. Human-carnivore conflict; 4. Raise awareness/support for large carnivores in Uganda; 5. Monitor and tackle diseases; and 6. Research and monitoring.
UWA (2016) Elephant Conservation Action Plan for Uganda (2016-2026). Uganda Wildlife Authority, Kampala, Uganda	2016	The report assesses threats to elephants in Uganda and defines an action plan with the strategic objectives of: 1. Halting poaching of elephants and trade in elephant products; 2.Minimising human-elephant conflict; 3. Controlling habitat loss and degradation; 4. Strengthening research on elephant conservation issues; 5 Promoting effective protection of elephants occurring through awareness, collaboration, resource mobilization and management; and 6) Identifying benefits from elephant conservation accruing to Ugandans.
WCS (2017) Critical Habitat Species Habitat associations and preferences (2017) Final Report (Ref. 14.23).	2017	This report analyses the habitat associations for 167 CHQS and other priority species. The main focus of the report relates to five[2] species on which it was considered to have sufficient data to be able to map their habitat associations and preferences accurately, using a phytosociological map created covering CA-1 and the northern part of LA-2.

[2] Elephant, lion, Lelwel hartebeest, Rothschild's giraffe and Uganda kob.

Document Title	Date	ESIA-Relevant Content and Limitations
WCS (2017) Implementation of Avoidance Gap Analysis for Research on Critical Habitat Species (2017) (Ref. 14.24).	2017	The report reviews data availability for CHQS: presents the information currently known on each CHQS (120 in total, of which); provides details of the additional survey and analysis requirements to enable reliable avoidance and mitigation of impacts; and, where appropriate, suggests the type of monitoring that should be carried out.
TBC & FFI (2017) Total E&P Uganda Block EA1, EA1A and EA2 North. Net Gain Pre-feasibility Report. Report on behalf of Total E&P Uganda.	2017	Presents a pre-feasibility study into options for achieving net gain of priority biodiversity for the Tilenga Project. Options for achieving no net loss/net gain are limited and therefore approaches with most potential in the Project context are likely to focus on: a) Enhancing species and habitat management within existing protected areas, including MFPA and Central Forest Reserves; and b) Community-based management of natural resources outside protected areas but within the Murchison Falls-Semliki landscape.
Tilenga Early Works Report AWE	Sept 2017	Biodiversity and other surveys were undertaken during 2017 at the following Project locations: i) Industrial area to locate the Central Processing Facility; construction camp (CC) and support base (CSB); operation camp (OC) and support base (OSB); ii) Proposed new roads to bypass towns along the route to minimize interference and impact to local communities and also reduce travel time to the Industrial area and other key Project locations; iii) Proposed road upgrades to enlarge roads to cater for anticipated Project traffic, and also provide suitable drainage on the roads; iv) Airstrip upgrade to enable handling of expected increased traffic. The objectives of this PB are to: a) Present baseline data on the physical, biological and socio-economic setting of the proposed project area; b) Predict and evaluate potential environmental and social impacts as well as benefits likely to result from the proposed project; c) Identify feasible and cost-effective mitigation measures for significant impacts identified; and d) Facilitate the preparation of an Environmental and Social Management Plan (ESMP) to ensure effective environmental and social management of the project during implementation.

14.5.3 Ecological surveys – Primary Data

A large number of field studies have been undertaken within the Project AoI, particularly within the MFNP but also with the Buliisa area and in the wider AoI.

However, for the purpose of this assessment, focus has been kept on recent surveys and/or those that relate to specific receptors within the Primary Study Area. In addition to those studies listed in Table 14-4 above, the principal field studies relating to terrestrial wildlife within the Primary Study Area are summarised in Table 14-5 below.

These studies have identified the presence of species of conservation concern some of which represent priority species for this assessment. The field survey reports generated by the Tilenga ESIA team for these studies are included in Appendix O.1.

Table 14-5: Summary of Directly Project-Related Field Surveys

Report Title	Period and Timeframe	Level of Effort (within Primary Study Area)	Sampling Locations	Survey Methodology	Field Study Team	Summary	Limitations
AECOM (2015) Block EA-1 Environmental Baseline Study (EBS) (Ref. 14.18).	Vegetation Surveys - Field Work May and July 2014	Approximately 120 person days	19 sampling locations, with an approximately 120 quadrats sampled	Quadrats around sampling locations in MFNP, west Nile and south Nile (Buliisa). Phytosociological mapping and recording of rare, notable and invasive species	Makerere University Botanists	Included detailed survey over two seasons in 2014 mainly within the MFNP, but also south of the Victoria Nile within EA-1 (now known as CA-1), for mammals, birds, herpetofauna and invertebrates. The study also included vegetation mapping for the block based on satellite imagery, previous mapping and extensive ground-truthing. Survey points were selected to provide a general coverage of vegetation types and likely oil exploration areas north of the Victoria Nile (within and adjacent to the MFNP), west of the Albert Nile and south of the Victoria Nile, mainly in the MFNP but also within the south Nile area within block CA-1. These findings are published in a separate stand-alone report;	Sample points were randomly placed with an attempt to characterise different habitat types. Sample points did not correspond to actual infrastructure locations (these were not known at the time).
	Fauna surveys – May and July 2015 (Birds April, June & October 2015)	Approximately 480 person days	21 sampling locations	Transects, physical trapping and camera trapping for mammals, VES for herpetiles. Sweep netting and traps for butterflies and dragonflies.	Makerere University Zoologists		
Tilenga ESIA (2017) – FEED: Avoidance Survey Report(s) (Ref. 14.27).	Main campaign 18 Nov 2016 to 25 Jan 2017 Subsequent visits	Survey of all well pad sites, Industrial area, CPF, Victoria Nile Ferry crossing sites, Water Abstraction System (WAS), Nile crossing	MFNP and Tilenga Project Area	Transect surveys for fauna. Sites were surveyed with 500m x 500m buffer.	Three team members for fauna, three for flora.	This survey was undertaken as part of the FEED process and was intended as the first stage in the mitigation hierarchy. Surveys were undertaken at each proposed well pad as well as at the Nile pipeline crossing points (north and south), the WAS)	These were preliminary walkover surveys only for the purpose of avoidance; not detailed surveys undertaken.

Report Title	Period and Timeframe	Level of Effort (within Primary Study Area)	Sampling Locations	Survey Methodology	Field Study Team	Summary	Limitations
		points				on Lake Albert and at other locations. It was used primarily to identify avoidance features within and close to the specific footprint of project infrastructure. The study also served to indicate where the subsequent specialist surveys should be focused, as it was evident that not all surveys would be useful at all of the sites. Some information on habitat condition was also collected.	
Tilenga Baseline Data Collection for the ESIA. (2016/2017)	March/April and June/July 2017	Approximately 20 days on site per survey team for two campaigns.	Selected well pad side within the MFNP, with some additional surveys in the Tilenga project area	Mammals – camera trapping for six months, transects, Sherman traps. Herpetiles, VES and drift fences with pitfall traps Bird surveys were walked and driven transects. Insects, sweep netting and baited traps.	Each fauna team had 3 to 4 members	This study is the most recent set of surveys undertaken within the Primary Study area. It builds on the findings of the avoidance study and included surveys for mammals, invertebrates, birds, herpetiles and flora within and immediately around the footprint of selected Project sites. The terrestrial vegetation focus was on identifying plant species of conservation concern within the context of vegetation type. Survey work for flora and fauna was undertaken in March/April and June/July 2017, representing dry and wet seasons respectively.	Surveys were not species specific. First survey season was extremely dry (late rains). Second season (technically the dry season) was wet. Survey of selected well pads only, mainly in MFNP. No long term monitoring or targeted surveys for priority species.
Tilenga ESIA (2017) – FEED:	11 Aug 2017 to 12 Oct	Survey of all well pad sites,	MFNP and Tilenga project	Flow lines routes were walked and	Three team members	Survey intended as the first stage in the mitigation	These were preliminary walkover

Report Title	Period and Timeframe	Level of Effort (within Primary Study Area)	Sampling Locations	Survey Methodology	Field Study Team	Summary	Limitations
Avoidance Survey Report for Flow Lines (Ref. 14.28). Field work is planned for August-October 2017	2017. Additional surveys for flow lines, access roads, and changed well pads undertaken Jan 2018.	Industrial area, CPF, HDD Crossing area, Water Abstraction Station (WAS), Victoria Nile Ferry Crossing	area	avoidance features recorded within 50m buffer.	for fauna, three for flora.	hierarchy. Surveys were undertaken at each flow line and any adjusted well pad (subsequently access tracks and other features were added to the survey (including alternative Nile pipeline crossing points (north and south)). Used primarily to identify avoidance features within and close to the specific footprint of project infrastructure. Some information on habitat condition was also collected.	surveys only for the purpose of avoidance; not detailed surveys undertaken.

14.6 Baseline Characteristics

14.6.1 Introduction

This section presents concisely the most pertinent existing data and information regarding terrestrial wildlife in the Primary Study Area and Project AoI. This is based on the primary and secondary data listed above.

This exercise is necessary in order to ensure that there is an appropriate baseline for the assessment of impacts on terrestrial wildlife. Specifically this means identifying the potential receptors that may be affected by the proposed oil development activities associated with the Project and defining their ecological sensitivity. It is therefore not intended to be a detailed literature review and presentation of all available data relating to terrestrial wildlife in the Project AoI.

The baseline section therefore provides:

- A description of areas of conservation interest within the biodiversity Project AoI, e.g. sites protected by law (note that these areas are assessed in ***Chapter 13: Terrestrial Vegetation***) and other sites recognised by international bodies; and
- A summary of the priority species that are considered in this assessment and how these have been determined.

Appendix B contains a series of fact sheets which provide summary environmental and social information on the existing conditions at each of the key Project component locations.

14.6.2 Areas of Conservation Interest

The Project is located in the Albertine Graben, Western Uganda, which encompasses two savanna biomes represented respectively by the sub-biomes of Acacia savanna grasslands and Guineo-Congolian Forest/Savanna Mosaic. In addition, there are areas of Albertine Rift montane forests areas that extend from the south into the Project AoI.

The oil production fields in the development area north of the Victoria Nile are entirely located within the MFNP. However, most of the fields south of the Victoria Nile are located in a populated area with dispersed dwellings and crops with areas of grazing land and scattered bush and trees (see ***Chapter 4: Project Description and Alternatives*** for a description of project components and their locations).

Biodiversity studies and reports available for the Albertine Graben demonstrate that it is recognised as one of Africa's most important areas for biodiversity (Ref. 14.42). Furthermore, approximately 70% of blocks CA-1/EA-1A, east of the Albert Nile, and part of LA-2 North, lie within the MFNP, which hosts a range of emblematic wildlife and attracts national and international tourism.

There are 39 protected areas listed within the Albertine Rift, most of which are Central Forest Reserves (CFR), as shown in Table 14-6 below. The protected areas considered to be of particular biodiversity significance are highlighted in the table and discussed in more detail below (see also Figure 14-2).

Table 14-6: Protected and Internationally Recognised Areas in the Albertine Rift

Protected Area	Category	IUCN criteria	Designation
Murchison Falls National Park	National Park	II	National
	Important Bird Area (IBA)	A1, A3, A4i	International
	Key Biodiversity Area (KBA)	-	International
Murchison Falls-Albert Delta Wetland System	Ramsar Site and Important Bird Area	-	International
Bugungu	Wildlife Reserve	III	National
Karuma	Wildlife Reserve	III	National
Budongo	Central Forest Reserve (CFR)	-	National
	IBA	A1, A3	International
	KBA	-	International
Bugoma	CFR		National
	IBA	A1, A3	International
	KBA	-	International
Wambabya	CFR	-	National
Bujawe	CFR	-	National
Hoima	Forest Reserve	-	National
Kabwoya	Wildlife Reserve	III	National
Kaiso Tonya	Community Wildlife Management Area	IV	National
Kasongoire	CFR	-	National
Kijubya	Forest Reserve	-	National
Kyahaiguru	CFR	-	National
Kyamugongo	CFR	-	National
Maseege	CFR	-	National
Mukihani	CFR	-	National
Nyabyeya	CFR	-	National
Nyamakere	CFR	-	National
Rwensama	CFR	-	National
Toro-Semliki	Wildlife Reserve	III	National
Rwengara	Community Wildlife Management Area	VI	National
Semliki reserves	IBA	A1	International
Kibeka	CFR	-	National
Kaduku	Forest Reserve	-	National
Masindi Port	Forest Reserve	-	National
Kigulya Hill	CFR	-	National
Masindi	Forest Reserve	-	National
Kirebe	Forest Reserve	-	National
Kasokwa	CFR	-	National
Sirisiri	Forest Reserve	-	National
Nyakunyu	CFR	-	National

Protected Area	Category	IUCN criteria	Designation
Kitonya Hill	CFR	-	National
Fumbya	CFR	-	National
Nsekuro Hill	CFR	-	National
Musoma	CFR	-	National
Kandanda - Ngobya	CFR	-	National
Ibamba	CFR	-	National
Kahurukobwire	CFR	-	National

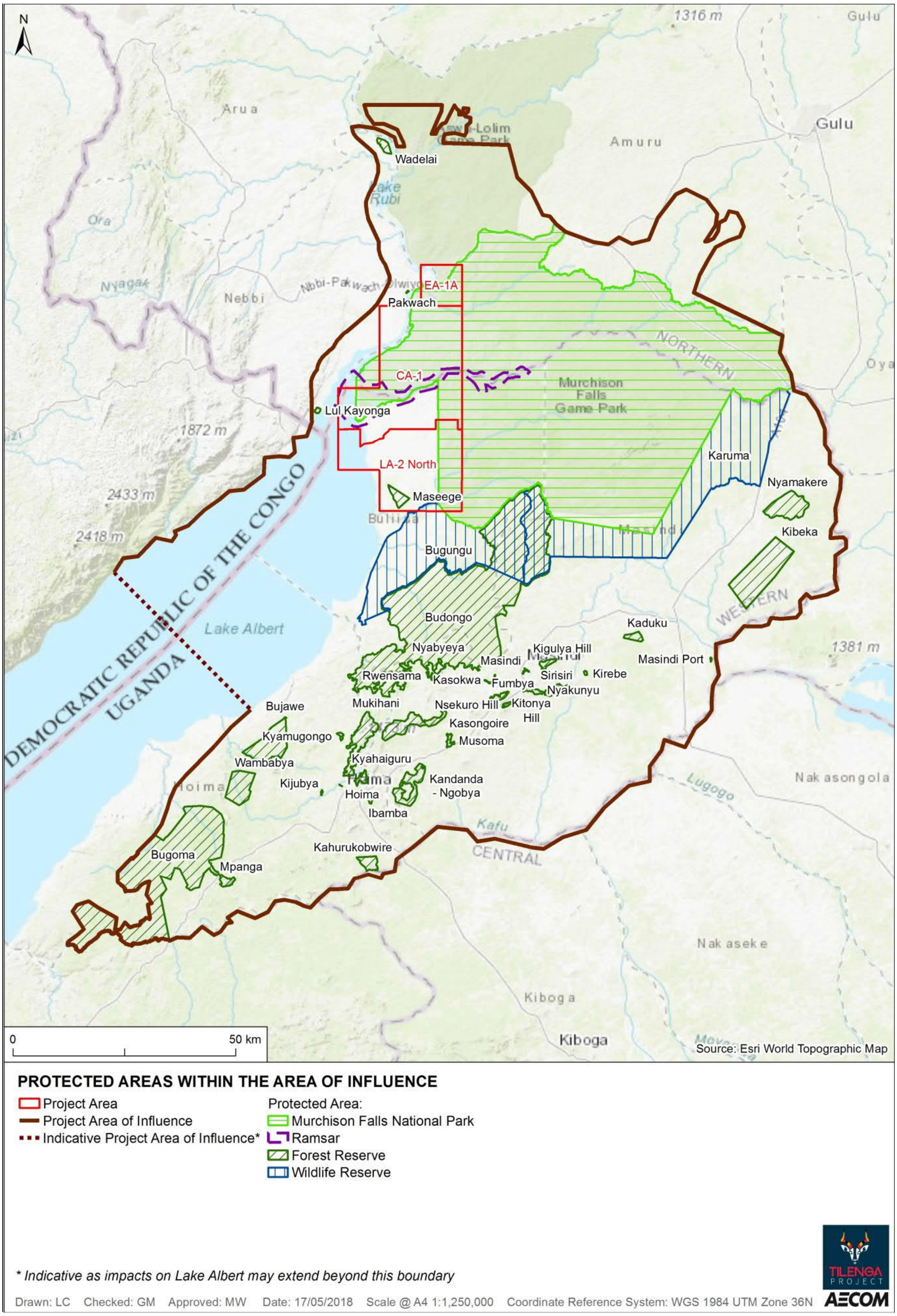

Figure 14-2: Protected Areas

14.6.2.1 Murchison Falls National Park

This is the largest National Park in Uganda (nearly 3,480 km^2) and was initially gazetted in 1926 as a game reserve and subsequently in 1952 as a National Park, based on its animal conservation status[3]. The park is recognised by the IUCN as a Category II Protected Area. The MFNP is bisected by the Victoria Nile for 80 km flowing in an East to West direction and overlaps with the Murchison Falls - Albert Delta Wetland System Ramsar Site.

The MFNP supports rich and varied habitat types including grassland savannas, wooded grassland, bushlands, woodlands, forests and wetlands that provide varied ecosystems that in turn support a high diversity of both flora and fauna.

The MFNP is of ecological importance for a number of globally and regionally endangered species including plants, reptiles, mammals and birds. The MFNP is also designated as an IBA and KBA for its populations of resident species, as well as passage, non-breeding and wintering species. In addition, the park is notable for its large population of mammals, particularly the largest Rothschild's giraffe population in Uganda (and indeed, the world).

The MFNP is contiguous to the South with the Bugungu Wildlife Reserve (WR) and Karuma WR to the South East and together these three protected areas form the Murchison Falls Protected Area (MFPA) (see Ref. 14.25). In addition to this, the Bugungu WR in turn is contiguous with the Budongo CFR.

Survey of the MFPA in 2015 (Ref. 14.25) identified a total known list of 144 mammal species, 556 bird species, 51 reptile species, 28 known amphibian species with an additional 23 species still (at that time) to be identified (i.e. 51 species). A total of 755 plant species were recorded in the MFPA (Ref. 14.25).

The LA-2 North portion of the Tilenga Project is located outside of the MFPA south of the Victoria Nile and the west of the southern portion of the MFNP. Here, the MFNP is generally less open than the MFNP North of the Victoria Nile, consisting mainly of woodland and wooded grassland with areas of thickets. There are some areas of wetland associated with the Waiga River in addition to other seasonal wetlands which generally drain either northwards towards the Victoria Nile, or westwards into Lake Albert.

14.6.2.2 Murchison Falls-Albert Delta Wetland System Ramsar Site

Designated in 2006, this Ramsar site covers an area of 17,293 ha, stretching from the top of Murchison Falls to the Albert Delta. It lies predominantly within the MFNP, although a small area along the southern edge is outside the park. It is also designated as an IBA (Ref 14.70) and KBA (Ref. 14.80).

The Ramsar site was designated as it supports rare, vulnerable and endangered species, including shoebill and grey crowned cranes. It also supports the largest known population of Nile crocodile in Uganda, and a number of indigenous fish species, and is a spawning ground on which the local fishing industry depends (Ref. 14.30). The river contains several sandbanks and Papyrus islands, which are important for a number of birds, including African skimmer and papyrus gonolek. The delta area of the Ramsar site had never been fully surveyed previously, but recent surveys (Ref 14.99), confirm the rich diversity of wild species, including fish (where it is a major spawning ground), mammals, reptiles and birds that it supports.

14.6.2.3 Bugungu WR

Bugungu WR covers an area of 520 km^2 and is located immediately southwest of MFNP. It is managed as a unit together with the MFNP and Karuma WR as part of the MFPA (Ref 14.77). The

[3] *http://www.ugandawildlife.org*

escarpment of the Albertine Rift runs in a southwest to northeast direction through the reserve and divides it into two distinct sections, which differ in terms of their dominant vegetation. The top of the escarpment supports dense, closed canopy woodland interspersed with tall grassland, while the valley floor supports more open savanna woodland and grassland.

The WR connects to Lake Albert mainly through the river corridors, such as the Waisoke, that run from into the lake. Elephant, hippopotamus, kob, lion, leopard, various mongoose species, giant pangolin, Bunyoro rabbit, ratel, spotted hyena, waterbuck and other species have previously been recorded within the reserve (Ref 14.25).

These recent surveys of the MFPA have indicated the biological value of Bugungu Wildlife Reserve which in the case of birds, amphibians and plants was richer in species than MFNP. It was also the site where many of the endemic and threatened plants occurred. This is probably because Bugungu is very diverse in habitats and also includes Tropical High Forest with its overlap with the Budongo Forest Reserve (see below).

14.6.2.4 Karuma WR

Karuma WR is located to the south east of MFNP, forms part of the MFPA, as noted above, and covers an area of 678km^2. Gazetted as a game reserve, the original concept was for the reserve to act as a buffer zone between MFNP and the adjacent villages and other unprotected areas. Recent studies (Ref. 14.25) indicate that the species richness is lower in Karuma than in other parts of the MFPA, which may be due to higher levels of poaching and other incursions.

14.6.2.5 Other Central Forest Reserves (CFRs)

CFRs are managed by the NFA, as defined by the National Forestry and Tree Planting Act (2003) (Ref 14.7). They comprise two main categories for forest, i.e. those for production and those for protection (although there may be an overlap between actual activities in some forests). Production forests, which may include patches of savanna bushland and grassland areas, are defined for the supply of forest products and future development of industrial plantations. The protected forests include all forests deemed to comprise a site of interest for the purpose of:

- protecting nature and scenic areas of national or international importance;
- enhancing biological genetic resources in an undisturbed, dynamic and evolutionary state;
- maintaining animal and plant indicator species; or
- preserving rare, endangered or vulnerable species, or high biological diversity.

In addition, other CFRs may be designed as a strict nature reserve for the purpose of:

- protecting streams, rivers, lakes, lakeshores, riverbanks or wetlands;
- soil, slope and environment protection; or
- protecting the ecosystem.

CFAs considered to be important for the protection of vulnerable species are discussed specifically below.

14.6.2.5.1 Budongo CFR

The Budongo CFR is a very important area of forest and represents the largest block of medium altitude, semi-deciduous forest type in the region, covering an area of 817km^2. It also supports a well-studied proportion of the population of Chimpanzee (*Pan troglodytes*), a species listed as Endangered (EN) (IUCN) and EN (Uganda Red List) and for which the IUCN Red List (IUCN, 2015) notes a decreasing trend in its global population. The forest meets a number of criteria for KBA status (Ref. 14.80).

The forest is located on the escarpment north-east of Lake Albert. It consists of a medium-altitude moist semi-deciduous forest (c.428 km^2), with areas of savanna and woodland. The reserve occupies gently undulating terrain, with a general slope north-north-west towards the Rift Valley. The forest is drained by four small rivers (Sonso, Waisoke, Wake and Bubwa), which flow generally westwards into

Lake Albert. The forest is partially degraded, mainly because of pit-sawing and saw-milling over many years.

The vegetation has also changed considerably following 60 years of selective logging and management treatment, which favoured the growth of valuable timber species, especially mahoganies. A number of species of birds found in Budongo CFR are not found elsewhere in East Africa, including Nahan's Partridge *Ptilopachus nahani*, (formerly Nahan's Francolin) defined as Vulnerable (VU) and as a globally threatened species and the African Crowned Eagle (*Stephanoaetus coronatus*) (EN), qualifying the areas as Tier 1 Critical Habitat.

14.6.2.5.2 Wambabya CFR

Wambabya CFR is a forest reserve covering an area of $34km^2$ that forms part of the forest fragments and corridors between Lake Albert and MFNP. It is important because it supports a population of chimpanzee. Among other species, are a number of threatened plant species as well as nationally endangered amphibians such as Golden Puddle Frog and Kivu Clawed Frog. The reserve is important because it contains several threatened species not found in the adjacent, larger Bugoma CFR (Ref 14.19). However, this forest is under threat from deforestation (Ref. 14.78).

14.6.2.5.3 Maseege CFR

Maseege CFR also forms part of the forest fragments and corridors between Lake Albert and MFNP and, although quite small ($9.4km^2$) and degraded it is a remnant feature in the area. The only CFR in the rift valley, which is near to Lake Albert and, as such, it is important for protection of Lake Albert as well as contributing to protection of River Waiga, which drains into Lake Albert.

Maseege has been identified as an area, which could provide mitigation of negative environmental impacts of oil extraction in the rift valley area and in Buliisa District in particular. It forms part of corridor between Lake Albert and MFNP (Ref 14.79).

14.6.2.5.4 Bugoma CFR

The Bugoma CFR is a large forest situated to the south of Hoima town, covering an area of $400km^2$. It forms part of the complex of forest fragments and corridors that extends north into Budongo CFR and MFNP and meets the criteria for KBA (Ref. 14.80). Like Budongo CFR it supports populations of chimpanzee, the Uganda mangabey, Nahan's partridge, the African crowned eagle, as well as rare plants, the golden puddle frog, Christy's grassland frog and various species of butterflies (Ref. 14.26).

The forest connects to Lake Albert via a number of narrow riverine forest corridors, which drain down from the escarpment and these are important routes across the otherwise more open and human occupied landscape.

14.6.3 Critical Habitat and Landscape Context

As noted, in ***Chapter 13: Terrestrial Vegetation***, in addition to the protected areas mentioned above, there are other areas of conservation significance that lie outside and also overlap with designated and protected areas. These comprise areas identified in the Critical Habitat Assessment (CHA) (see ***Chapter 13: Terrestrial Vegetation*** and Ref. 14.19 and Ref. 14.20), which represent habitats that are associated with species of conservation concern, and which, under the criteria defined in IFC Performance Standard 6 indicate that these areas represent Critical Habitat within the Project AoI (see CHA Summary in Appendix O.2).

These species of conservation concern (as well as certain other species) are referred to as "priority species" in this assessment and represent the receptors that have been considered in this assessment. However, their habitat associations within the landscape are important (because without those habitats those species would not be present) and therefore the Landscape Context are included here. In addition, the CHA defined six 'Landscape Contexts' in order to provide a clear focus for management of impacts on them. These Landscape Contexts are shown in Figure 14-3.

Although the Project will not interact directly with all six Murchison Semliki Landscape Contexts, there will also be indirect interactions. Table 14-7 below summarises in general terms how each of the defined Landscape Contexts are anticipated to interact with the Project.

Table 14-7: CHA Landscape Contexts and Project Interactions

Context	Name	Description	Interaction with Project Footprint
A	MFPA	Grassland and woodland within the MFPA and to its north. Contains extensive areas of Moist Combretum Savanna and Hyparrhenia Grass Savanna, and a concentration of Vulnerable species in Bugungu Wildlife Reserve. Context A is linked ecologically with Context B, but the management issues in each are different.	Well pads, flow lines and roads in CA-1 north of the Nile. Other infrastructure including Nile crossings (pipeline and Victoria Nile Ferry), Bugungu airstrip upgrade and borrow pits. Indirect impacts on this Landscape Context may also occur.
B	Savanna corridor	Grassland and open wooded or scrub habitats along a weakly-protected savanna corridor that runs approximately north-south along and below the escarpment. Contains Natural Habitat and transitional habitat, with areas of Moist Combretum Savanna and a concentration of Vulnerable species along the escarpment. Context A is linked ecologically with Context B, but the management issues in each are different.	Well pads, flow lines and roads, Industrial Area. Indirect impacts on this Landscape Context may also occur.
C	Lake Albert, rivers and wetlands	Lake Albert and fringing wetlands, including the Murchison Falls-Albert Delta Wetland System Ramsar Site and Waiga/Waisoke River floodplain, as well as many other smaller rivers and swamps: Contains a concentration of Vulnerable species in the Murchison Falls-Albert Delta Wetlands System Ramsar Site.	Nile Crossing beneath facilities for Victoria Nile Ferry, Albert shore. WAS on Lake Albert. Indirect impacts on this Landscape Context may occur.
D	Tropical high forest	Forest and forest fragments and corridors, including the large Central Forest Reserves of Budongo and Bugoma; smaller fragments, including Wambabya, between and around these; and gulley/riparian forests along rivers and streams running down to Lake Albert.	No Project footprint anticipated and no direct impacts are expected, although indirect impacts may occur.
E	Nebbi	Unprotected savanna habitats in Nebbi District (West Nile sub-region), including areas of two threatened ecosystems. This context also potentially contains Critical Habitat for a globally and nationally threatened cycad species.	No Project footprint anticipated and indirect impacts are probably unlikely.
F	Mixed land-scape	This is a 'catch all' context that covers mixed habitats landscape-wide, including agriculture. Two landscape species, African Elephant and Chimpanzee, are wide-ranging across several ecosystems and in Modified Habitat.	All Project infrastructure. Direct and indirect impacts are possible.

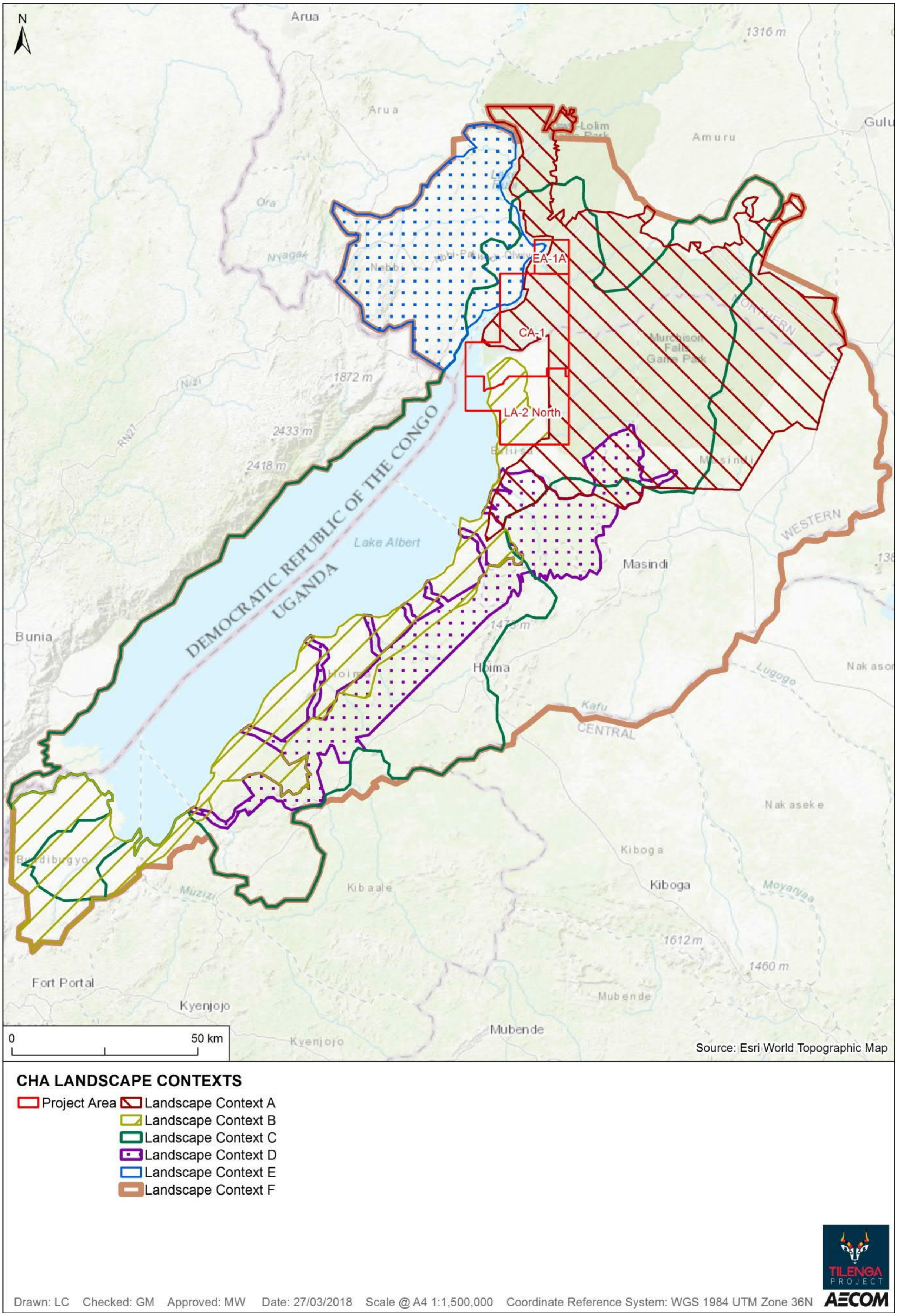

Figure 14-3: Landscape Contexts

14.6.4 Identification of priority biodiversity species

The previous section identifies the protected and other areas of conservation concern that are relevant to this assessment. These protected areas are set within six landscape contexts as defined above.

This section presents baseline for defined priority species. It was necessary to identify priority species because it is not practical to assess the impacts of this project on all species within the Project's AoI. The Project is instead taking a risk-based approach to understanding and addressing impacts through identification of 'priority biodiversity' within its AoI. The focus on priority species does not mean that other species are overlooked or disregarded in the assessment. It should also be noted that, the mitigation measures that have been developed for the priority species should also provide mitigation for these other species, as many, if not most of these, are dependent on or associated with habitats and landscape contexts with which priority species are associated.

The selection of priority species is based on the following parameters:

- Species that are identified as a CHQS (Ref 14.20). This is the main criterion for inclusion as a priority species in this assessment and all species listed as CHQS have been included in this assessment;
- Some species that are not identified as CHQS but which:
    - Have been highlighted in field studies as being of particular interest, for example they have not previously been recorded in the region and/or their conservation status is under review (for example they are being considered for inclusion in the Uganda Red Book)[4]; and
    - Are species that were not identified from desk study activities but nevertheless were recorded within the Project footprint, and therefore as they are present in the actual Project area may be subject to direct impact.

In addition, species comprising certain high profile species have been included as priority species either because they are important for tourism, are iconic species associated with the region or are apex predators.

Table 14-8 below lists the priority species that will be assessed in this chapter with an explanation of why they have been included. Their international (IUCN) and national status (from the Uganda Red List (URL) Ref 14.22) is shown, based on the designations recorded in the URL.

Table 14-8: Priority Species

Mammals	*IUCN*	*PS6 Criterion*[5]	*Landscape Context*			*General Location*	*Reason for Qualification as Priority Species*
Criterion 1, Tier 1 Critically Endangered and Endangered Species							
Chimpanzee	EN (Uganda Red List EN)	Footnote GN20 [6] (1a)	B	D	F	Located largely outside the **Project footprint** and concentrated in tropical forest, but **wide-ranging** in the landscape. N.B. Also a Tier 2 species.	CHQS

[4] It should be noted that the field surveyors AECOM used for the EBS and those used directly for the Tilenga Project are all main contributors to the Uganda Red Book.

[5] See Appendix O.2 for summary of CHA results.

[6] IFC Guidance Note 6, 2012 (Ref 14.15). Included based on reference to footnote GN20 which discusses the special consideration for wide-ranging, large EN and CR mammals that would not otherwise trigger Tier 1 thresholds.

Mammals	*IUCN*	*PS6 Criterion*[5]	*Landscape Context*	*General Location*	*Reason for Qualification as Priority Species*
Rothschild's Giraffe	EN (Uganda Red List EN)	1ab	A	Both species are concentrated in and around the **Project footprint**, in MFNP and mainly north of the Nile (Area A). Small numbers of Rothschild's Giraffe have recently been re-introduced south of the Nile.	CHQS
Lelwel Hartebeest	EN (Uganda Red List NE)	1a	A		CHQS
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					
Chimpanzee	EN (Uganda Red List EN)	1bc	B D F	Located largely outside the Project footprint and concentrated in tropical forest, but **wide-ranging** in the landscape. N.B. Also a Tier 1 species (see above).	CHQS
Mammals	**Uganda Red List (& IUCN)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Reason for Qualification as Priority Species**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in Project AoI For which there are species point location records in the Project AoI					
African Elephant	CR (IUCN VU)	1e	A B C F	Species recorded in MFNP, Bugungu WR, and the Ramsar site. Elephant also range widely in various habitats (hence Landscape Context F has been added).	CHQS
Lion	CR (IUCN VU)	1e	A B		CHQS
Spotted Hyena	CR (IUCN LC)	1e	A		CHQS
Bohor Reedbuck	EN (IUCN LC)	1e	A	Species recorded in MFNP and the Ramsar site.	CHQS
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species For which there are no species point location records in the Project AoI					
No mammal species defined in this category.					
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species that are data deficient					
Medje Mops Bat	EN (IUCN LC)	1e	D	Budongo Forest Reserve	CHQS
Trevor's Free-tailed Bat	EN (IUCN DD)	1e	D	Budongo Forest Reserve, Semliki National Park, Wakiso District	CHQS
Savanna/Helios Pipistrelle	CR (IUCN DD)	1e (possible)	D	Hoima District (Buhamba), corridor wetlands between Wambabya and Budongo Forest Reserves	CHQS
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.					
No mammal species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the Project AoI.					
Charming Thicket Rat	VU (IUCN DD)	Poss. 2b (Tier 2)	Unknown	Unknown	CHQS
Ugandan Lowland Shrew	EN (IUCN DD)	1e & poss. 2e (Tier 2)	D	Recorded in lowland forest	CHQS
Uganda Mangabey	VU (IUCN LC)	Wb (Tier 2)	D	Bugoma Forest	CHQS

Mammals	Uganda Red List (& IUCN)	PS6 Criterion	Landscape Context		General Location	Reason for Qualification as Priority Species
Criterion 3: Migratory and congregatory species						
Uganda kob	NE (IUCN LC)	3d (Tier 2)	A	B	Kob congregate at traditional lekking sites during breeding. This species is concentrated in MFPA and along the savanna corridor to the south. The Project footprint area is a global stronghold for this species, which is not yet globally threatened but is vulnerable to hunting and disturbance.	CHQS
Data Deficient and Not Evaluated species						
Russet free-tailed bat	NE (IUCN NT)	Possibly 1e	Unknown (Forest?)		This species may potentially qualify as CHQS under criterion 1e. However, very little is known about this bat, which is generally considered to be associated with tropical forest habitats.	CHQS
Mammals	**Uganda Red List (& IUCN)**	**PS6 Criterion**	**Landscape Context**		**General Location**	**Reason for Qualification as Priority Species**
Other Priority Species (not CHQS)						
Hippopotamus	VU (IUCN VU)	N/A	A	C	Present in MFNP and Ramsar site.	Stakeholder priority
Leopard	VU (IUCN NT)	N/A	A B	D F	Recorded in MFNP.	Stakeholder priority
Giant Pangolin	VU (IUCN VU)	N/A	B	D	Recorded in Bugungu WR, Budongo & Buliisa CA.	Stakeholder priority (CITES)
Peters' Pygmy Mouse	DD (IUCN LC)	N/A	A	B	Recorded in MFNP. Likely to be present in similar habitat outside of the PA.	Identified during field studies of 2017 as being of importance
Ethiopian Pygmy / Mahomet Mouse	DD (IUCN LC)	N/A	A	B	Recorded in MFNP, Kabwoya FR and Bugungu WR.	
Bunyoro Rabbit	VU (IUCN LC)	N/A	B		Has been recorded in Bugungu WR, Budongo & Buliisa CA.	
Alexander's Cusimanse	VU (IUCN LC)	N/A	B	D	Recorded in Bugungu WR, Budongo & Buliisa CA.	
Duke of Abruzzi's Free-tailed Bat	VU (IUCN LC)	N/A	B	D	Recorded from lowland tropical moist and dry forest, including Wambabya Forest	
Bibundi Butterfly Bat	DD (IUCN DD)	N/A	B	D	Recorded in Bugungu WR and Budongo CFR	
Mongalia Free-tailed Bat	VU (IUCN LC)	N/A	B	D	Found in open and dry savanna and Saharan grasslands. Recorded in Wambabya FR.	
Silvered Butterfly Bat	LC (IUCN DD)	N/A	B	D	Found in open and dry savanna and Saharan grasslands. Recorded in Wambabya FR.	
Light-winged Lesser House Bat	DD (IUCN DD)	N/A	A	B	Recorded in MFNP.	CHQS

Birds	IUCN (& URL)	PS6 Criterion	Landscape Context	General Location	Reason for Qualification as Priority Species
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
No bird species defined in this category.					
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					
White-backed Vulture	CR (URL EN)	1ce	A	Vultures may forage over a large area. Nest sites for these species reportedly overlap with the Project footprint, but aerial surveys and field surveys have indicated that no nests are present close to the proposed locations of Project components.	CHQS
Rüppell's Vulture	CR (URL EN)	1ce	A B D		CHQS
Hooded Vulture	CR (URL EN)	1c	A B		CHQS
White-headed Vulture	CR (URL CR)	1c	A B		CHQS
Lappet-faced Vulture	EN (URL CR)	1ce	A		CHQS
Grey Crowned Crane	EN (URL EN)	1e	C	In the MFNP, mainly along the Lake Albert shoreline and fringing wetlands, close to the Project footprint	CHQS
Madagascar Pond Heron	EN (URL EN)	1ce	C		CHQS
Birds	**Uganda Red List (& IUCN)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Reason for Qualification as Priority Species**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint					
Pallid Harrier	CR (IUCN NT)	1e	A B	Recorded within MFNP	CHQS
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project footprint					
African Crowned Eagle	EN (IUCN NT)	1e	D	Known from Budongo and Bugoma CFRs	CHQS
Black-rumped Buttonquail[7]	EN (IUCN LC)	1e	A B	Grassland	CHQS
Denham's Bustard[8]	CR (IUCN NT)	1e	A	Grassland	CHQS
Fox Kestrel	EN (IUCN LC)	1e	A	*Acacia* savannah and thicket, especially where there are rocky hills	CHQS
Lappet-faced Vulture	CR (IUCN EN)	1e	A	Dry savanna	CHQS
Pel's Fishing Owl	EN (IUCN LC)	1e	A	Riverine woodland	CHQS
Shoebill	EN (IUCN VU)	1e	C	Seasonally flooded marshes, papyrus, reeds and grasses.	CHQS
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient					
No bird species defined in this category.					

[7] Black-rumped Buttonquail may qualify as Tier 2 Critical Habitat under criterion 1e, but reliable data are lacking at present.
[8] A Denham's Bustard was observed near Delta Point during TBC's scoping visit to MFNP, 7 November 2016, but the exact locality was not mapped. In addition, in March 2017 an individual bird was recorded by the Tilenga ESIA survey team in the vicinity of well pads JBR-05 and JBR-06, near Pakuba Airstrip.

Birds	Uganda Red List (& IUCN)	PS6 Criterion	Landscape Context	General Location	Reason for Qualification as Priority Species
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.					
No bird species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the Project AoI.					
Nahan's Partridge	VU (IUCN EN)	2b	D	Budongo and Bugoma Forests	CHQS
Criterion 3: Migratory and Congregatory Species					
African Skimmer	VU (IUCN NT)	3 (possibly 2b) (Tier 2)	A C	A congregatory water-bird, with a regional stronghold in the Albert Nile below Murchison Falls, within the Ramsar Site.	CHQS
Data Deficient and Not Evaluated species					
No bird species defined in this category.					
Amphibians	**IUCN (& URL)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Reason for Qualification as Priority Species**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
No amphibian species defined in this category.					
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					
Adolf Friedrich's / Rugege Squeaker Frog	LC (URL EN)	1e, 2b	D	Budongo CFR	CHQS
Golden Puddle Frog	LC (URL EN)	1e	D	Budongo CFR, Bugoma CFR and Wambabya Forest Reserve	CHQS
Kivu Clawed Frog	LC (URL EN)	1e	D	Wambabya CFR	CHQS
Amphibians	**IUCN (& URL)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Reason for Qualification as Priority Species**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project AoI					
No amphibian species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project AoI					
No amphibian species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient					
No amphibian species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI					
No amphibian species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the Project AoI.					
Adolf Friedrich / Rugege Forest Squeaker Frog	LC (URL EN)	2b (Tier 2)	D	Known from Budongo CFR	CHQS
Christy's Grassland Frog	DD (URL VU)	2 (Tier 2)	A B D	Budongo CFR, escarpment below Bugoma Forest (may be confined to escarpment along Lake Albert)	CHQS

Amphibians	**IUCN (& URL)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Reason for Qualification as Priority Species**
Uganda Clawed Frog	DD (URL VU)	2 (Tier 2)	D	Budongo CFR	CHQS
Kivu Clawed Frog	LC (URL EN)	2b (Tier 2)	D	Wambabya CFR	CHQS
Hyperolius langi	LC (URL DD)	Possibly 2b (Tier 2)	N/A	Unknown	CHQS
Rwanda Long Reed Frog	NE (URL DD)	Possibly 2b (Tier 2)	N/A	Unknown	CHQS
Hyperolius lateralis	LC (URL NE)	Possibly 2b (Tier 2)	N/A	Unknown	CHQS
Garamba Forest Tree Frog	LC (URL NE)	Possibly 2b (Tier 2)	N/A	Unknown	CHQS
Criterion 3: Migratory and congregatory species					
No amphibian species defined in this category.					
Data Deficient and Not Evaluated species					
Rwanda Long Reed Frog (*Hyperolius rwandae)*	NE (URL DD)	Possibly Tier 2	N/A	This frog species might potentially qualify as Tier 2 restricted range species because they are endemic to the Albertine Rift. However, there are taxonomic uncertainties and the data are unreliable.	CHQS
Other Notable Species (not CHQS)					
Lake Victoria Toad	DD (URL NE)	N/A	A C	Recorded at pipeline and Victoria Nile Ferry crossing points within Ramsar.	Identified during field studies of 2017 as being of importance
Reptiles	**Uganda Red List (& IUCN)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Reason for Qualification as Priority Species**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
No reptile species defined in this category.					
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					
No reptile species defined in this category.					
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project AoI					
No reptile species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project footprint					
Adanson's Hinged Terrapin	CR (IUCN NE)	1e	C	Shores of Lake Albert, adjoining streams and wetlands	CHQS
African Soft-shelled Turtle	CR (IUCN NE)	1e	C	Shores of Lake Albert, Victoria Nile below the falls	CHQS
Zaire Hinged Terrapin	CR (IUCN NE)	1e	C	MFNP, Kabwoya Wildlife Reserve (along Lake Albert shoreline)	CHQS
Smooth Chameleon	EN (IUCN NE)	1e	A B	CHQS	CHQS
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient					
No reptile species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.					

Reptiles	Uganda Red List (& IUCN)	PS6 Criterion	Landscape Context	General Location	Reason for Qualification as Priority Species
No reptile species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the Project AoI.					
Common / Serrated Hinge-back Tortoise	DD (IUCN DD)	Possibly 2b (Tier 2)	N/A	Unknown	CHQS
Mocquard's African Ground Snake	NE (IUCN NE)	Possibly 2b (Tier 2)	N/A	Unknown	CHQS
Uganda House Snake, Yellow Forest snake, Brown File Snake	NE (IUCN LC)	Possibly 2b (Tier 2)	N/A	Unknown	CHQS
Striped beaked snake(*Psammophylax acutus*)	NE (IUCN NE)	Possibly 2b (Tier 2)	N/A	Unknown	CHQS
Criterion 3: Migratory and congregatory species					
No reptile species defined in this category.					
Data Deficient and Not Evaluated species					
Common / Serrated Hinge-back Tortoise	DD (IUCN DD)	Possibly 2b	N/A	These species are all under-studied but are only known from the Project AoI so far and may qualify for Criterion 2b but require more study nationally.	CHQS
Mocquard's African Ground Snake	NE (IUCN NE)	Possibly 2b	N/A		CHQS
Uganda House Snake, Yellow Forest snake, Brown File Snake	NE (IUCN LC)	Possibly 2b	N/A		CHQS
Striped beaked snake (*Psammophylax acutus*)	NE (IUCN NE)	Possibly 2b	N/A		CHQS
Other Notable Species (not CHQS)					
Northern Green Bush Snake/ Bequaert's Green Snake	DD (IUCN LC)	N/A	A	Recorded with MFNP (JBR-09)	Identified during field studies of 2017 as being of importance and/or not previously recorded in the area
Sudan Beaked Snake	NE (IUCN LC)	N/A	A B C	Caught in pitfall traps at the IA and at Pipeline Nile Crossing.	
Reticulated Centipede-eater	VU (IUCN NE)	N/A	A B C	Prefers moist savanna and was recorded at the Isolation Valve (North) within the MFNP and Ramsar site.	
Nile Crocodile	NE (IUCN LC)	N/A	A C	Common within the Ramsar and MFNP.	Stakeholder priority
Butterflies	**Uganda Red List (& IUCN)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Reason for Qualification as Priority Species**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
No butterfly species defined in this category.					
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					
No butterfly species defined in this category.					
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project AoI					

Butterflies	Uganda Red List (& IUCN)	PS6 Criterion	Landscape Context	General Location	Reason for Qualification as Priority Species
No butterfly species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project AoI					
No butterfly species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient					
Acraea alciope	CR (IUCN NE)	1e	D		CHQS
Andronymus caesar	EN (IUCN NE)	1e	D		CHQS
Andronymus gander	EN (IUCN NE)	1e	D		CHQS
Anthene ituria	VU (IUCN NE)	1e	D		CHQS
Bicyclus procora	EN (IUCN NE)	1e	D		CHQS
Euphaedra paradoxa	EN (IUCN NE)	1e	D		CHQS
Hypocopelates mera	CR (IUCN NE)	1e	D		CHQS
Iridana marina	EN (IUCN NE)	1e	D		CHQS
Lachnocnema magna	EN (IUCN NE)	1e	D		CHQS
Leptosia marginea	EN (IUCN NE)	1e	D	All forest species known from Budongo and Bugoma CFRs	CHQS
Leptosia medusa	EN (IUCN NE)	1e	D		CHQS
Liptena hapale	EN (IUCN NE)	1e	D		CHQS
Liptena hiendlmayri	VU (IUCN NE)	1e	D		CHQS
Liptena undina	EN (IUCN NE)	1e	D		CHQS
Micropentila bunyoro	EN (IUCN DD)	1e	D		CHQS
Mylothris hylara	NE (IUCN NE)	1e	D		CHQS
Bright Chalk Blue *Thermoniphas togara*	EN (IUCN NE)	1e	D		CHQS
Light Banded Blue *Uranothauma heritsia*	EN (IUCN NE)	1e	D		CHQS
Xanthodisca vibius	EN (IUCN NE)	1e	D		CHQS
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.					
No butterfly species defined in this category.					

Butterflies	Uganda Red List (& IUCN)	PS6 Criterion	Landscape Context	General Location	Reason for Qualification as Priority Species
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the Project AoI.					
Anthene ituria	VU (IUCN NE)	1A and possibly 2b (Tier 2)	D	Bugoma CFR	CHQS
Liptena hapale	NE (IUCN NE)	1A and possibly 2b (Tier 2)	D	Budongo CFR	CHQS
Liptenara hiendlmayri	VU (IUCN NE)	1A and possibly 2b (Tier 2)	D	Budongo CFR	CHQS
Criterion 3: Migratory and congregatory species					
No butterfly species defined in this category.					
Data Deficient and Not Evaluated species					
Mylothris hylara (alternative spelling: *Milithrus hylara*)	NE (IUCN NE)	Possible 1e	D	This species is yet to be evaluated for Red List. It has been associated with forest corridor habitats and it is possible that this butterfly meets Critical Habitat criterion 1e in the study area.	CHQS
Other Notable Species (not CHQS)					
Acraea pharsalus	VU (IUCN NE)	N/A	A D	Field surveys undertaken by Project ESIA team in 2017 identified a number of other mainly forest species within the MFNP, around the Bugungu Airstrip and Buliisa areas.	All identified during field studies of 2017 as being of importance
Anthene indefinita	VU (IUCN NE)	N/A	A D		
Euchrysops albistriata	VU (IUCN NE)	N/A	A D		
Anthene indefinita	VU (IUCN NE)	N/A	A D		
Euchrysops subpallida	VU (IUCN NE)	N/A	A D		
Leptotes marginalis	VU (IUCN NE)	N/A	A D		
Lepidochrysops jansei	DD (IUCN NE)	N/A	A D		
Acraea pharsalus	NE (IUCN NE)	N/A	A D		
Anthene indefinite	NE (IUCN NE)	N/A	A D		
Colotis chrysonome	NE (IUCN NE)	N/A	A D		
Dragonflies	**Uganda Red List (& IUICN)**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Reason for Qualification as Priority Species**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
No dragonfly species defined in this category.					
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					
No dragonfly species defined in this category.					

Dragonflies	Uganda Red List (& IUICN)	PS6 Criterion	Landscape Context	General Location	Reason for Qualification as Priority Species
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project AoI					
No dragonfly species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project AoI					
No dragonfly species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient					
Albertine Jewel *Chlorocypha schmidti*	DD (IUCN VU)	1e (possible)	D	Forests in Uganda	CHQS
Aethiothemis coryndoni	VU (IUCN LC)	1e	D	Budongo CFR	CHQS
Black Threadtail *Elattoneura nigra*	EN (IUCN LC)	1e	D	MFNP	CHQS
Pale Duskhawker *Heliaeschna trinervulata*	CR (IUCN LC)	1e	D	Forests in western Uganda	CHQS
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.					
No dragonfly species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the Project AoI.					
Aethiothemis coryndoni	VU (IUCN LC)	1e and possibly 2b (Tier 2)	Unknown	Unknown	CHQS
Criterion 3: Migratory and congregatory species					
No dragonfly species defined in this category.					
Data Deficient and Not Evaluated species					
No dragonfly species defined in this category.					
Other Notable Species (not CHQS)					
Pseudagrion (B) torridum	VU (IUCN LC)	N/A	A C	Field surveys undertaken by Project ESIA team in 2017 identified a number of other dragonfly species within the MFNP and Ramsar site areas.	All identified during field studies of 2017 as being of importance
Neurogomphus featheri	DD > ?EN (IUCN LC)	N/A	A C		
Sympetrum fonscolombii	DD (IUCN LC)	N/A	A C		
Acisoma inflatum	NE (IUCN LC)	N/A	A C		
Gomphidia bredoi	VU (IUCN LC)	N/A	A C		

Further information on each priority species is included in the Species Profile Tables, included in Appendix O.3.

14.6.5 Invasive and Alien Species

In addition to the assessment of impacts on priority species consideration needs to be given to the threats posed by the presence of Invasive and Alien Species (IAS) and whether the Project will cause IAS to be spread within or introduced into the AoI.

Disturbances, such as those associated with development, are frequently associated with the spread of IAS. As such, it is very important to understand the risks associated with invasive species prior to the commencement of disruptive site works. Long linear infrastructure projects that pass through many different habitats and locations are particularly at risk of spreading IAS via various pathways, e.g. larvae in water attached to machines and in ballast. As such, activities/pathways/vectors with known potential to increase the spread of IAS above ‘normal levels’ (i.e. spread that would occur regardless of development, i.e. natural pathways like water flow and animal movement) were identified and are presented in Table 14-9.

Table 14-9: Pathways with the potential to spread invasive alien species

Pathway	Species Groups	Notes
Imported potted/nursery plants, contamination of potted/nursery plants, and other landscaping related works. Mud on clothing, vehicles and equipment.	Terrestrial invertebrates	Invasive invertebrates, living on nursery stock, and can be accidently introduced to new areas during landscaping works.
Vegetation clearance and movement of plant debris	Terrestrial invertebrates	Invasive invertebrates, living on cleared vegetation, and can be accidently introduced to new areas during clearance works.
Movement of felled timber	Terrestrial invertebrates	Where felled trees are inhabited by invertebrates or other tree diseases, felling and transport can be a vector for such pests/microorganisms.
Water on footwear/clothing	Aquatic invertebrates and vertebrates (including juveniles and larvae)	IAS can remain viable for extended periods of time in water attached to clothing, particularly in boot sole ridges, folds and cuffs, and subsequently be introduced to other water bodies if sufficient cleaning/disinfection does not take place.
Water on equipment and tyres/body of vehicles	Aquatic invertebrates and vertebrates (including juveniles and larvae)	IAS can remain viable for extended periods of time in water attached to equipment/machinery, particularly in crevasses and recesses, and subsequently be introduced to other water bodies if sufficient cleaning/disinfection does not take place.
Water via pumping	Aquatic invertebrates and vertebrates (including juveniles and larvae)	Invasive aquatic animals, especially their juvenile and larval stages, are readily pulled into pumps even when filters or screens are present (larvae can be tiny).
Boats and other watercraft	Aquatic invertebrates and vertebrates (including juveniles and larvae)	Invasive aquatic animals, especially their juvenile and larval stages, readily attached to the underside of boats or can get caught up in other recesses. Spread can be from waterbody to another waterbody and also within a waterbody.
Equipment used in waterbodies, e.g. fishing nets and tackle	Aquatic invertebrates and vertebrates (including juveniles and larvae)	Invasive aquatic animals, especially their juvenile and larval stages, readily become caught up in equipment used in lakes, rivers and other waterbodies.
Ballast water	Aquatic invertebrates and vertebrates (including juveniles and larvae)	Transport of IAS in ballast is a leading vector of IAS, particularly in the marine environment. IAS are readily drawn into the ballast of boats, where they can survive for extended periods before being released in a new location.
Infrastructure maintenance works, including drainage	Aquatic invertebrates and vertebrates (including juveniles and larvae)	IAS are frequently moved around and between sites by the activity of infrastructure maintenance teams carrying out repairs, drainage etc., with species becoming attached for footwear, clothing, equipment and machinery. This vector persists following

Pathway	Species Groups	Notes
		development.
Imported material and containers	Terrestrial vertebrates & invertebrates	Species may be brought in within containers of equipment and supplies. These may include terrestrial invertebrates or vertebrates (reptiles or rodents).
Deliberate introduction	Terrestrial and aquatic invertebrates and vertebrates (including juveniles and larvae)	Deliberate release of IAS as biological control agents of other IAS, for commercial/economic reasons such as an additional food source, or for aesthetic reasons

14.7 Impact Assessment and Methodology

14.7.1 Introduction

The following sections present the impact assessment relating to Terrestrial Wildlife. The assessment has been undertaken for the four distinct stages of the project as follows:

- Site Preparation and Enabling Works;
- Construction and Pre-Commissioning;
- Commissioning and Operations; and
- Decommissioning.

For each stage of the project the assessment sets out:

- The potential impacts on each of the defined receptors (this takes into account the embedded mitigation described above);
- The additional mitigation measures; and
- The residual impacts of the project, taking all mitigation measures (embedded and additional) into account. The assessment considers the direct and indirect impacts of each stage of the project.

For most stages of the project, activities are the same and therefore the impacts will actually be quite similar. Because of this, and in order to minimise repetition of text, the assessment has largely been undertaken in tabular form with additional commentary where necessary to highlight differences of potential impacts, mitigation and residual impacts between phases, where these differences can be defined.

It should be noted however, that except where species-specific mitigation has been identified, most mitigation measures will be generic and based on the general habitat and landscape scale of receptor.

The tables included in the assessment provide a summary of the impact assessment. However, the reader is asked to refer to the detailed assessment for each priority species, which is included in the species profile tables in Appendix O.3. These extended tables include information on individual receptor ecology and sensitivities and provide a discussion of direct and indirect potential and residual impacts for each species.

14.7.2 Impact Assessment Methodology

14.7.2.1 General Approach

This section describes the approach to impact assessment for terrestrial wildlife.

As with the assessment for terrestrial vegetation, it is necessary to understand the likely effects of the Project and the receptors that may be affected by it.

For this assessment each identified receptor is assigned an indication of its sensitivity, which is based on a number of factors as set out below. Once the sensitivity of the receptor is known, it can be considered in the context of the likely magnitude (used interchangeably with the word character in this chapter) of the impact on the receptor and the significance of the impact can therefore be determined. It allows the identification and prioritisation of management measures, with clearly defined mitigation actions, for these receptors during appropriate phases of the Project's life.

In considering the actual impact on the receptor, the impact that is most relevant is the **residual impact**, i.e. the impact after agreed mitigation (following the mitigation hierarchy).

There is also another level of mitigation which relates to indirect impacts and achieving the objectives of no net loss / net gain which are part of the Net Gain Strategy (that some may refer to as "Offset Strategy") for direct and indirect impacts. These are referred to as mitigation concept strategies or biodiversity conservation initiatives.

Identifying and evaluating the sensitivity of receptors and defining impacts on them in this systematic way provides a robust assessment and framework for understanding what receptors are likely to be most affected by the Project. This therefore allows the identification and prioritisation of management measures for these receptors, with clearly defined mitigation actions, that will be required during appropriate stages of the Project's life.

14.7.2.2 Receptor Sensitivity

Based on the information collected from previous studies, data gathering and field surveys, the ESIA has identified the relevant receptors and assigned a sensitivity value (very high / high / medium / low / negligible) to each identified species, protected area or Landscape Context present, or likely to be present, within the Project AoI.

The sensitivity of species receptors has been defined based on a combination of vulnerability (e.g. level of extinction risk) and irreplaceability (e.g. relating to issues of species considered to have a restricted range) as well as species that are considered to be important for tourism, are iconic species associated with the region or are apex predators. Extinction risk has been defined based on the IUCN Red List of Threatened Species (IUCN 2017, Ref 13.51) and the Uganda Red List (2016) (Ref 14.22). It is also largely based on PS6 criteria for identification of Critical and Natural Habitats.

Receptor sensitivity categories are defined in Table 14-10 as follows.

Table 14-10: Receptor Sensitivity

Receptor Sensitivity	Selection Criteria
Very High	• Legally protected and internationally recognised areas (Class I and II), such as Ramsar sites, Important Bird and Biodiversity Areas (IBA), National Parks, wildlife reserves, or areas of high biodiversity value (including some Forest Reserves (FR)) that meet the criteria for such designation, irrespective of whether or not they have yet been designated (see above for an explanation of PS6 Criteria). • Critically Endangered (CR) and Endangered (EN) species (PS6 Criterion 1: Tier 1); • Endemic/ Restricted Range Species (PS6 Criterion 2: Tier 1); • Migratory/Congregatory Species (PS6 Criterion 3: Tier 1);
High	• Legally protected and nationally recognised areas, such as wildlife reserves, or areas of high biodiversity value (including some FR) that meet the criteria for such designation, irrespective of whether or not they have yet been designated. • Critically Endangered (CR) and Endangered (EN) species (PS6 Criterion 1: Tier 2); • Endemic/ Restricted Range Species (PS6 Criterion 2: Tier 2); • Migratory/Congregatory Species (PS6 Criterion 3: Tier 2); • Endangered (EN) Highly Threatened and/or Unique Ecosystems (PS6 Criterion 4); & • Key Evolutionary Processes (PS6 Criterion 5).
Medium	• Sites that are of regional importance such as Community Wildlife Management Areas. Regionally important areas that may meet the published ecological selection criteria for designation, but are not designated as such. • Species assessed by IUCN and/or listed on the Ugandan Red List as Vulnerable (VU), Near Threatened (NT), Data Deficient (DD), or are defined as Not Evaluated (NE), whichever is the higher category. • Vulnerable (VU) Highly Threatened and/or Unique Ecosystems (PS6 Criterion 4). • A regularly occurring, locally significant number of a regionally important species. Or species which is legally protected. • Features functioning as wildlife corridors or seasonal routes but which may not be designated or protected.
Low	• Areas of habitat considered to appreciably enrich the habitat resource within the context of the area, e.g. species-rich grassland, less usual ecological features but with no protected status or designation. • A significant population of a locally important species. Sites/features that are scarce within the locality or that appreciably enrich the local area's habitat resource. • Species that do not meeting the criteria for 'high' or 'medium' but are notable for other reasons (e.g. of socio-economic importance).
Negligible	• Areas of low ecological value such as modified or disturbed habitat with low species diversity or concentrations and with no priority species known to be present. • Species that are common and widespread.

14.7.2.3 Impact Magnitude

Once the sensitivity of a particular receptor has been identified it is then necessary to determine the magnitude of changes/activities and impacts on the receptor. To determine the magnitude the following four parameters have been considered:

- Extent;
- Severity;
- Duration; and
- Permanence (Reversibility).

These parameters are defined below:

Extent: relates to the location and proportion of the feature's area or population in the landscape that is expected to be affected by the project;

Severity: is a measure (or estimation) of how severe the impact could be on that proportion of the population or location defined by the scope. Such parameters would include extent of habitat degradation, loss of integrity of protected areas (including connectivity) and changes ranging from disturbance to measurable demographic extent on species populations;

Duration: is defined by whether the impact is short term, temporary or long term; and

Permanence (Reversibility): defines the expected capacity for the species or habitat to recover once the cause of the impact has been removed. This includes the time it might take for population or status to recover and also what proportion of that impact will also be reversible.

This assessment has therefore been undertaken with reference to Table 14-11 below, where the impact magnitude is defined based on consideration of these parameters. It should be noted that where parameters within one level of impact character differ radically, the higher level of category is used to determine the impact character.

Note that the assessment undertaken for this ESIA has not been a fully quantitative exercise because in most cases figures for populations, trends and spatial distribution of species are not fully known. Therefore, where required, professional judgement has influenced the level of impact character ultimately assigned.

Table 14-11: Impact Magnitude Assessment Criteria

Magnitude	Assessment Criteria
High Adverse	**Scope:** 20% or more of the feature's population and/or distribution within the Project AoI will be affected by the impact. **Severity:** Complete loss or severe degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Change may result in reduction in conservation status (as defined by IUCN) of the species or habitat. **Duration:** The impact will be long term (10 to 20 years) or permanent. **Permanence:** The impact cannot be reversed with 10 years of the activity causing the impact has ceased and/or less than 30% of the population / areas lost / habitat quality will be fully recovered / restored.
Medium Adverse	**Scope:** Between 10% and 20% of the feature's population and/or distribution within the AoI will be affected by the impact. **Severity:** Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Change likely to result in change in conservation status of the species or habitat. **Duration:** The impact will be temporary and medium term (between 5 and 10 years). **Permanence:** The impact can be reversed to baseline levels within 5 years of the activity causing the impact having ceased and/or less than 60% of the population / areas lost / habitat quality will be fully recovered / restored.
Low Adverse	**Scope:** Up to 10% of the feature's population and/or distribution within the AoI will be affected by the impact. **Severity:** insignificant degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Change will not be enough to result in change in conservation status of the species or habitat. **Duration:** The impact will be temporary and short term (between 1 and 5 years). **Permanence:** The impact can be reversed to baseline levels with 2 years of the activity causing the impact having ceased and/or less than 90% of the population / areas lost / habitat quality will be will be fully recovered / restored.

Magnitude	Assessment Criteria
Negligible	**Scope:** Less than 1% of the feature's population and/or distribution within the AoI will be affected by the impact. **Severity:** No discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. **Duration:** The impact will be temporary and short term (less than 1 year). **Permanence:** The impact can be reversed to baseline levels within 2 years of the activity causing the impact having ceased and will be fully reversed and restored.

14.7.2.4 Impacts significance

Due to the nature of the environment where the Project is located, it has been necessary to extend the standard impact significance matrix to allow for an extra category in determining the receptor sensitivity, which is mainly based on the presence of Tier 1 (internationally important) and Tier 2 (nationally important) species present within the AoI. Therefore, the impact significance matrix deviates slightly from the standard approach presented in ***Chapter 3: ESIA Methodology***.

Impacts of the Project on terrestrial wildlife have been determined by combining the sensitivity of the receptor against the magnitude of the impact, as shown in Table 14-12 below.

Table 14-12: Impact Assessment Matrix

	Impact Magnitude			
Receptor Sensitivity	**Negligible**	**Low Adverse**	**Medium Adverse**	**High Adverse**
Negligible	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	LOW
Low	INSIGNIFICANT	INSIGNIFICANT	LOW	MODERATE
Medium	INSIGNIFICANT	LOW	MODERATE	MODERATE
High	LOW	MODERATE	MODERATE	HIGH
Very High	LOW	MODERATE	HIGH	CRITICAL

Based on this approach potential or residual impact of Moderate or higher significance as indicated on the assessment matrix is regarded as a **significant** impact.

In following this framework the assessment of significance has also been informed by the most recent Guidelines for Ecological Impact Assessment (CIEEM, 2016, Ref 14.53). These use the principle of valuing an ecological resource at a defined geographic scale (in our case the landscape contexts) but advocating that impacts are evaluated simply as significant or not significant for the geographic level at which the ecological resource is valued.

Therefore, whether potential or residual impact is significant or not is based on whether the impact could affect the integrity of a defined species or ecosystem (and the degree of that effect). This allows some flexibility in defining significance based on the geographical scale because if an impact is found not to be significant at the level at which the resource or feature has been valued, it could be that it is significant at a more local level.

In addition, because of the wide geographical distribution of receptors and differences in their ecology, these are likely to be affected by a spectrum of potential direct and/or indirect impacts depending on their habitat associations and where they are actually likely to be physically located in relation to the Project Footprint and project activities.

Consequently, in this assessment a distinction has been made between the significance of likely potential direct and indirect impacts on receptors and these are summarised in the assessment tables below for each phase of the project.

14.7.2.5 Data gaps and limitations

In preparing this ESIA a great deal of primary and secondary information has been reviewed in order to identify receptors and define their sensitivity (see Section 14.5 above). For most priority species records of actual presence within the Project Area and/or AoI have been sufficient to determine whether that species may be a receptor and how the Project may affect it. For some species more information on behaviour, population trends and habitat preferences was available, or was specifically generated in preparation of this ESIA.

This further information has been invaluable in identifying potential impacts and in determining what appropriate mitigation should be put in place. However, much as the available data has been sufficient to undertake a comprehensive ESIA, there still remain some data gaps and other uncertainties particularly relating to information that would support planning further mitigation and monitoring in future.

More data is being and will therefore need to continue being collected for some species to allow better iterative planning in future. This will include amongst others, monitoring of populations of priority species and the condition and extent of habitats upon which they depend. In particular the Project will need to understand how the receptors respond to the mitigation that will be implemented. This is necessary to allow feedback on mitigation measures so that they can be adjusted in order to achieve the objectives for each receptor.

This additional data is particularly necessary in the case of such a complex and large-scale project that is likely to have direct and/or indirect impacts on a wide range of receptors and priority species, with different levels of direct and indirect impacts depending on their location and sensitivity.

Species-specific data gaps are discussed in the species profile tables included in Appendix O.3 of this ESIA and also in a robust gap analysis (Ref. 14.81) which deals specifically with data gaps relating to CHQS. The gap analysis (Ref. 14.81) confirmed that taxa have variable data availability and also that data availability for the same taxa also varied between the Critical Habitat Landscape Contexts, as follows:

Context A: Some data is available for all mammal CHQS, and population estimates are available for five (5) of the mammal species. Further research on these species is recommended, especially for species that lack adequate data (e.g. for Bohor reedbuck), and on habitat association and preference in order to enable further mitigations and to understand the proportion of the population impacted within the AoI. Less information is currently available on the birds in MFPA.

Context B: Generally, less information is available for species in the savanna corridor. Four (4) of the twelve CHQS have no data and five (5) are data deficient. Basic location data and identification of suitable habitat was recommended as a first step.

Context C: Within Lake Albert and tributary rivers and wetlands, there is no data for four fish species or for mollusc and shrimp species, while reptiles have limited data. The report recommended that detailed surveys should first be carried out in and around development areas. If the species is found, further surveys of the species populations and study of the species ecology should be undertaken.

Context D: Limited to moderate amounts of data exist for all CHQS within the forests and corridors. Detailed surveys were recommended for those with limited data. Long term studies e.g. collecting data on species behaviour, and development of a database were recommended for the remaining CHQS.

Context E: No data is available for species in the Nebbi district, but information from literature was synthesized to inform about CHQS that could potentially occur in this context. In addition, mapping of the habitats has only been done at a coarse scale.

Context F: For the mixed landscape, which includes mixed habitats landscape-wide, and the wide-ranging African Elephant and Chimpanzee, no accurate map exists for the different identified habitats used by these species. Some patchy data for these two mammals are available with population estimates for elephant in MFNP. Recommendations were mainly to establish these animals' ranging patterns, especially outside protected areas so as to identify potential safe corridors as well as areas of potential human-wildlife conflict.

The report (Ref. 14.81) concluded that there is the need for further data collection and analysis in each of the landscape contexts. The information will guide further mitigation and monitoring measures to ensure that species are not adversely exposed to significant impacts that would threaten their recovery and long-term outlook. The Project Proponents has already started collecting information to fill some identified data gaps as early as possible before operations start through recently initiated projects such as the collaring activities of various species within MFNP.

In the absence of complete information about all priority species, the assessment approach tried to be pragmatic about the information that is available and to employ the *precautionary principle*. Where more data is available, for example with regard to presence and activities of giraffe, elephants and larger mammals (such as Refs 14.46, 14.56, 14.58) and studies on habitat associations (Ref. 14.55), there is less requirement to deploy this principle as the effects of the project will be more certain, but for other species which are less well known or studied then more caution is required.

For example, if there are records of a particular priority species being present in an area or habitat type but our surveys have not found it, the assessment does not disregard this species. Similarly, field surveys taken for the project and in the surrounding area may record species that were not expected or which are not, for example, included in the URL and/or may not have been identified as a CHQS, but are nevertheless, by virtue of them actually being recorded in the project area, of greater importance than the desk study review might conclude. Where considered to be important these have been included in the assessment as priority species.

Therefore as noted a precautionary principle has been used in defining the sensitivity of priority species and their habitats, as well as the likely magnitude/character of impact that may occur as result of the direct and indirect effects of the project. Determining the level of potential impact consequently indicates the level and focus of mitigation that will be required in order to minimise the residual impacts; the level of residual impacts will determine what further monitoring and surveys will be required in order to determine the effectiveness of mitigation and so manage the impacts on these receptors.

14.7.3 Receptor sensitivity

This section presents the sensitivity of each receptor identified above; using the criteria presented in section 14.7.2.3. Table 14-13 below defines the sensitivity of each receptor.

Table 14-13: Receptor Species

Mammals	IUCN	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
Chimpanzee	EN (URL EN)	Footnote GN20[9] (1a)	B D F	Located largely outside the **Project footprint** and concentrated in tropical forest, but **wide-ranging** in the landscape (also Tier 2)	VERY HIGH
Rothschild's Giraffe	EN (URL EN)	1ab	A	Both species are concentrated in and around the **Project footprint**, in	VERY HIGH

[9] IFC Guidance Note 6, 2012 (Ref 14.15). Included based on reference to footnote GN20 which discusses the special consideration for wide-ranging, large EN and CR mammals that would not otherwise trigger Tier 1 thresholds.

Mammals	IUCN	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Lelwel Hartebeest	EN (URL NE)	1a	A	MFNP and mainly north of the Nile (Area A). Small numbers of Rothschild's Giraffe have recently been re-introduced south of the Nile.	VERY HIGH
Mammals	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint					
African Elephant	CR (IUCN VU)	1e	A B C F	Species recorded in MFNP, Bugungu WR, and the Ramsar site. Elephant also range widely in various habitats (hence Landscape Context F has been added).	HIGH
Lion	CR (IUCN VU)	1e	A B		VERY HIGH[10]
Spotted Hyena	CR (IUCN LC)	1e	A		HIGH
Bohor Reedbuck	EN (IUCN LC)	1e	A	Species recorded in MFNP and the Ramsar site.	HIGH
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project footprint					
No mammal species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient					
Medje Mops Bat	EN (IUCN LC)	1e	D	Budongo Forest Reserve	HIGH
Trevor's Free-tailed Bat	EN (IUCN DD)	1e	D	Budongo Forest Reserve, Semliki National Park, Wakiso District	HIGH
Savanna/Helios Pipistrelle	CR (IUCN DD)	1e (possible)	D	Hoima District (Buhamba), corridor wetlands between Wambabya and Budongo Forest Reserves	HIGH
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.					
No mammal species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the Project AoI.					
Charming Thicket Rat	VU (IUCN DD)	Poss. 2b (Tier 2)	Unknown	Unknown	MEDIUM
Ugandan Lowland Shrew	EN (IUCN DD)	1e & poss. 2e (Tier 2)	D	Recorded in lowland forest	HIGH
Uganda Mangabey	VU (IUCN LC)	Wb (Tier 2)	D	Bugoma Forest	MEDIUM
Criterion 3: Migratory and congregatory species					
Uganda kob	NE (IUCN LC)	3d (Tier 2)	A B	Kob congregate at traditional lekking sites during breeding. This species is concentrated in MFPA and along the savanna corridor to the south. The Project footprint area is a global stronghold for this species, which is not yet globally threatened but is vulnerable to hunting and disturbance.	HIGH

[10] In this assessment Lions have been defined as of Very High sensitivity due to their small population and vulnerability to poisoning and other physical threats.

Mammals	Uganda Red List	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Data Deficient and Not Evaluated species					
Russet free-tailed bat (*Chaerephon russata*)	NE (IUCN NT)	Possibly 1e	Unknown (Forest?)	This species may potentially qualify as CHQS under criterion 1e. However, very little is known about this bat, which is generally considered to be associated with tropical forest habitats.	HIGH
Mammals	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Other Notable Species (not CHQS)					
Hippopotamus	VU (IUCN VU)	N/A	A C	Present in MFNP and Ramsar site.	MEDIUM
Leopard	VU (IUCN NT)	N/A	A B D F	Recorded in MFNP.	MEDIUM
Giant pangolin	VU (IUCN VU)	N/A	B D	Has been recorded in Bugungu WR, Budongo & Buliisa CA.	MEDIUM
Peters' Pygmy Mouse	DD (IUCN LC)	N/A	A B	Recorded in MFNP. Likely to be present in similar habitat outside of the PA.	MEDIUM
Ethiopian Pygmy / Mahomet Mouse	DD (IUCN LC)	N/A	A B	Recorded in MFNP, Kabwoya FR and Bugungu WR.	MEDIUM
Bunyoro rabbit	VU (IUCN LC)	N/A	B	Has been recorded in Bugungu WR, Budongo & Buliisa CA.	MEDIUM
Alexander's cusimanse	VU (IUCN LC)	N/A	B D	Recorded in Bugungu WR, Budongo & Buliisa CA.	MEDIUM
Duke of Abruzzi's Free-tailed Bat	VU (IUCN LC)	N/A	B D	Recorded from lowland tropical moist and dry forest, including Wambabya Forest	MEDIUM
Bibundi Butterfly Bat	DD (IUCN DD)	N/A	B D	Recorded in Bugungu WR and Budongo FR	MEDIUM
Mongalia Free-tailed Bat	VU (IUCN LC)	N/A	B D	Found in open and dry savanna and Saharan grasslands. Recorded in Wambabya FR.	MEDIUM
Silvered Bat	VU (IUCN DD)	N/A	B D	Found in open and dry savanna and Saharan grasslands. Recorded in Wambabya FR.	MEDIUM
Light winged Lesser House Bat	DD (IUCN DD)	N/A	A B	Recorded in MFNP.	MEDIUM
Birds	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
No bird species defined in this category.					
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					
White-backed Vulture	CR (URL EN)	1ce	A	Vultures may forage over a large area. Nest sites for these species reportedly overlap with the Project footprint, but aerial surveys and field surveys have indicated that no nests are present close to the proposed locations of Project components.	HIGH
Rüppell's Vulture	CR (URL EN)	1ce	A B D		HIGH
Hooded Vulture	CR (URL EN)	1c	A B		HIGH
White-headed Vulture	CR (URL CR)	1c	A B		HIGH

Birds	IUCN	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Lappet-faced Vulture	EN (URL CR)	1ce	A		HIGH
Grey Crowned Crane	EN (URL EN)	1e	C	In the MFNP, mainly along the Lake Albert shoreline and fringing wetlands, close to the Project footprint	HIGH
Madagascar Pond-heron	EN (URL EN)	1ce	C		HIGH
Birds	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint					
Pallid Harrier	CR (IUCN NT)	1e	A B	Recorded within MFNP	HIGH
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project footprint					
African Crowned Eagle	EN (IUCN NT)	1e	D	Known from Budongo and Bugoma Forest Reserves	HIGH
Black-rumped Buttonquail	EN (IUCN LC)	1e	A B	Grassland	HIGH
Denham's Bustard	CR (IUCN NT)	1e	A	Grassland	HIGH
Fox Kestrel	EN (IUCN LC)	1e	A	*Acacia* savannah and thicket, especially where there are rocky hills	HIGH
Lappet-faced Vulture	CR (IUCN EN)	1e	A	Dry savanna	HIGH
Pel's Fishing Owl	EN (IUCN LC)	1e	A	Riverine woodland	HIGH
Shoebill	EN (IUCN VU)	1e	C	Seasonally flooded marshes, papyrus, reeds and grasses.	HIGH
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient					
No bird species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.					
No bird species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the Project AoI.					
Nahan's Partridge	VU (IUCN EN)	2b	D	Budongo and Bugoma Forests	HIGH
Criterion 3: Migratory and congregatory species					
African skimmer	VU (IUCN NT)	3 (possibly 2b) (Tier 2)	A C	A congregatory water-bird, with a regional stronghold in the Albert Nile below Murchison Falls, within the Ramsar and also above the Falls.	HIGH
Data Deficient and Not Evaluated species					
No bird species defined in this category.					
Amphibians	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
No amphibian species defined in this category.					
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					

Amphibians	IUCN	PS6 Criterion	Landscape Context			General Location	Receptor Sensitivity
Adolf Friedrich's / Rugege Squeaker Frog	LC (URL EN)	1e, 2b	D			Budongo Forest Reserve	HIGH
Golden Puddle Frog	LC (URL EN)	1e	D			Budongo Forest Reserve, Bugoma Forest Reserve and Wambabya Forest Reserve	HIGH
Kivu Clawed Frog	LC (URL EN)	1e	D			Wambabya Forest Reserve	HIGH
Amphibians	**IUCN**	**PS6 Criterion**	**Landscape Context**			**General Location**	**Receptor Sensitivity**
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint							
No amphibian species defined in this category.							
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project footprint							
No amphibian species defined in this category.							
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient							
No amphibian species defined in this category.							
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.							
No amphibian species defined in this category.							
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the Project AoI.							
Adolf Friedrich / Rugege Forest Squeaker Frog	LC (URL EN)	2b (Tier 2)	D			Known from Budongo Forest Reserve	HIGH
Christy's Grassland Frog	DD (URL VU)	2 (Tier 2)	A	B	D	Budongo Forest Reserve, escarpment below Bugoma Forest (may be confined to escarpment along Lake Albert)	MEDIUM
Uganda Clawed Frog	DD (URL VU)	2 (Tier 2)	D			Budongo Forest Reserve	MEDIUM
Kivu Clawed Frog	LC (URL EN)	2b (Tier 2)	D			Wambabya Forest Reserve	HIGH
Hyperolius langi	LC (URL DD)	Possibly 2b (Tier 2)	N/A			Unknown	MEDIUM
Hyperolius rwandae	NE (URL DD)	Possibly 2b (Tier 2)	N/A			Unknown	MEDIUM
Hyperolius lateralis	LC (URL NE)	Possibly 2b (Tier 2)	N/A			Unknown	MEDIUM
Leptopelis oryi	LC (URL NE)	Possibly 2b (Tier 2)	N/A			Unknown	MEDIUM
Criterion 3: Migratory and congregatory species							
No amphibian species defined in this category.							
Data Deficient and Not Evaluated species							
Rwanda Long Reed Frog (*Hyperolius rwandae*)	NE (URL DD)	Possibly Tier 2	N/A			This frog species might potentially qualify as Tier 2 restricted range species because they are endemic to the Albertine Rift. However, there are taxonomic uncertainties and the data are unreliable.	MEDIUM
Other Notable Species (not CHQS)							

Amphibians	**IUCN**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Lake Victoria Toad	DD URL NE)	N/A	A C	Recorded at pipeline and Victoria Nile Ferry crossing points within Ramsar.	MEDIUM
Reptiles	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
No reptile species defined in this category.					
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					
No reptile species defined in this category.					
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint					
No reptile species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project footprint					
Adanson's Hinged Terrapin	CR (IUCN DD)	1e	C	Shores of Lake Albert, adjoining streams and wetlands	HIGH
African soft-shelled turtle	CR (IUCN NE)	1e	C	Shores of Lake Albert, Victoria Nile below the falls	HIGH
Zaire Hinged Terrapin	CR (IUCN LC)	1e	C	MFNP, Kabwoya Wildlife Reserve (along Lake Albert shoreline)	HIGH
Smooth Chameleon	EN (IUCN NE)	1e	A B	MFNP, Bugungu Wildlife Reserve	HIGH
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient					
No reptile species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.					
No reptile species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species [also Data Deficient and Not Evaluated species] Restricted range species for which there are no species point location records in the Project AoI.					
Common / Serrated Hinge-back Tortoise	DD (IUCN DD)	Possibly 2b (Tier 2)	N/A	These species are all very under-studied but are only known from the Project AoI so far and may qualify for Criterion 2b but require more study nationally.	MEDIUM
Mocquard's African Ground Snake	NE (IUCN NE)	Possibly 2b (Tier 2)	N/A		MEDIUM
Uganda House Snake, Yellow Forest snake, Brown File Snake	NE (IUCN LC)	Possibly 2b (Tier 2)	N/A		LOW
Striped beaked snake (*Psammophylax acutus*)	NE (IUCN NE)	Possibly 2b (Tier 2)	N/A		MEDIUM
Criterion 3: Migratory and congregatory species					
No reptile species defined in this category.					
Other Notable Species (not CHQS)					
Northern Green Bush Snake/ Bequaert's Green Snake	DD (IUCN LC)	N/A	A	Recorded within MFNP (JBR-09)	MEDIUM
Sudan Beaked Snake	NE (IUCN LC)	N/A	A B C	Caught in pitfall traps at the CPF and at Isolation Valve (North), Isolation Valve (South).	LOW

Reptiles	Uganda Red List	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Reticulated Centipede-eater	DD (IUCN NE)	N/A	A B C	prefers moist savanna and was recorded at the Isolation Valve (North) within the MFNP and Ramsar site	MEDIUM
Nile Crocodile	NE (IUCN LC)	N/A	A C	Common within the Ramsar and MFNP.	LOW
Butterflies	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
No butterfly species defined in this category.					
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					
No butterfly species defined in this category.					
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint					
No butterfly species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project footprint					
No butterfly species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient (All species except *Micropentila bunyoro* are IUCN NE)					
Acraea alciope	CR	1e	D	All forest species known from Budongo and Bugoma Forest Reserves	HIGH
Andronymus caesar	EN	1e	D		HIGH
Andronymus gander	EN	1e	D		HIGH
Anthene ituria	EN	1e	D		HIGH
Bicyclus procura	EN	1e	D		HIGH
Euphaedra paradoxa	EN	1e	D		HIGH
Hypocopelates mera	CR	1e	D		HIGH
Iridana marina	EN	1e	D		HIGH
Lachnocnema magna	EN	1e	D		HIGH
Leptosia marginea	EN	1e	D		HIGH
Leptosia medusa	EN	1e	D		HIGH
Liptena hapale	EN	1e	D		HIGH
Liptena hiendlmayri	VU	1e	D		MEDIUM
Liptena undina	EN	1e	D		HIGH
Micropentila bunyoro	EN (IUCN DD)	1e	D		HIGH
Mylothris hylara	NE	1e	D		MEDIUM
Bright Chalk Blue *Thermoniphas togara*	EN	1e	D		HIGH
Light Banded Blue *Uranothauma heritsia*	EN	1e	D		HIGH
Xanthodisca vibius	EN	1e	D		HIGH
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.					
No butterfly species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species (All species are IUCN NE) Restricted range species for which there are no species point location records in the Project AoI.					

Butterflies	Uganda Red List	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Anthene ituria	NE	1A and possibly 2b (Tier 2)	D	Bugoma Forest Reserve	MEDIUM
Liptena hapale	NE	1A and possibly 2b (Tier 2)	D	Budongo Forest Reserve	MEDIUM
Liptenara hiendlmayri	NE	1A and possibly 2b (Tier 2)	D	Budongo Forest Reserve	MEDIUM
Criterion 3: Migratory and congregatory species					
No butterfly species defined in this category.					
Data Deficient and Not Evaluated species					
Mylothris hylara (alternative spelling: *Milithrus hylara*)	NE (IUCN NE)	Possible 1e	D	This species is yet to be evaluated for either Red List. It has been associated with forest corridor habitats and it is possible that this butterfly meets Critical Habitat criterion 1e in the study area.	MEDIUM
Other Notable Species (not CHQS) (All species are IUCN NE)					
Acraea pharsalus	VU	N/A	A D	Field surveys undertaken by Project ESIA team in 2017 identified a number of other mainly forest species within the MFNP, around the Bugungu Airstrip and Buliisa areas.	MEDIUM
Anthene indefinita	VU	N/A	A D		MEDIUM
Euchrysops albistriata	VU	N/A	A D		MEDIUM
Anthene indefinita	VU	N/A	A D		MEDIUM
Euchrysops subpallida	VU	N/A	A D		MEDIUM
Leptotes marginalis	VU	N/A	A D		MEDIUM
Lepidochrysops jansei	DD	N/A	A D		MEDIUM
Acraea pharsalus	VU	N/A	A D		MEDIUM
Anthene indefinite	VU	N/A	A D		MEDIUM
Colotis chrysonome	VU	N/A	A D		MEDIUM
Dragonflies	**Uganda Red List**	**PS6 Criterion**	**Landscape Context**	**General Location**	**Receptor Sensitivity**
Criterion 1, Tier 1 Critically Endangered and Endangered Species					
No dragonfly species defined in this category.					
Globally threatened Criterion 1, Tier 2 Critical Habitat-qualifying Species					
No dragonfly species defined in this category.					
Nationally-threatened Criterion 1, Tier 2 Critical Habitat-qualifying species recorded in the Project Footprint					
No dragonfly species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species thought likely to occur in/near to the Project footprint					
No dragonfly species defined in this category.					
Nationally-threatened Tier 2 Critical Habitat-qualifying Species that are data deficient					
Albertine Jewel *Chlorocypha schmidti*	DD (IUCN VU)	1e (possible)	D	Forests in Uganda	MEDIUM
Aethiothemis coryndoni	VU (IUCN LC)	1e	D	Budongo Forest Reserve	MEDIUM
Black Threadtail *Elattoneura nigra*	EN (IUCN LC)	1e	D	MFNP	HIGH

Dragonflies	Uganda Red List	PS6 Criterion	Landscape Context	General Location	Receptor Sensitivity
Pale Duskhawker *Heliaeschna trinervulata*	CR (IUCN LC)	1e	D	Forests in western Uganda	HIGH
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are species point location records in the Project AoI.					
No dragonfly species defined in this category.					
Criterion 2 (Tier 1 and 2) Endemic/Restricted Range Species Restricted range species for which there are no species point location records in the Project AoI.					
Aethiothemis coryndoni	VU (IUCN LC)	1e and possibly 2b (Tier 2)	Unknown	Unknown	MEDIUM
Criterion 3: Migratory and congregatory species					
No dragonfly species defined in this category.					
Data Deficient and Not Evaluated species					
No dragonfly species defined in this category.					
Other Notable Species (not CHQS)					
Pseudagrion (B) *torridum*	VU (IUCN LC)	N/A	A C	Field surveys undertaken by Project ESIA team in 2017 identified a number of other dragonfly species within the MFNP and Ramsar site areas.	MEDIUM
Neurogomphus featheri	DD > ?EN (IUCN LC)	N/A	A C		MEDIUM
Sympetrum fonscolombii	DD (IUCN LC)	N/A	A C		MEDIUM
Acisoma inflatum	NE (IUCN LC)	N/A	A C		MEDIUM
Gomphidia bredoi	VU (IUCN LC)	N/A	A C		MEDIUM

14.7.4 Project Components and Activities

Having defined the receptors it is necessary to understand how the Project activities and components will likely interact with them. The Project is a complex entity that includes a number of inter-linking elements. These project components will be constructed over a number of years and operated for even longer, with ultimately decommission and restoration at the end of the Project's life.

Many of the project's component sites are similar and there is considerable repetition of processes and structures. However, the overall combined impact of those components needs to be taken into account, particularly where such components are located near each other in similar habitat. In such situations the combined effects of project infrastructure can have broader effects over the project's various landscapes and the populations of species that inhabit them.

An overview of the design of the Project is provided in ***Chapter 4: Project Description and Alternatives***. However, it is necessary to isolate and describe those elements of the project that are likely to interact with (and therefore impact on) the ecological receptors that have been identified in this chapter. The Project will have four phases comprising:

- Site Preparation and Enabling Works, expected to take approximately 5 years;
- Construction and Pre-Commissioning, expected to take around 7 years;
- Commissioning and Operations, expected to commence in Year 3. The lifetime of the Project is 25 years; and
- Decommissioning, planned for the end of the 25 year operation

The Project activities that are likely to occur during each of the Project's four phases, derived from the Project Description, are summarised in Table 14-14 below.

Table 14-14: Project Activities which may Impact Terrestrial Wildlife

Phase	Activity
Site Preparation and Enabling Works	Land acquisition for all Project components
	Mobilisation of plant and construction vehicles to the Project Site
	Transportation of personnel, construction material (e.g. Materials; murram, sand, stones etc.), waste, other materials and supplies (including fuel and other hazardous substances)
	Physical presence of construction personnel
	Drilling of boreholes for water abstraction (Buliisa camp, Bugungu camp, Tangi Camp, well pads and Industrial Area)
	Abstraction of water from boreholes for potable, washing and dust suppression purposes
	Waste generation, storage and disposal (hazardous and non-hazardous)
	Disposal of treated waste water (grey and black)
	Storage of fuel and hazardous materials
	Refuelling of plant and machinery within Project Site
	Use of power generation plant (e.g. diesel generators)
	Lighting emissions
	Excavation from borrow pits and quarries
	Resource use (i.e. construction materials)
	Restoration of borrow pits and quarries
	Physical movement of vehicles and plant (Industrial Area, well pads, WAS, Masindi Vehicle Check Point, Bugungu Airstrip and Victoria Nile Ferry Crossing Facilities)
	Clearance of vegetation and soils (Industrial Area, well pads, WAS, Masindi Vehicle Check Point, Bugungu Airstrip, Victoria Nile Ferry Crossing Facilities, Tangi camp extension)
	Demolition of existing buildings at the Industrial Area, well pads, WAS, if present
	Civil works activities at well pads and WAS sites
	Installation of structure around well pads in the north of the Victoria Nile
	Installation of temporary facilities at the Masindi Vehicle Check Point (i.e. containers)
	Construction of Victoria Nile Ferry Crossing Facility, including piling for the jetties
	Installation of facilities at Victoria Nile Ferry Crossing (i.e. containers)
	New access roads (W1 ,C1, N1, N2 , inter field access roads south of the Victoria Nile) and upgrade works of existing roads (A1, A2, A3, A4, B1 and B2) including the installation of drainage
	Discharge of surface runoff from roads
	Construction activities at Tangi Camp
Construction and Pre-Commissioning	Mobilisation of plant and construction vehicles to the Project Site
	Transportation of personnel, construction material (e.g. Materials; murram, sand, stones etc.), waste, other materials and supplies (including fuel and other hazardous substances)
	Physical presence of construction personnel
	Abstraction of water (ground and surface) for use at well pads, camps and Masindi Vehicle Check Point for potable, washing and dust suppression purposes
	Operation and discharge from temporary Sustainable Drainage System (SuDS) (including use of storm water facility)
	Discharge of treated waste water from Waste Water Treatment plant at camps
	Waste generation, storage and disposal (hazardous and non-hazardous)

Phase	Activity
	Refuelling of plant and machinery within Project Site
	Storage of fuel and hazardous materials
	Drilling of wells and Horizontal Directional Drilling (HDD) activities at the Victoria Nile Crossing Points (on a 24/7 basis); involving Nightime working at well pads and HDD Construction Area
	Use of temporary power generation plant (e.g. diesel generators)
	Construction activities at the Industrial Area, well pads and WAS
	Excavation of construction material from quarries
	Resource use (i.e. construction materials)
	Physical movement of construction vehicles and plant within the Project Site
	Clearance of vegetation and soils for Production and Injection Network Right of Way (RoW), WAS pipeline RoW and HDD Construction Area
	Painting and coating of pipeline at Tangi and Industrial Area Construction Support Base
	Construction of Production and Injection Network (i.e. Pipelines and Flowlines) and WAS pipeline RoW including trenching, welding, storage of material, backfilling etc.
	Pre-commissioning activities including use and disposal of treated water and associated chemicals
	Restoration of borrow pits and quarries, Projection and Injection Network RoW, WAS pipeline RoW and HDD Construction Area
Commissioning and Operations	Transportation of personnel, waste, other materials and supplies (including fuel and other hazardous substances
	Physical movement of vehicles and plant within the Project Site
	Abstraction of water from boreholes and surface water for industrial, potable, washing and dust suppression purposes
	Waste generation, storage and disposal (hazardous and non-hazardous)
	Discharge of treated waste water from Waste Water Treatment plant
	Storage of fuel and hazardous materials
	Refuelling of plant and machinery within Project Site
	Lighting emissions from Industrial Area, Tangi, well pads (during work over activities only)
	Power generation and flaring at CPF
	Operation of CPF plant and equipment
	Operation of plant and equipment at the well pads
	Well pad maintenance activities (including the use of work-over rig)
	Projection and Injection Network maintenance (e.g. pigging activities)
	Operation and maintenance of WAS
	Operation and maintenance of the Victoria Nile Ferry
	Discharge of surface runoff from all permanent facilities via SuDS
Decommissioning	Dependent upon Decommissioning strategy - but expected to be the similar to those for Construction and Pre-Commissioning

14.7.5 Potential Direct Impacts

The way the Project activities could impact on terrestrial wildlife can be condensed into four main types that are listed and summarised in general terms in Table 14-15 below.

Note that there is a certain amount of overlap between impact types, for example where loss, degradation or fragmentation of habitats will have an effect on species populations, but the aim is to try to separate out further the causes of impacts for the assessment. In addition, in a technical sense barrier effects could be regarded as 'disturbance'. However, because the Project comprises linear or interconnected infrastructure elements, for the purposes of this assessment barrier effects has been included as a separate category of impact.

Table 14-15: Potential Direct Impacts

Potential Impacts on Terrestrial Wildlife (Covers All Phases)
Loss, degradation or fragmentation of species habitat
1. Direct loss of habitat from site clearance and establishment of well pads, roads and other components; 2. Soil erosion at adjacent habitats from site drainage or flooding; 3. Smothering of adjacent habitats from dust, concrete or other material; 4. Compaction of soils from works or off-road driving; 5. Changes to seasonal wetlands or other habitats due to surface and groundwater changes; 6. Changes to frequency of fires or where they might occur; and 7. Impacts due to unplanned events such as: - Introduction of alien or invasive plant species; - Contamination with oils or chemicals; - Waste management issues; and - Illegal land clearance.
Population Changes
1. Species mortality from unplanned events such as vehicle incidents, fire, poisoning or disease transfer; 2. Loss of breeding areas and/or disruption of breeding behaviours; 3. Reductions in prey or loss of feeding areas; 4. Destruction or disturbance of nests and nursery areas; and 5. Increased incidence of human-wildlife conflicts.
Disturbance
1. Visible human presence; 2. Lighting and night-time working; 3. Vehicles movements; 4. Noise and vibration; 5. Dust and air quality (smoke and other emissions); 6. From unplanned events such as water contamination; and 7. Barrier Effects (see below).
Barrier Effects

Potential Impacts on Terrestrial Wildlife (Covers All Phases)
1. Construction sequencing creating linear working areas over extended periods; 2. Presence of road construction and traffic flow; creating barrier effects; 3. Presence of trenches and other extended linear excavations; 4. Presence of linear fencing; 5. Lighting of roads and around installations; 6. Pipelines located at the surface (temporary, or assembled strings prior to installation); 7. Linear works near features such as watering holes; 8. Positioning of physical project components; and 9. Loss of connecting habitats through illegal clearance or land use severing habitat corridors.

14.7.6 Potential Indirect Impacts

As noted in Table 14-12 above, in addition to the direct effects of various phases of the Project, there are likely to be indirect or induced impacts. These will relate mainly to increased pressures on natural resources due to the influx of workers and their social and economic dependents. Such an influx will attract people providing ancillary goods and services to those workers, and with improved access to the region, this will exacerbate those pressures.

Indirect impacts may occur close to the Project Footprint, for example in the MFPA itself but also further afield in protected areas, other parts of the landscape contexts and unprotected natural habitat that may lie some distance from the Project location. This will be particularly the case where there are induced population increases around existing population centres such as Masindi, Hoima, Wanseko, Pakwach and other settlements.

Potential indirect impacts are summarised in Table 14-16 below.

Table 14-16: Potential Indirect Impacts

Potential Indirect / Induced Impacts (All Phases)
1. Encroachment on protected areas from illegal land clearance; 2. Loss of natural habitat to farming, grazing or settlements or other infrastructure; 3. Illegal natural resource collection for firewood, fibres, food, medicines; 4. Fragmentation or degradation of natural habitat leading reducing further remaining connectivity between protected areas and/or areas of higher ecological value; 5. Increased risk of fire (deliberate or accidental), e.g. from poachers deliberate fire setting; 6. Introduction/spreading of invasive species; 7. Pressure on water supply causing changes to hydrology/hydrogeology affecting water supply to habitats; 8. Increased poaching/hunting and fishing; 9. Increased potential for human-wildlife conflict; 10. Loss of threatened species (CHQS and other protected species) directly or through loss of habitat; and 11. Overall loss or reduction in species diversity.

14.7.7 Embedded Mitigation

In undertaking an impact assessment it is necessary at all stages of the Project development and assessment process to consider the potential impacts of the Project. Such consideration should be used to recognise and design out these potential impacts as early in the design process as possible.

This is one of the objectives of the FEED process, which has to consider many factors, including potentially significant impacts on the environment, in order to refine the Project design.

In developing the embedded or in-built design mitigation, the requirements of the mitigation hierarchy have been followed. This places avoidance at the first stage of mitigation. For the FEED process, within the limitations of the actual location of the Project Area, avoidance has therefore been the focus of much of the design.

To achieve this, several iterations of avoidance mapping for biodiversity have been undertaken to identify and map fixed features, which the Project design has sought to avoid. Following general identification of such features, detailed avoidance mapping was undertaken by the Tilenga ESIA team in order to support refining of the locations for Project infrastructure (see Refs. 13-27 & 13-28) as well as studies on preferred habitats for a number of species (Ref 13.29). ***Chapter 4 Project Description and Alternatives*** presents an overview of the mitigation hierarchy applied by the Project Proponents, with avoidance being a prime consideration in the Project's design.

The positioning of Project infrastructure has included "micro-siting" of well pads and other facilities and sensitive routing of access roads and flowlines in order to avoid important features that have been identified within the landscape.

In addition to the actual siting of facilities, the construction and design details have taken environmental protection into consideration. Details of the Project's in-built design and operational parameters are defined in ***Chapter 4: Project Description and Alternatives*** of this ESIA and the embedded mitigation have been taken into consideration when undertaking the assessment. The embedded mitigation measures of particular relevance to terrestrial wildlife that have been considered in the impact assessment are listed in Table 14-17 below.

Table 14-17: Embedded Mitigation

Embedded Mitigation for Terrestrial Wildlife
All fuels and hazardous materials will be stored with appropriate containment including impermeable areas, kerbing, bunding and drip trays
Chemicals and hazardous liquids will be supplied in dedicated tote tanks made of sufficiently robust construction to prevent leaks/spills. Dedicated procedures will be developed for fuel and hazardous material transfers and personnel will be trained to respond. Spill kits will be available at all storage locations
Main refuelling facilities will be located within the Industrial Area, the camps and the Masindi Vehicle Check Point. Facilities will be located within bunded areas with appropriate capacity (110% tank containment). The refuelling pumps will be equipped with automatic shut off and there will be dedicated procedures and spill kits available. Bunds will be designed to minimise ingress of surface water, facilities roofed where practicable and any contaminated water collected will be trucked off site for disposal
With the exception of the CPF which has a bespoke drainage arrangement, drainage for the permanent facilities will be as follows: potentially contaminated areas (i.e. fuel and chemical storage areas) will be provided with local effluent collection (sumps, kerbing and bunding) whereby the potentially contaminated water will be collected and removed by road tanker to a licenced waste disposal facility; and uncontaminated areas which will drain naturally to the environment via Sustainable Drainage System (SuDS) comprising filter drains and soakaways. The SuDS design is subject to further detailed design.
Lighting will be reduced to the minimum and its design consider need to limit associated nuisances (e.g. light directed inwards, of warm/neutral colour) without impacting safety and security.
There will be a 15 m wide buffer from the perimeter security structure, which will be cleared of vegetation. Within the MFNP, the structure will be designed to prevent the ingress of animals entering the well pads and will comprise a bund wall structure
The pipelines will comprise carbon steel with adequate corrosion allowance built into material specifications (wall thickness) to prevent leaks

Embedded Mitigation for Terrestrial Wildlife
The drainage arrangement of the CPF will be designed to segregate clean and potentially contaminated effluent streams.
Drainage channels will be installed along the edges of the upgraded roads to prevent excessive runoff and cross drainage culverts will be installed as required. All drainage infrastructure will be designed taking into account the Uganda Ministry of Works and Transport - Road and Bridge Works Design Manual for Drainage (January 2010) (Ref. 4.2)
All site clearance activities will be undertaken in line with the Site Clearance Plan which will be developed by the Contractor(s) prior to commencing the Site Preparation and Enabling Works Phase to limit extent of vegetation clearance.
Surface water will be managed via temporary sustainable drainage systems (SuDS) to manage flood and contamination risk. The requirements for construction SuDS will be adapted depending on the nature of the activities utilising the principles as outlined in Chapter 23: Environmental and Social Management Plan
During site clearance, vegetation stripping will be undertaken using a phased approach to minimise sediment pollution from runoff
Buffer zones will be established to protect watercourses and habitats
Barriers and fences will be used to isolate work areas
Contaminated run off will be minimised by ensuring adequate storage facilities are in place for materials stockpiles, waste, fuels/chemicals/hazardous materials, vehicles/washing areas, parking facilities
Clean surface water will be diverted away from exposed soils with use of diversion drains and bunds
All dewatering from excavations or isolated work areas will be provided with appropriate level of treatment prior to discharge
Implementation of a Dust Control Plan, which will include measures to include the application of dust suppressants (including water), on potentially dust generating sources, including on site and off site roads used by Project vehicles and material stockpiles.
All temporary facilities, including temporary access roads, will be restored after they are no longer required after use; in line with Site Restoration Plan
Additional water supply boreholes will be installed during the Site Preparation and Enabling Works Phase and will be drilled to target deep water aquifer zones using water and bentonite
It is planned to reuse removed soil onsite or for borrow pits restoration. Through detailed design, the Project will ensure the generation of excess material is minimised
All borrow pits and quarries used by Project Proponents will be re-habilitated following completions of extraction in line with the Site Restoration Plan as developed by the Contractor
As per base case, there will be no routine nightshift activities associated with the Site Preparation and Enabling Works Phase
With the exception of drilling and HDD construction activities there will be no permanent night time working in the MFNP
Laydown areas at each of the well pad sites will be located within the footprint of the well pad; there will be no additional site clearance required outside the well pad footprint during the Construction and Pre-Commissioning Phase
Construction activities for the Production and Injection Network will be contained within the permanent RoW which will have a width of 30 m and is designed to accommodate the pipeline trench(s), stockpile areas, laydown, welding, and the movement of construction equipment alongside the trench(s)

Embedded Mitigation for Terrestrial Wildlife
The length of open trenching at any given time will be minimised to approximately 1 km to allow wildlife and the local community safe passage
The use of animal crossing structures such as bridges, culverts, and over crossings, along pipeline and access road RoW will be considered. At special points such as crossings, deep excavations and tie-in bell holes, safety fences will be installed to prevent human or animal ingress
Ditch plugs will be installed on all trenches to prevent the pooling of water in the trenches
When stringing pipeline in the MFNP, consideration will be given to minimising the amount of open trench time and where practicable maintaining pathways for wildlife to traverse
The pipe laying and backfill activity is to be conducted as soon as practicable after the trench excavation utilising standard pipe laying cranes and earthmoving equipment
The temporary land required for the HDD Construction Areas will be restored following construction in line with the Site Restoration Plan as developed by the Contractor
Any residues and wastes generated from pre-commissioning activities will be managed in accordance with the site Waste Management Plan
For any chemical usage [with respect to pre-commissioning], a thorough Chemical Risk Assessment will be undertaken and lowest toxicity chemicals will be used wherever possible
All construction vehicles/equipment will be kept on site when not in use
The base case for Tilenga is that there will be no night driving. However, night driving may be permitted in exceptional circumstances and with internal derogation where it is deemed safe and practicable to do so
The ferry will operate for 8 hours a day and will be dedicated to Project use only. There will be no ferry movements during night time hours except in exceptional circumstances and with internal derogation
The permanent RoW will be kept clear of trees, deep rooting vegetation, poles, structures and graves. Regular monitoring will be undertaken, which will include removal of vegetation overgrowth and uprooting tree seedlings
A Waste Management Plan will be developed and maintained to cover the duration of the Project; and will address the anticipated waste streams, likely quantities and any special handling requirements. The Project Proponent's will implement a waste tracking system to ensure traceability of all wastes removed off site.
Sewage produced from the camps and other Project Areas will be treated at the WWTPs located at the camps in compliance with regulatory requirements (refer to Chapter 10: Surface Water). Wastewater from the well pads will be collected and transferred by tanker to the nearest WWTPs
Avoidance of sensitive features to minimise the footprint when siting options for key facilities, taking into account both environmental and social sensitivities. The Project Proponents initiated their own avoidance protocol which was used by the FEED Engineers in the development of the Project's design.

14.7.8 Additional Mitigation

The agreed embedded mitigation will be implemented as part of the Project to the sequence of the mitigation hierarchy as set out in IFC PS6. However, further additional mitigation has been identified through the assessment process and, where relevant, this is discussed through the assessment sections below. Taking both the embedded and the additional mitigation into account defines the residual environmental impacts of the Project.

Where required, further detail on mitigation measures will be given in Environmental and Social Management Plans as indicated in ***Chapter 23: Environmental Social Management Plan***. In some cases, further work (including surveys and monitoring) will be required to consider various mitigation options before selection and implementation of the most appropriate option.

Except where explicitly stated, mitigation for closure and decommissioning of the Project is not considered in detail in this assessment, because the necessary measures will be developed during the operational life of the field and are not known at the present time. In addition, the conservation status of various receptors and consequently their sensitivity is likely to have changed by the time decommissioning works actually take place.

It is intended that those mitigation measures, which will include restoration of Project sites, will be flexible and that feedback on the success of mitigation measures, will be reviewed in order to ensure that the defined and agreed mitigation objectives are actually achieved. These will also be reviewed during the detailed design phase to ensure their adequacy in mitigating the potential impacts.

Where it is determined through monitoring that overall the mitigation measures have not been successful or have fallen short of objectives, then remedial actions will be identified and undertaken as soon as practicable after the requirement for remedial action is identified.

14.7.9 Assessment of Impacts: Site Preparation and Enabling Works

14.7.9.1 Potential Impacts

Potential impacts on identified terrestrial wildlife receptors are defined in this section, that is, impacts considered to be likely to occur during the Site Preparation and Enabling Works phase, taking into account the embedded mitigation but not additional mitigation. As noted above, the potential impacts on terrestrial wildlife can be divided into four main impact types, which are discussed further below.

14.7.9.1.1 Loss, degradation or fragmentation of species habitat

During the initial Site Preparation and Enabling Works phase there will be clearance of vegetation and preparation for the subsequent phases of the project. Access tracks will be built and the Industrial Area and well pads areas cleared, with soil and subsoil stockpiled for later use as required.

In addition to vegetation and habitats, such site clearance may directly affect animal burrows, nests, seasonal wetlands, animal territories, breeding grounds and other sensitive areas. Potential damage to seasonal wetlands from access track crossings may affect the hydrology of these wetland areas as well as disturbing fauna species that may attempt to utilise them during construction activities.

Furthermore, during the Site Preparation and Enabling Works phase there is potential for additional habitat to be affected by activities where they spread into areas outside of the immediate project footprint. This may be as a result of the works or plant straying beyond the defined footprint of the works, or because through run-off or spreading of dust or pollution, habitats are lost or otherwise degraded.

14.7.9.1.2 Population changes

The introduction of intensive human activity within the MFNP may impact on population levels of a number of species. In addition, increased numbers of humans into protected areas may increase the spread of zoonotic diseases and disturb breeding birds.

14.7.9.1.3 Disturbance

Animals are likely to be disturbed by the presence of people in the landscape, vehicle movements, noise and vibration. The greatest potential for disturbance it likely to be during site clearance and construction phases, particularly during site activities such as access road creation, earth moving, well-pad clearance and other excavations because there will be disturbance, noise, vehicles and humans in the landscape and a direct and rapid loss of habitat.

Of particular concern is works near sensitive areas such as season wetlands and waterholes, where the presence of humans and construction activities may deter animals from using them. From site observations (Dr B Cuthbert, personal observation) animals such as giraffe, kob and hartebeest were noted to move some considerable distance if they detect humans on foot in the vicinity, often displacing more than 500m away.

14.7.9.1.4 Barrier Effects

Site clearance for linear project elements such as access roads may create barrier effects for animals as they traverse the landscape. In addition, where well pads are located close together (such as well pads JBR-07 and JBR-08 which lie within 500m of each other) this may also deter animals from moving between them during site clearance activities, particularly when some species move at the end of each season to and from the delta in search of better forage and water. It is therefore possible that individuals will be deterred from using certain routes between preferred habitats during periods where there is more intense activity and more humans are present in the landscape.

14.7.9.1.5 Indirect Impacts

A number of priority species receptors are not recorded in the Landscape Context A but are present in protected areas (PA) and other areas within the wider Project AoI. These include species associated with Landscape contexts B (Savanna Corridor) and D (Tropical High Forest), where potential indirect impacts on forests and other areas due to human population changes induced by the Project could occur.

These population changes would be likely to cause land use changes and degradation of habitats, illegal logging, drinking/irrigation water, resource/ medicinal plant gathering, land clearance, illegal hunting/ poaching/ snare setting and zoonotic disease transmission. In addition construction of ‘oil roads’ as associated infrastructure will enable easier access for people and vehicles to forests and other protected areas.

14.7.9.1.6 Overview of potential Impacts

Table 14-18 summarises the potential impacts on priority species (before consideration of additional mitigation) for this phase of the works.

Table 14-18: Summary of Potential Impacts: Site Preparation and Enabling Works

Mammals	Landscape Context	Sensitivity	Potential Direct Impact Magnitude	Potential Direct Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance
CHQS Species						
Chimpanzee	B D F	VERY HIGH	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Rothschild's Giraffe	A	VERY HIGH	MEDIUM	**HIGH ADVERSE**	LOW	**MODERATE ADVERSE**
Lelwel Hartebeest	A	VERY HIGH	MEDIUM	**HIGH ADVERSE**	LOW	**MODERATE ADVERSE**
African Elephant	A B C F	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Lion	A B	VERY HIGH	MEDIUM	**HIGH ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Spotted Hyena	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Bohor Reedbuck	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Medje Mops Bat	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Trevor's Free-tailed Bat	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Savanna/Helios Pipistrelle	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Charming Thicket Rat	(Forest?)	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Ugandan Lowland Shrew	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Uganda Mangabey	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Uganda kob	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Russet free-tailed bat	(Forest?)	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Other Notable Species (not CHQS)						
Hippopotamus	A C	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Leopard	A B D F	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Giant pangolin	B D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Peters' Pygmy Mouse	A B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**
Ethiopian Pygmy / Mahomet Mouse	A B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**
Bunyoro rabbit	B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**

Mammals	Landscape Context	Sensitivity	Potential Direct Impact Magnitude	Potential Direct Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance
Alexander's cusimanse	B D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Duke of Abruzzi's Free-tailed Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Bibundi Butterfly Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Mongalia Free-tailed Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Silvered Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Light winged Lesser House Bat	A B	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Birds	**Landscape Context**	**Sensitivity**	**Potential Direct Impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**
CHQS Species						
White-backed Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Rüppell's Vulture	A B D	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Hooded Vulture	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
White-headed Vulture	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Lappet-faced Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Grey Crowned Crane	C	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Madagascar Pond-heron	C	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Pallid Harrier	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
African Crowned Eagle	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Black-rumped Buttonquail	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Denham's Bustard	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Fox Kestrel	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Lappet-faced Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Pel's Fishing Owl	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Shoebill	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Nahan's Partridge	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
African skimmer	A C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**

Amphibians	Landscape Context	Sensitivity	Potential Direct Impact Magnitude	Potential Direct Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance
CHQS Species						
Adolf Friedrich's / Rugege Squeaker Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Golden Puddle Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Kivu Clawed Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Christy's Grassland Frog	A B D	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Uganda Clawed Frog	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Hyperolius langi	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Hyperolius rwandae	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Hyperolius lateralis	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Leptopelis oryi	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Other Notable Species (not CHQS)						
Lake Victoria Toad	A C	MEDIUM	MEDIUM	**MODERATE**	MEDIUM	**MODERATE**
Reptiles	**Landscape Context**	**Sensitivity**	**Potential Direct Impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**
CHQS Species						
Adanson's Hinged Terrapin	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
African soft-shelled turtle	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Zaire Hinged Terrapin	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Smooth Chameleon	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Common / Serrated Hinge-back Tortoise	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Mocquard's African Ground Snake	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Uganda House Snake, Yellow Forest / Brown File Snake	N/A	LOW	LOW	**INSIGNIFICANT**	LOW	**INSIGNIFICANT**
Striped beaked snake *Psammophylax acutus*	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**

Reptiles	**Landscape Context**	**Sensitivity**	**Potential Direct Impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**
Other Notable Species (not CHQS)						
Northern Green Bush Snake/ Bequaert's Green Snake	A	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Sudan Beaked Snake	A B C	LOW	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Reticulated Centipede-eater	A B C	MEDIUM	MEDIUM	**LOW ADVERSE**	MEDIUM	**LOW ADVERSE**
Nile Crocodile	A C	LOW	MEDIUM	**LOW ADVERSE**	MEDIUM	**LOW ADVERSE**
Butterflies & Dragonflies	**Landscape Context**	**Sensitivity**	**Potential Direct Impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**
CHQS Species						
17 butterfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
5 butterfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Mylothris hylara	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
2 dragonfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
2 dragonfly species	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Other Notable Species (not CHQS)						
10 butterfly species	A D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
5 dragonfly species	A C	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**

The assessment of potential impacts, prior to additional mitigation, for the Site Preparation and Enabling Works indicates that there are potentially significant (**Moderate** to **High**) impacts for a number of receptor groups mainly within Landscape Contexts A (MFNP), B (savanna corridor) and C (Lake Albert, rivers and wetlands). In addition, there are potentially significant impacts on species associated with Landscape Context D (Forests) due to indirect effects.

This stage of the project includes most of the site clearance and earthworks for the Project. This is likely to have the general effect of disturbance of animals as well as potential barrier effects, as there will be areas which the animals will avoid while activities are on-going. This disturbance and barrier effects arise largely because of the presence of humans that the animals will be able to detect. The full assessment and discussion for all species is included in the tables in Appendix O.3.

14.7.9.2 Additional Mitigation and Enhancement: Direct impacts

The embedded mitigation measures presented in Table 14-17 will be supplemented with further 'additional' mitigation measures to control and reduce potential impacts on terrestrial wildlife. These are presented in Table 14-19 below. It should be noted that as many of the mitigation measures will be similar across different Project phases they are all shown in this table, with the Project phase(s) they relate to indicated in the columns on the right.

Each mitigation measure has been assigned a reference number for ease of reference throughout the ESIA. All mitigation measures will be outlined in the Environmental and Social Management Plan (ESMP) for the Project and are included in the ESMP Mitigation Checklist in Appendix T. As indicated above, these will be reviewed during the detailed design phase to ensure their adequacy in mitigating the potential impacts.

Table 14-19: Additional Mitigation (All Project Phases)

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TW1	A Biodiversity and Ecosystem Services Management Plan (BMP) will be developed, ensuring that impacts of site clearance on plant species of conservation concern will be minimised	X	X	X	X
TW2	The Site Clearance Plan will be developed to structure and schedule clearly site clearance activities, noting any constraints	X	X		
TW3	A Site Restoration Plan for the Project will be developed and will be updated prior to commencement of every stage of the Project	X	X	X	X
TW4	Works and traffic/plant movement will maintain strict adherence to agreed footprint design including access roads and other infrastructure	X	X	X	X
TW5	Materials to be used in forming platforms, bund walls and other site preparation works within Protected Areas will be locally sourced as much as possible (i.e. materials used in the MFNP should be from other sites within the MFNP), but away from sensitive biodiversity areas	X			
TW6	Where unavoidable, soil and/or other materials shall be brought from outside of Protected Areas for use within the Protected Areas only upon approval by the responsible government agency (i.e. UWA or NFA), and this process will be subject to a risk assessment process as described in the scope for the Alien/Invasive Species Management Plan	X			X

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TW7	The design of the bund walls in the park will be optimised to minimise requirement for materials taken from outside of the park	X			
TW8	Topsoil will be stockpiled separately from subsoil, with all soils being reinstated in the reverse order to that in which they have been removed in order to initiate rehabilitation. All stockpiles will be stabilised, not being higher than 3 m, and where practicable blend in with the surrounding topography. Topsoils will also be monitored (e.g. for organic content)	X	X		X
TW9	There will be no smoking outside of any designated areas due to risk of fire and consequently loss of adjacent habitats	X	X	X	X
TW10	Access to areas outside of site boundaries by workers will be prohibited within the park	X	X	X	X
TW11	Dust control measures will be implemented at each site and access road to prevent smothering of adjacent habitats (as outlined within the Air Quality and Climate chapter). Dust emissions will be strictly controlled via adhering to the operating procedures set out in the Dust Control Plan	X	X	X	X
TW12	Landforms, slopes and drainage from sites and access roads will be designed to prevent erosion of adjacent soils and impacts on habitats, as discussed in Chapter 8: Geology and Soils	X	X	X	X
TW13	Discussions will be held with UWA regarding the MFPA Management Plan in consideration of O&G development, burning regimes and animal species management initiatives to minimise further loss of suitable habitat and improve habitat quality in surrounding areas of habitat, similar to that which is lost	X	X	X	X
TW14	If there are proposed changes to locations, alignment, working areas or footprint of Project components, the Avoidance Protocol, including site selection survey and mapping, will be carried out before determining the configuration of these components	X	X		
TW15	All temporary facilities, including temporary access roads, will be restored after they are no longer required after use; in line with Site Restoration Plan	X	X		X
TW16	Land-based effluent / runoff will be controlled to prevent sedimentation and pollution as defined in Chapter 8: Geology and Soils and Chapter 10: Surface Water	X	X	X	X
TW17	Temporary 'bogmats', riprap bridges and other measures to reduce compaction or erosion of soils and habitat degradation during wet conditions will be utilised	X	X		X
TW18	Any work in watercourses and wetlands will be avoided in periods of heavy rainfall. Where unavoidable appropriate mitigation measure shall be developed to minimise adverse impacts	X	X		

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TW19	Burning of vegetation waste following site clearance will be prohibited within MFPA but could be considered in areas outside MFPA when no other appropriate alternative has been identified, to avoid air emissions and reduce the risk of fires. This requirement will be included in the Site Clearance Plan	X	X		
TW20	Consideration will be given to making cleared wood from the Industrial Area, from well pads and flowline wayleaves, available to the local community to help lower the need and demand for wood from protected areas. However it will be communicated to local communities that this supply will not remain during Operations Phase in order not to create expectations	X	X		X
TW21	Soil spill, where soil spreads beyond the defined boundary of the component footprint, from well pad or other construction areas, will be minimised	X	X		X
TW22	Spill Prevention and Oil Spill Contingency Plans will be developed and implemented; as defined under Chapter 4: Project Description and Alternatives, Chapter 20: Unplanned Events and Chapter 23: ESMP	X	X	X	X
TW23	Provision will be made for - the recruitment of Ecological Compliance Officers (ECOs); and - the training and capacity building of the ECOs.	X	X		X
TW24	The ECO will be present on site during the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases where site clearance and excavations are required (e.g. construction of flow lines) to oversee the works and ensure compliance	X	X		
TW25	Prior to site clearance each site will be surveyed for the presence of plant species of conservation concern, as listed in the BMP. This is important because there may be considerable time between baseline/avoidance surveys and actual site works and species may move into the area (also animals) that were not present during baseline surveys. If any such species are found, these will be recorded and either avoided or transplanted to similar habitat under supervision of a botanist/ecologist. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts on those species.	X			
TW26	Water abstraction and activities at other locations will ensure that they do not affect groundwater base-flow to wetlands (including wallows and watering holes) and other habitats resulting in degradation of those habitats. Flow rates and residual recharge rates will be sufficient to sustain sensitive habitats. To achieve this, water abstraction points will be carefully selected, as defined in Chapter 9: Hydrogeology. In addition, all water abstraction activities will comply with the requirements of water abstraction permits	X	X	X	X

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TW27	Construction techniques will allow unimpeded shallow groundwater and surface water flow where they have to cross seasonal watercourses (for example between JBR-01 & JBR-10/Nile crossing; JBR-03 & JBR-04; around JBR-09; between JBR-08 and JBR-09), through use of culverts and permeable layers, avoiding compaction of soils	X	X		
TW28	Care will be taken not to cause compaction of ground near wetlands resulting in hydrological or hydrogeological changes that may affect those habitats	X	X		X
TW29	Use of concrete or other impermeable surfacing material at sites will be minimised. These materials will be used only at those areas that absolutely require it	X	X		
TW30	A Biodiversity (and Ecosystem Services) Action Plan (BAP) will be developed in line with relevant IFC Performance Standards, and will include key mitigation actions aiming at achieving No Net Loss/Net Gain to biodiversity	X	X	X	X
TW31	Biodiversity codes of conduct for workers will be developed, which can be disseminated to economic dependents and others that may be able to enter Protected Areas. This may require punitive measures if not complied with	X	X	X	X
TW32	Workers will be prohibited from collecting shells, timber, firewood, fibres and other plant based resources. Fishing will not be permitted. Ensure control at the camps and work sites	X	X	X	X
TW33	Landscaping, including earth bunds around well pads within the park will be established, and will be covered with topsoil and plants associated with the immediate vicinity and monitored and maintained to ensure success and stability of these bunds. Consideration will be given to the need to avoid attracting animals (e.g. the oasis effect in dry seasons)	X			
TW34	Topsoil will be stockpiled separately from subsoil during pipeline construction with all soils being reinstated in the reverse order to that in which they have been removed in order to initiate rehabilitation		X		
TW35	Pipeline trenches will be designed to ensure that they do not become preferential flow paths for groundwater, particularly where they cross seasonal wetland areas or terrain, which comprises catchment for wallows or waterholes. This could comprise placement of impermeable backfill (clay or similar) at certain locations within the trench to prevent lateral movement of water within the pipeline alignment		X		
TW36	For Project areas that cross seasonal wetlands/rivers, construction works will take place in the dry season as much as possible. This is to prevent disruption of surface water / shallow groundwater flow thus affecting habitats as well as disturbing the animals relying on those wetlands. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts		X		

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TW37	Decommissioning activities to be confined within the Project footprint				X
TW38	For areas of the Project that cross seasonal wetlands/rivers decommissioning works will take place in the dry season as much as possible. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts				X
TW39	Materials used in restoration will be locally sourced, where possible (i.e. materials used in the MFNP should be from other sites within the MFNP), but away from sensitive biodiversity areas. Plants will be transplanted from nurseries to the site being restored (or from adjacent areas, as appropriate)				X
TW40	A Biodiversity and Ecosystem Services Management Plan (BMP) will be developed which will define how impacts of site clearance on animal species of conservation concern will be minimised. This will include maps showing locations of sensitive habitats and seasonal wetlands known to be preferred habitat of those species. The BMP will also indicate routes of large mammal movements if known (can be determined from presence of tracks) as well as other sensitive features such as kob leks	X	X		
TW41	Activities scheduling will consider seasonal sensitivities of Priority Species as much as practicable. In any case, Project shall ensure that disturbance to sensitive discrete areas at any one time is minimised, and that wide areas, free of works, are maintained to allow animal movements and any other potential mitigations are investigated	X	X		X
TW42	Prior to commencement of site works, each site will be subject to a pre-start walkover survey by a qualified ecologist, to detect signs of active burrows, dens, bird nests, bat roosting, presence of reptiles/amphibians and critical wildlife movement routes and tracks (e.g. access to watering holes). This is important because species may have moved to the site since baseline surveys were undertaken	X	X		
TW43	If animal burrows are present and appear to be occupied then these should be carefully excavated to allow any occupant the opportunity to escape	X	X		
TW44	Where signs of small mammals (including bat roosts), amphibians (in wetland areas) or reptiles are encountered during pre-start surveys, individuals will be given time to escape. For amphibians or reptiles species of conservation concern, capture and translocation to adjacent similar habitat by an experienced field ecologist should be attempted	X	X		

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TW45	As indicated in Chapter 4: Project Description and Alternatives, open trench areas will be approximately 1 km lengths. In addition, in remote areas and/or at night wildlife escape ramps from open trenches will be used. The use of animal crossing structures such as bridges, culverts, and over crossings, along pipeline and access road rights-of-way will be considered. At special points such as crossings, deep excavations and tie-in bell holes, safety barriers (such as fences) will be installed to prevent human or animal ingress. The barriers will be temporary structures and the intention is that they will be a deterrent to animals entering the working area rather than an impenetrable physical barrier to prevent animals colliding with them. Where fences are used, they should have opaque panels in them (e.g. cloth material), and a means of escape from the fenced areas by use of ramps, etc., will be included	X	X		X
TW46	Prior to commencement of work each morning, every excavation and fenced area will be inspected, and any trapped animals allowed to escape safely	X	X		X
TW47	Training and awareness-raising will be undertaken on bushmeat issues and to communicate to all personnel requirements not to consume bushmeat while at work (e.g. notices will be placed around the site to remind staff of their responsibilities)	X	X	X	X
TW48	Checks will be undertaken on all staff and contractor vehicles, either by TOTAL security staff or through support from UWA, to discourage poaching and to check that only authorised personnel are entering the park in company or contractor vehicles	X	X	X	X
TW49	The Labour Management Plan and General site rules will include a ban on bushmeat hunting/purchase, transport, and/or consumption of bushmeat for employees	X	X	X	X
TW50	A Road Safety and Transport Management Plan will be developed and implemented that will outline journey optimisation, speed restrictions, traffic rules (confirming that animals have right of way if encountered), and appropriate reporting procedures in case of collisions, as detailed in Chapter 16: Social	X	X	X	X

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TW51	A risk-based Alien/Invasive Species Management Plan will be developed and implemented to include but not be limited to: • Developing a register of existing invasive species in the Area of Influence; • A risk assessment to identify existing and/or potential invasive species and/or threats/risks; • Definition of relevant control measures identified for each type of threat under project control e.g. bringing in topsoil from outside of Protected Areas, risk of vehicles introducing or spreading Alien/Invasive species. These could consist of dedicating a fleet of vehicles to serve activities in MFNP, implementing systematic checks on vehicles and considering washing as and where appropriate and practicable (at Masindi checkpoint and Tangi for instance); • Preparation of a 'risk map' showing areas of existing infestation; • Development of generic methods for incident management of broad groups of invasive species, as well as species specific measures; • On-site monitoring for invasive species; • Procedures for reporting and developing specific control measures for any new invasive alien species that are detected; • Procedures to contain or remove (as appropriate) any pre-existing invasive species on the Project site; and • Procedures to contain or remove pre-existing invasive species in areas close to the Project site.	X	X	X	X
TW52	As detailed in Chapter 16: Social, a Community Environmental Conservation Plan will be developed which will contain educational/information programmes to explain how pressure on those priority species should be alleviated as well as information concerning the conservation and legal status of priority species	X	X	X	X
TW53	Roads will be designed so that their permanent and construction footprint will be minimised	X			
TW54	Optimising the logistics to maximise use of available vehicles, reduce number of trips and reduce movements on more sensitive routes; using convoys when appropriate (e.g. via using one shared logistics service provider who can ensure appropriate planning across all parts of the Project and ensure efficiencies are made)	X	X	X	X
TW55	Sensitise drivers (as part of training), emphasising the need to adhere to designated routes and speed limits, and to avoid making wide turns at the edges of the site	X	X	X	X
TW56	Where positioning of infrastructure could restrict animals' access to critical water resources, alternative access routes will be maintained or created, where practicable	X			

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TW57	As defined in Chapter 7: Noise, For work activities located close to noise sensitive receptors, a range of specific noise mitigation measures shall be implemented to minimise impacts. Such measures shall be implemented on a case by case basis and may include the use of temporary abatement such as dampening and shielding techniques, noise barriers, and mufflers. Specific noise regulations and thresholds will be specified in the Noise and Vibration Management Plan	X	X	X	X
TW58	Loud music is not to be played.	X	X	X	X
TW59	Lighting at night at well pads and other infrastructure will be minimised to avoid affecting commuting and feeding behaviour of bat species. This can be achieved by using directional lighting and by turning off lights (using timers or motion detectors where practicable and to ensure safety) when not required	X	X	X	X
TW60	No feeding of any wildlife will be permitted	X	X	X	X
TW61	When roads intercept key crossing points for certain species (e.g. amphibians near wetlands), design consideration should include needing to maintain crossing path as much as practicable	X	X	X	X
TW62	Piling and other activities generating noise and vibration will be 'ramped up' (slow started) to allow wildlife to move away in good time	X	X		
TW63	Surface water management on site and pooling of water or open water storage will be managed so as not to create areas to which animals may be attracted	X	X	X	X
TW64	For works taking place in or near the Ramsar site, a buffer will be established around identified sensitive features where no works will take place, as defined in the Avoidance Protocol. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts	X	X	X	X
TW65	An Environmental Monitoring Programme will be established. This will include comprehensive monitoring associated with water, noise, air quality, etc. as defined in the respective chapters of the ESIA	X	X	X	X
TW66	Ensure spill response equipment (including sampling and personal protective equipment) is readily available on site to contain and clean any spillages, and containment/clean up undertaken after the event	X	X	X	X
TW67	Specific awareness training for Project staff/ contractors about roles of wildlife species in the ecosystem and impacts will be provided	X	X	X	X
TW68	The footprint of the HDD will be minimised to avoid unnecessary loss of wetland/riparian habitat	X	X		

Ref No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TW69	Further mitigation for the pipeline across the seasonal river between JBR-09 and JBR-08 will be considered. This is a deep gully and bridging may be required		X		
TW70	Excavations will be furnished with ramps or other means of escape, which will be put into open trenches at regular intervals to allow animals to escape	X	X		
TW71	If temporary surface water pipelines are required, which are not fully buried, then means of crossing them for animals will be constructed, whether these are extended earth ramps or shallow burial of the pipelines	X	X		
TW72	Minimise actual and effective traffic volume in MFNP, including requirements to travel in convoy with defined 'quiet times'	X	X	X	X
TW73	Procedures and protocols for operating water vessels and ferry will be formulated and implemented. Water vessels will travel at reduced speeds while travelling along watercourses to reduce risk of disturbance of wildlife and collisions	X	X	X	X
TW74	A Wetland Management Plan will be established to ensure no disruption to wetland areas. The main measures will comprise avoiding and minimising impacts on wetlands and restricted exclusion zones	X	X	X	X
TW75	Pre-construction surveys will be performed to confirm the extent and state of identified wetlands	X	X		
TW76	Construction activities within 200 m for lake (Lake Albert) and 100 m for a river (River Nile) will be avoided. Should they be unavoidable, a permit for use of river banks and lake shores will be applied for activities within those zones (for Water Abstraction System, HDD crossing, Nile River Ferry Crossing)	X	X		

In addition to the generic additional mitigation described above, there will also be some species-specific mitigation, which is set out in Table 14-20 below. As indicated above, these will be reviewed during the detailed design phase to ensure their adequacy in mitigating the potential impacts.

Table 14-20: Additional Species-Specific Mitigation

Ref No.	Additional Species Specific Mitigation	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning

Ref No.	Additional Species Specific Mitigation	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
Chimpanzee					
CH1	Further engagement with NFA, Budongo Conservation Field Station, and other key stakeholders will be undertaken to ensure that appropriate measures are identified to mitigate potential impacts associated with anticipated traffic	X	X	X	X
CH2	Consider contributing to development and implementation of a long-term chimpanzee monitoring and evaluation program through establishment of partnerships and information exchange with researchers and land managers (e.g. Budongo Forest Project, NFA, UWA, Makerere) to understand trends and threats to chimpanzees across the landscape and how Project can best contribute to minimising impacts and contributing to long-term persistence	X	X	X	X
CH3	The Community Environmental Conservation Plan will contain educational/information programmes in villages affected by human-chimpanzee conflict	X	X	X	X
Giraffe					
G1	Activities scheduling should consider preventing barrier effects for seasonal movements of giraffe. Giraffe tend to be more concentrated in the Buligi area in the dry season (Nov-Feb) and move to the Ayago area when the rains start (Mar)	X	X		X
G2	Minimise the loss of key plant species for giraffe diet: namely *Acacia senegal*, *A. sieberiana*, A. *drepanolobium, Harrisonia abyssinica* and *Crateva adansonii*	X	X		
G3	Continue long-term monitoring of giraffe (including population size and structure, incidence of snaring, movements, stress levels, reproduction) throughout the MFPA to assess longer term impacts and disturbances of oil activities	X	X	X	X
G4	Consideration will be given, as appropriate, to future monitoring through undertaking relevant studies on the priority species	X	X	X	X
Elephants					
E1	Activities scheduling should consider preventing barrier effects for seasonal movements of elephants. Elephants tend to be more concentrated in the Ayago area in the dry season (Nov-Feb) and move to the Buligi area when the rains start (Mar)	X	X		X
E2	Appropriate fencing/animal barriers will be designed with the help of elephant barrier experts where available	X	X	X	X
E3	Creation of an “oasis” effect (e.g. lush vegetation from site drainage) will be avoided, that may attract and encourage elephants especially in the dry season, to attempt to break into the well pads and camps	X	X	X	X

Ref No.	Additional Species Specific Mitigation	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
E4	Planting of trees likely to attract elephants (e.g. mango) as ornamentals at Project sites will be prohibited to reduce the risk of human-elephant conflict	X	X	X	
E5	All chemicals, food, food waste, and other materials within current and potential elephant ranges will be stored in secure (ideally elephant-proof structures) to avoid accidental poisoning and / or frequent close encounters with elephants	X	X	X	X
E6	Studies of elephant behavioural ecology and response to disturbance in Buligi and Ayago to understand impacts and adapt mitigation will be continued as required	X	X	X	X
E7	Commissioning of studies of elephant movements outside of MFPA in order to understand better the risk of indirect impacts and human-elephant conflict will be considered	X	X	X	X
E8	A Community Environmental Conservation Plan will be developed that will contain educational/information programmes in villages affected by human-elephant conflict	X	X	X	X
Lions					
L1	Site construction scheduling should consider avoiding simultaneous works at two working areas within the same lion pride's territory	X	X		X
L2	Monitoring, using radio collars will be continued. It should cover of all lion prides potentially affected by Project infrastructure and activities and a control pride	X	X	X	X
Spotted Hyena					
SH1	As this species is Critically Endangered, continue specific study of hyenas within the Project landscape to assess how they could be affected by the Project direct and indirect activities and disturbance	X	X	X	X
SH2	Within areas of current or potential hyena presence, all chemicals, food waste and hazardous waste will be stored / disposed of in hyena-proof structures (i.e. heavy duty metal freight containers and/or secure cabinets) to avoid accidental poisoning	X	X	X	X
Uganda Kob					
UK1	Activities scheduling should consider preventing barrier effects for seasonal movements of kobs. Kobs tend to be more concentrated in the Ayago area in the dry season (Nov-Feb) and move to the Buligi area when the rains start (Mar). Lekking seems to occur in June (possibly July) and works near identified leks should be avoided during these months.	X	X		X
Birds					

Ref No.	Additional Species Specific Mitigation	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
B1	Where bird nests of threatened species are present within or close to the working area, then works must halt and access to these will be restricted in order to avoid disturbance to birds until any fledglings have hatched and left the nest	X	X		
B2	Construction in and around bird roosting sites for Shoebill, Madagascar pond heron, Grey Crowned Crane and Pel's fishing owl within the Ramsar site will be avoided. When unavoidable, then works must halt and access to these will be restricted in order to avoid disturbance to birds until any fledglings have hatched and left the nest.	X	X		
B3	Activities scheduling for construction activities should consider avoiding disturbance within Ramsar site during migratory bird season [October to March approximately]	X	X		
B4	As vultures are priority species, consider specific study of vultures in order to define roosting/nesting and preferred feeding areas to assess how they could be affected by the Project direct and indirect activities and disturbance	X	X		X
B5	Use of rodenticides and other toxic chemicals by site personnel and workers inhabiting site compounds will be prohibited during all phases of the Project	X	X	X	X
B6	Where Site preparation, Construction and decommissioning activities occur within wetlands and seasonally inundated grassland habitat; scheduling of these activities should consider avoiding the November window when the shoebill is most likely to be breeding (incubation phase)	X	X		X
B7	Use of birds deflectors should be considered when a risk of collision or electrocution is identified; in particular with pylons/flare systems.	X	X	X	X
B8	Bird eggs of any species must not be taken or destroyed	X	X	X	X
Crocodiles					
C1	Vegetation clearance activities within the Ramsar should consider avoiding the crocodile nesting period (Jan-Mar). Where unavoidable a suitably experienced ecologist will inspect the site for any signs of crocodiles or their nest sites prior to the removal of habitats. Where active nests are recorded, they will be cordoned off until the hatchlings have emerged and dispersed	X	X		
C2	Fencing will be erected around human occupied areas (well pads, barge pier facilities, water abstraction point *etc.*) situated close to watercourses (< 1 km) to prevent crocodiles interacting with people and vehicles	X	X	X	X
C3	With exception of HDD and drilling activities, construction in and around watercourses and waterbodies will not be undertaken at night. This will minimise the disturbance of hunting crocodiles	X	X	X	X

14.7.9.3 Additional mitigation and Enhancement: Indirect Impacts

In addition to the mitigation measures for potential direct impacts listed above specific mitigation has been identified for potential indirect impacts. Mitigation is of two types:

1. *Mitigation measures that operate by addressing factors that are under the control of the Project* – for example recruitment strategies, access control on project roads, location of workers' camps and other infrastructure (amenities, etc.) that might attract in-migrants;
2. *Strategic mitigation measures for impact pathways outside the Project's sphere of control* and which therefore need to be implemented in partnership with other actors, including, communities, government, NGOs and the private sector as appropriate.

Additional mitigation measures for potential indirect effects are listed in Table 14-21. These measures apply to all project phases, however since many are preventive it is important they are in place prior to the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases. As indicated above, these will be reviewed during the detailed design phase to ensure their adequacy in mitigating the potential impacts.

Implementation of the proposed mitigation measures discussed above and below, including the following relative Management Plans: **Biodiversity Management Plan**; **Stakeholder Communication Plan**; **Environmental and Social Management Plan**; **Road Safety and Transport Management Plan**; **Resettlement Action Plan; Community Impact Management Strategy; and Influx Management Strategy** will mitigate the likely residual impacts.

Table 14-21: Additional Mitigation for Indirect Impacts

Ref No.	Additional Mitigation for Indirect Impacts	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
TW77	As detailed in Chapter 16: Social, the Project Proponents will provide support to the Ministry of Lands Housing and Urban Development and Buliisa District Government to develop a District Land Use Plan through financing of a study that can be used as basis of such planning. The study will consider existing land use and land tenure, trends in land use, and future land use requirements including for Project infrastructure and for any mitigations required to off-set Project impacts, e.g. relocation land and land for biodiversity offsetting. The study will also identify areas that will benefit from improved accessibility across Buliisa District	X	X	X	X
TW78	Ensure that the Resettlement Action Plan (RAP) does not increase pressure on natural or critical habitats by moving people into or where practicable closer to sensitive habitats or Protected Areas	X	X	X	X
TW79	As detailed in Chapter 16: Social, a Community Environmental Conservation Plan will be developed which will contain educational/information programmes to highlight importance of protected areas, identify plant species of conservation concern (and why they are important), and to explain how pressure on those will be alleviated	X	X	X	X
TW80	As detailed in Chapter 16: Social dependence on firewood and charcoal will be used through development of the Community Environmental Conservation Plan, which will include promotion of alternative fuel use (e.g. briquettes, solar technology) and clean cook-stoves through partnership with local organisations and social enterprises. Support schemes to find alternative fuel sources, reduce reliance on charcoal will be developed. The potential to involve communities in biodiversity conservation as alternative livelihood options will be explored	X	X	X	X
TW81	As detailed in Chapter 16: Social, an Influx Management Strategy will be developed to mitigate in-migration impacts and maximise benefits for local communities. Implementation of the strategy will depend on joint coordination between the Project, government, other project developers, local communities and civil society. The Strategy will build on the recommendations provided in the In-Migration Risk Assessment (Ref. 16-11) and will set out the overarching approach and objectives for mitigating the negative impacts of influx and enhancing the benefits. The strategy will make reference to more detailed actions and procedures contained within other environmental and social management plans that are relevant to addressing influx. The strategy will also propose a specific monitoring & evaluation framework to measure project-induced in-migration trends, hotspots and key impacts	X	X	X	X
TW82	The Influx Management Strategy will also consider potential impacts of increased pressure on natural resources due to population growth including looking at ways to provide alternative sources of fuel, building materials, farming land and food (particularly protein)	X	X	X	X
TW83	As detailed in Chapter 16: Social, the Community Content, Economic development and Livelihood Plan will consider measures aimed at mitigating impact of population growth such as increased pressure on	X	X	X	X

Ref No.	Additional Mitigation for Indirect Impacts	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
	fisheries resources				
TW84	The Community Environmental Conservation Plan will consider (but not be limited to) community based programmes for extension of tree nurseries, promotion of alternative fuel use, fisheries management and monitoring programme that will entail engagement of communities through BMUs in fisheries management as defined in Chapter 16: Social	X	X	X	X
TW85	Resettlement Action Plans will include livelihood restoration and will also provide alternative livelihoods/ income diversification programmes to ease dependence on natural resources or protected areas as a source of livelihood as defined in Chapter 16: Social	X	X	X	X
TW86	Project Recruitment Centres locations should be defined in consideration of potential impacts it may generate on protected areas and unprotected forest areas	X	X	X	X
TW87	Regular monitoring of the extent and impacts of in-migration, generally on natural resources, will be carried out as part of the Biodiversity Monitoring and Evaluation Plan, including regular acquisition and analysis of satellite imagery to assess landuse/landcover changes	X	X	X	X
TW88	Strategic collaboration platforms will be established with local and regional authorities, UWA, NFA development and conservation NGOs and other stakeholders as appropriate to regularly evaluate and review the extent of indirect effects, share understanding of causes and identify adapted or additional mitigation requirements	X	X	X	X
TW89	Relevant authorities will be engaged with and consideration will be given to fostering development of a plan with them to strengthen the protection of Bugungu Wildlife Reserve and adjacent areas of transitional habitat with direct community involvement. The objective will be to provide legal safeguard for wildlife populations and maintain an effective north-south savanna corridor in the landscape	X	X	X	X
TW90	The in-migration risk assessment will be regularly updated based on monitoring data to assess which protected areas, species and habitats are most at risk of indirect impacts, both imminently and in the foreseeable future	X	X	X	X
TW91	Measures to minimise human-wildlife conflict will be implemented. This will include provision of livestock management training, fencing (where appropriate) and other initiatives	X	X	X	X
TW92	As detailed in Chapter 16: Social, the community-wildlife conflict prevention program will align with the goals and actions set out in the Community-Based Wildlife Crime Prevention Action Plan (2017-2023) prepared by UWA (April 2017).	X	X	X	X

14.7.9.4 Residual Impacts: Site Preparation and Enabling Works

Residual impacts on terrestrial wildlife receptors considered likely to occur during the Site Preparation and Enabling Works phase are shown in Table 14-22 below. These impacts are termed residual impacts because they take into account the embedded mitigation and the additional mitigation discussed above, which will be implemented during this phase.

The assessment assumes that the embedded and additional mitigations will be successful in achieving their objectives.

Table 14-22: Summary of Residual Impacts: Site Preparation and Enabling Works

Mammals	Landscape Context	Sensitivity	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
CHQS Species						
Chimpanzee	B D F	VERY HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Rothschild's Giraffe	A	VERY HIGH	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE
Lelwel Hartebeest	A	VERY HIGH	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE
African Elephant	A B C F	HIGH	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE
Lion	A B	VERY HIGH	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE
Spotted Hyena	A	HIGH	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE
Bohor Reedbuck	A	HIGH	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE
Medje Mops Bat	D	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Trevor's Free-tailed Bat	D	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Savanna/Helios Pipistrelle	D	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Charming Thicket Rat	(Forest?)	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	NEGLIGIBLE	INSIGNIFICANT
Ugandan Lowland Shrew	D	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Uganda Mangabey	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	NEGLIGIBLE	INSIGNIFICANT
Uganda kob	A B	HIGH	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE
Russet free-tailed bat	(Forest?)	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Other Notable Species (not CHQS)						
Hippopotamus	A C	MEDIUM	LOW	INSIGNIFICANT	NEGLIGIBLE	INSIGNIFICANT
Leopard	A B D F	MEDIUM	LOW	LOW ADVERSE	NEGLIGIBLE	INSIGNIFICANT
Giant pangolin	B D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	NEGLIGIBLE	INSIGNIFICANT
Peters' Pygmy Mouse	A B	MEDIUM	LOW	LOW ADVERSE	NEGLIGIBLE	INSIGNIFICANT
Ethiopian Pygmy / Mahomet Mouse	A B	MEDIUM	LOW	LOW ADVERSE	NEGLIGIBLE	INSIGNIFICANT
Bunyoro rabbit	B	MEDIUM	LOW	LOW ADVERSE	NEGLIGIBLE	INSIGNIFICANT
Alexander's cusimanse	B D	MEDIUM	LOW	LOW ADVERSE	NEGLIGIBLE	INSIGNIFICANT

Mammals	Landscape Context	Sensitivity	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
Duke of Abruzzi's Free-tailed Bat	B D	MEDIUM	LOW	LOW ADVERSE	NEGLIGIBLE	INSIGNIFICANT
Bibundi Butterfly Bat	B D	MEDIUM	LOW	LOW ADVERSE	NEGLIGIBLE	INSIGNIFICANT
Mongalia Free-tailed Bat	B D	MEDIUM	LOW	LOW ADVERSE	NEGLIGIBLE	INSIGNIFICANT
Silvered Bat	B D	MEDIUM	LOW	LOW ADVERSE	NEGLIGIBLE	INSIGNIFICANT
Light winged Lesser House Bat	A B	MEDIUM	LOW	LOW ADVERSE	NEGLIGIBLE	INSIGNIFICANT
Birds	**Landscape Context**	**Sensitivity**	**Residual Direct Impact Magnitude**	**Residual Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species						
White-backed Vulture	A	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Rüppell's Vulture	A B D	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Hooded Vulture	A B	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
White-headed Vulture	A B	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Lappet-faced Vulture	A	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Grey Crowned Crane	C	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Madagascar Pond-heron	C	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Pallid Harrier	A B	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
African Crowned Eagle	D	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Black-rumped Buttonquail	A B	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Denham's Bustard	A	HIGH	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE
Fox Kestrel	A	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Lappet-faced Vulture	A	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Pel's Fishing Owl	A	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Shoebill	C	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Nahan's Partridge	D	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
African skimmer	A C	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE

Amphibians	Landscape Context	Sensitivity	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
CHQS Species						
Adolf Friedrich's / Rugege Squeaker Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Golden Puddle Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Kivu Clawed Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Christy's Grassland Frog	A B D	MEDIUM	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**
Uganda Clawed Frog	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Hyperolius langi	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Hyperolius rwandae	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Hyperolius lateralis	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Leptopelis oryi	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Other Notable Species (not CHQS)						
Lake Victoria Toad	A C	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Reptiles	**Landscape Context**	**Sensitivity**	**Residual Direct Impact Magnitude**	**Residual Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species						
Adanson's Hinged Terrapin	C	HIGH	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
African soft-shelled turtle	C	HIGH	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Zaire Hinged Terrapin	C	HIGH	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Smooth Chameleon	A B	HIGH	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Common / Serrated Hinge-back Tortoise	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Mocquard's African Ground Snake	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Uganda House Snake, Yellow Forest / Brown File Snake	N/A	LOW	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Striped beaked snake *Psammophylax acutus*	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**

Reptiles	Landscape Context	Sensitivity	Residual Direct Impact Magnitude	Residual Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
Other Notable Species (not CHQS)						
Northern Green Bush Snake/ Bequaert's Green Snake	A	MEDIUM	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**
Sudan Beaked Snake	A B C	LOW	LOW	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Reticulated Centipede-eater	A B C	MEDIUM	LOW	**LOW ADVERSE**	INSIGNIFICANT	**INSIGNIFICANT**
Nile Crocodile	A C	LOW	LOW	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Butterflies & Dragonflies	**Landscape Context**	**Sensitivity**	**Residual Direct Impact Magnitude**	**Residual Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species						
17 butterfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
5 butterfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Mylothris hylara	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
2 dragonfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
2 dragonfly species	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Other Notable Species (not CHQS)						
10 butterfly species	A D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
5 dragonfly species	A C	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**

Assuming the embedded and additional mitigation is undertaken as proposed, there are unlikely to be significant direct residual impacts on most species present in any of the Landscape Contexts during this phase of the works. Direct residual impacts are unlikely on forest species associated with most Landscape Contexts D because no project infrastructure is being built in these areas.

However, there are likely to be direct residual impacts on sensitive species that are concentrated in Landscape Contexts A and B, mainly because these contexts will be directly affected by the Project. Indeed, although the mitigation will be effective in reducing the magnitude of impacts there will still be **Moderate** significant direct residual impacts remaining on sensitive species associated with the MFNP, including giraffe, Lelwel hartebeest, elephant, lion, spotted hyena, Bohor reedbuck, Uganda kob and Denham's bustard. For other species residual impacts will be **Low** or **Insignificant**.

Although the MFNP is large and most species will have scope to move elsewhere when disturbed, the Project is still expected to impact them. This is why the success or otherwise of implemented mitigation measures will need to be maintained and monitored, and where required remedial measures taken to ensure that impacts are minimised as much as possible.

As noted above, in addition to direct impacts of the project there may be indirect impacts on receptors caused by human population movements and in-migration pressures to the region. It is considered that these indirect impacts are likely to be more complex to mitigate, because this will involve coordination between Project Proponents and other organisations over which the project has less or no control.

The main Landscape Contexts that could be affected by indirect impacts will be forest habitats (Landscape Context D) and unprotected savanna areas (Landscape Context B) and their associated species. Following implementation of the mitigation strategies, the overall residual impact is however **Insignificant** to **Low** during that phase.

It should be noted that for the most sensitive species, it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation. This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain (for Critical Habitat and CHQS) is required. These measures are discussed at the end of this chapter (see Section 14.8).

14.7.10 Assessment of Impacts: Construction and Pre-Commissioning

This section describes the assessment of potential and residual impacts during the Construction and Pre-commissioning phase. Although this phase does not include site clearance generally, it does include construction of flow lines and well pads which could impact animal species and their movement within the MFNP.

In addition, this phase will see drilling of wells in addition to HDD beneath the Victoria Nile and installation of the WAS and associated pipelines in the Buliisa area. It should be noted that the HDD will require some access to the Ramsar site, principally south of the Nile, and will also require a stringing area located north of the Nile within the MFNP. However, drilling works will be set back from the water's edge and drilling will be entirely beneath the Nile itself.

14.7.10.1 Potential Impacts

Potential impacts on identified terrestrial wildlife receptors, i.e. those based on embedded mitigation (without additional mitigation) considered to be likely during the Construction and Pre-Commissioning phase, are defined below. Many potential impacts are expected to be similar to the ones during Site Preparation and Enabling Works phase; therefore only those specific to the Construction and Pre-Commissioning have been discussed further in these paragraphs.

14.7.10.1.1 Loss, degradation or fragmentation of species habitat

During this phase most of the site clearance will have already been undertaken apart from for the flow line works, the HDD and other pipelines such as that to the WAS. Some of the working area for the HDD will be located within the Ramsar site as indicated above. Works within or close to the Ramsar site may therefore potentially impact on various species through temporary loss of their habitat, for example, for hippopotamus, crocodile and various bird species that breed or visit these permanent wetland areas.

Habitats will be lost during flowline construction works, although this will be temporary as the wayleaves will be restored as soon as practicable after works have been completed unless these are being used as access roads. Potential damage to seasonal wetlands, where these may be crossed by excavations, may affect the hydrology of these wetland areas during works, as well as disturbing species that may want to use these areas. In addition, once it has been completed the pipeline may still affect water supply to the wetlands by creating preferential flow paths for shallow groundwater that may therefore affect connected surface water resources.

In addition, during this phase there is potential for habitat to be affected by construction activities where they spread into areas outside of the immediate project footprint. This may be as a result of the works or plant straying beyond the defined footprint of the works, or through run-off or spreading of dust or pollution, resulting in species habitats being smothered, lost or otherwise degraded.

14.7.10.1.2 Population changes

Potential impacts on population changes are expected to be similar to those identified during the Site Preparation and Enabling Works phase.

14.7.10.1.3 Disturbance

As for the Site Preparation and Enabling Works phase, animals are likely to be disturbed by the presence of people in the landscape, vehicle movements, noise and vibration from various stages of the project.

During Construction and Pre-Commissioning, night time activities, noise and vibration from drilling and piling activities, including that associated with the HDD may affect some species.

14.7.10.1.4 Barrier Effects

As indicated during the Site Preparation and Enabling Works phase, construction activities may create barrier effects. In particular during the Construction and Pre-Commissioning phase where pipelines are being constructed, barrier effects would be caused by pipeline trenches as well as laying of welded pipeline strings parallel to excavations prior to installation. This is also applicable to the HDD area at North Nile where pipe strings will need to be stored, assembled and welded together before they are pulled back towards the South Nile side through the tunnel that has been drilled under the Nile.

14.7.10.1.5 Indirect Impacts

Potential impacts on habitats and species that are caused by indirect factors such as human population in-migration, are likely to increase in this phase compared to the previous phase. This is because as the Project develops it has the potential to gradually attract more people to the area due to the potential for increased economic opportunities, thus putting growing pressure on resources, habitats and species.

It is therefore considered that the level of potential impact will increase in this phase as there is likely to be a lag between the initiation of the project and people starting to move into the area and this is reflected in the potential impact table presented below.

14.7.10.1.6 Overview of potential Impacts

Table 14-25 summarises the potential impacts on all receptors for this phase of the project, as a result of direct and indirect impacts.

Table 14-23: Summary of Potential Impacts: Construction and Pre-Commissioning

Mammals	Landscape Context	Sensitivity	Potential Direct Impact Magnitude	Potential Direct Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance
CHQS Species						
Chimpanzee	B D F	VERY HIGH	LOW	**MODERATE ADVERSE**	MEDIUM	**HIGH ADVERSE**
Rothschild's Giraffe	A	VERY HIGH	MEDIUM	**HIGH ADVERSE**	LOW	**MODERATE ADVERSE**
Lelwel Hartebeest	A	VERY HIGH	MEDIUM	**HIGH ADVERSE**	LOW	**MODERATE ADVERSE**
African Elephant	A B C F	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Lion	A B	VERY HIGH	HIGH	**CRITICAL ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Spotted Hyena	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Bohor Reedbuck	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Medje Mops Bat	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Trevor's Free-tailed Bat	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Savanna/Helios Pipistrelle	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Charming Thicket Rat	(Forest?)	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**
Ugandan Lowland Shrew	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Uganda Mangabey	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**
Uganda kob	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Russet free-tailed bat	(Forest?)	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Other Notable Species (not CHQS)						
Hippopotamus	A C	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Leopard	A B D F	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Giant pangolin	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Peters' Pygmy Mouse	A B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**
Ethiopian Pygmy / Mahomet Mouse	A B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**
Bunyoro rabbit	B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**
Alexander's cusimanse	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**

Mammals	Landscape Context	Sensitivity	Potential Direct Impact Magnitude	Potential Direct Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance
Duke of Abruzzi's Free-tailed Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Bibundi Butterfly Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Mongalia Free-tailed Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Silvered Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Light winged Lesser House Bat	A B	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Birds	**Landscape Context**	**Sensitivity**	**Potential Direct Impact Magnitude**	**Potential Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**
CHQS Species						
White-backed Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Rüppell's Vulture	A B D	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Hooded Vulture	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
White-headed Vulture	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Lappet-faced Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Grey Crowned Crane	C	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Madagascar Pond-heron	C	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Pallid Harrier	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
African Crowned Eagle	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Black-rumped Buttonquail	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Denham's Bustard	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Fox Kestrel	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Lappet-faced Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Pel's Fishing Owl	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Shoebill	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Nahan's Partridge	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
African skimmer	A C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**

Amphibians	Landscape Context	Sensitivity	Potential Direct Impact Magnitude	Potential Direct Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance
CHQS Species						
Adolf Friedrich's / Rugege Squeaker Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Golden Puddle Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Kivu Clawed Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Christy's Grassland Frog	A B D	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Uganda Clawed Frog	D	MEDIUM	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Hyperolius langi	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**
Hyperolius rwandae	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**
Hyperolius lateralis	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**
Leptopelis oryi	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**
Other Notable Species (not CHQS)						
Lake Victoria Toad	A C	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Reptiles	**Landscape Context**	**Sensitivity**	**Potential Direct Impact Magnitude**	**Potential Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**
CHQS Species						
Adanson's Hinged Terrapin	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
African soft-shelled turtle	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Zaire Hinged Terrapin	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Smooth Chameleon	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Common / Serrated Hinge-back Tortoise	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Mocquard's African Ground Snake	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Uganda House Snake, Yellow Forest / Brown File Snake	N/A	LOW	LOW	**INSIGNIFICANT**	LOW	**INSIGNIFICANT**
Striped beaked snake *Psammophylax acutus*	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**

Reptiles	Landscape Context	Sensitivity	Potential Direct Impact Magnitude	Potential Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance
Other Notable Species (not CHQS)						
Northern Green Bush Snake/ Bequaert's Green Snake	A	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Sudan Beaked Snake	A B C	LOW	MEDIUM	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Reticulated Centipede-eater	A B C	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**
Nile Crocodile	A C	LOW	LOW	**LOW ADVERSE**	MEDIUM	**LOW ADVERSE**
Butterflies & Dragonflies	**Landscape Context**	**Sensitivity**	**Potential Direct Impact Magnitude**	**Potential Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**
CHQS Species						
17 butterfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
5 butterfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Mylothris hylara	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
2 dragonfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
2 dragonfly species	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Other Notable Species (not CHQS)						
10 butterfly species	A D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
5 dragonfly species	A C	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**

The assessment of potential direct impacts, prior to additional mitigation, for the Construction and Pre-Commissioning phase are very similar to the Site Preparation and Enabling Works phase. There are therefore potentially significant impacts (**Moderate** to **Critical**) for a number of receptor groups mainly within Landscape Contexts A (MFNP), B (savanna corridor) and C (Lake Albert, rivers and wetlands). The tables in Appendix O.3 provide a full explanation of potential impacts on each species.

Compared to the preceding Site Preparation and Enabling Works phase, the potential impacts are considered to be more significant in this phase. For species that are associated with MFPA, such as giraffe, elephant and kob, where infrastructure will be constructed, it is assumed that there will be more disturbance and barrier effects as there will be more activities going on in various places. This will include construction work on well pads and pipelines with more personnel and vehicles in the landscape.

For lion this species has a very high sensitivity due to its small population size, rapid population decline, restricted range within Uganda and existing threats. In addition, the potential impact magnitude has been defined as high because the well pads within MFNP will be located within a number of known pride territories resulting in potential loss and/or disturbance of lions. Based on the assessment method, the combination of sensitivity and potential impact magnitude gives a potential Critical impact significance for this species.

For species that may be vulnerable to potential indirect impacts, for example chimpanzees and other forest species, the magnitude and therefore significance of potential impacts is likely to be greater than the previous Site Preparation and Enabling Works phase, with potential significant impacts of **Moderate** to **High** significance. This is considered to be the case because as the project progresses the number of people working on the project will have increased, as well as the likely increase in traffic and population influx caused by the elevated economic activity and opportunities in the region. These human population changes are likely to put more pressure on habitats and natural resources, included animal species, through poaching and/or loss of habitats.

14.7.10.2 Additional Mitigation and Enhancement

As in the previous project phase, the assessment of potential impacts indicates that additional mitigation will be required in order to reduce or avoid significant impacts from the Project. The additional mitigation for potential direct and indirect impacts is presented in Sections 14.7.9.2 and 14.7.9.3 above.

14.7.10.3 Residual Impacts: Construction and Pre-Commissioning

Residual impacts on terrestrial wildlife receptors considered likely to occur during this phase are shown in Table 14-24 below. These impacts are termed residual impacts because they take into account the embedded mitigation and the additional mitigation discussed above, which will be implemented during this phase.

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives.

Table 14-24: Summary of Residual Impacts: Construction and Pre-Commissioning

Mammals	Landscape Context	Sensitivity	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
CHQS Species						
Chimpanzee	B D F	VERY HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Rothschild's Giraffe	A	VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Lelwel Hartebeest	A	VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
African Elephant	A B C F	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Lion	A B	VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Spotted Hyena	A	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Bohor Reedbuck	A	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Medje Mops Bat	D	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Trevor's Free-tailed Bat	D	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Savanna/Helios Pipistrelle	D	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Charming Thicket Rat	(Forest?)	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
Ugandan Lowland Shrew	D	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Uganda Mangabey	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
Uganda kob	A B	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Russet free-tailed bat	(Forest?)	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Other Notable Species (not CHQS)						
Hippopotamus	A C	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
Leopard	A B D F	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Giant pangolin	B D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
Peters' Pygmy Mouse	A B	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Ethiopian Pygmy / Mahomet Mouse	A B	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Bunyoro rabbit	B	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Alexander's cusimanse	B D	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE

Mammals	Landscape Context	Sensitivity	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
Duke of Abruzzi's Free-tailed Bat	B D	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Bibundi Butterfly Bat	B D	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Mongalia Free-tailed Bat	B D	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Silvered Bat	B D	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Light winged Lesser House Bat	A B	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Birds	**Landscape Context**	**Sensitivity**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species						
White-backed Vulture	A	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Rüppell's Vulture	A B D	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Hooded Vulture	A B	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
White-headed Vulture	A B	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Lappet-faced Vulture	A	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Grey Crowned Crane	C	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Madagascar Pond-heron	C	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Pallid Harrier	A B	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
African Crowned Eagle	D	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Black-rumped Buttonquail	A B	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Denham's Bustard	A	HIGH	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE
Fox Kestrel	A	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Lappet-faced Vulture	A	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Pel's Fishing Owl	A	HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Shoebill	C	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Nahan's Partridge	D	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
African skimmer	A C	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE

Amphibians	Landscape Context	Sensitivity	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
CHQS Species						
Adolf Friedrich's / Rugege Squeaker Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Golden Puddle Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Kivu Clawed Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Christy's Grassland Frog	A B D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Uganda Clawed Frog	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Hyperolius langi	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Hyperolius rwandae	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Hyperolius lateralis	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Leptopelis oryi	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Other Notable Species (not CHQS)						
Lake Victoria Toad	A C	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Reptiles	**Landscape Context**	**Sensitivity**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species						
Adanson's Hinged Terrapin	C	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
African soft-shelled turtle	C	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Zaire Hinged Terrapin	C	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Smooth Chameleon	A B	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Common / Serrated Hinge-back Tortoise	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Mocquard's African Ground Snake	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Uganda House Snake, Yellow Forest / Brown File Snake	N/A	LOW	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Striped beaked snake *Psammophylax acutus*	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**

Reptiles	Landscape Context	Sensitivity	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
Other Notable Species (not CHQS)						
Northern Green Bush Snake/ Bequaert's Green Snake	A	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Sudan Beaked Snake	A B C	LOW	LOW	INSIGNIFICANT	LOW	INSIGNIFICANT
Reticulated Centipede-eater	A B C	MEDIUM	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Nile Crocodile	A C	LOW	LOW	INSIGNIFICANT	LOW	INSIGNIFICANT
Butterflies & Dragonflies	**Landscape Context**	**Sensitivity**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species						
17 butterfly species	D	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
5 butterfly species	D	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Mylothris hylara	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
2 dragonfly species	D	HIGH	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
2 dragonfly species	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
Other Notable Species (not CHQS)						
10 butterfly species	A D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
5 dragonfly species	A C	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE

Assuming the embedded and additional mitigation is undertaken as proposed, for most species the residual magnitude of impact will be reduced from the level of potential magnitude of impact identified earlier, and for some this will therefore mean that the impact will fall below the level of significance as defined in this assessment.

However, there will still be **Moderate** significant direct residual impacts for some of the more sensitive priority species associated with Landscape Contexts A and B, mainly because these contexts will be directly affected by the Project. Nevertheless the assessment indicates that the significance of direct impacts in this Project phase will be similar to the previous phase.

Although the MFNP is large and most species will have scope to move elsewhere when disturbed, the Project will still impact them, with, as noted, the most sensitive species likely to experience the most significant impacts. This is why the success or otherwise of implemented mitigation measures will need to be maintained and monitored, and where required remedial measures taken, to ensure that impacts are minimised as much as possible.

As noted above, in addition to direct impacts of the project there may by indirect impacts on receptors caused by human population movements and in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and harder to mitigate, because their exact extent and nature cannot be known until they start to develop. The main Landscape Contexts that could be affected by indirect impacts will be forest habitats (Landscape Context D) and unprotected savanna areas (Landscape Context B) and the species associated with these landscape contexts.

It is considered likely that compared to the previous Site Clearance and Enabling works phase, the residual indirect impacts arising from this Phase will increase in magnitude and therefore significance due to the growing effects of human population influx and the pressures that will have on natural environments within the Project's AoI. These impacts will be more complex to control through mitigation, which will need to be coordinated with other stakeholders than the direct impacts. Following implementation of the mitigation strategy, the overall residual impact on some species would therefore remain **Moderate** significant.

It should be noted that for the most sensitive species, particularly those that comprise CHQS, it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation. This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain for Critical Habitat and CHQS is required. These measures are discussed at the end of this chapter (see Section 14.8).

14.7.11 Assessment of Impacts: Commissioning and Operations

This section describes the assessment of potential and residual impacts during the Commissioning and Operations phase. At this point all major construction will have been completed and any temporary infrastructure such as temporary access tracks, wayleaves for flow lines and other infrastructure will have been restored (or be in the process of restoration and establishment).

14.7.11.1 Potential Impacts

Potential impacts on identified terrestrial wildlife receptors, i.e. those based on embedded mitigation (but not additional mitigation) considered to be likely during the Commissioning and Operations phase, are defined below.

14.7.11.1.1 Loss, degradation or fragmentation of species habitat

During this phase all site clearance and construction work will have already been completed and restoration of some habitat is likely to already be taking place (e.g. along flowlines). However, the permanent infrastructure left in place will still cause some long-term fragmentation of habitats, although apart from access roads this infrastructure (at surface) will generally not be continuous and is so will be likely to allow habitats to remain / re-establish between project elements (i.e. mainly the well pads). Works within or close to the Ramsar site associated with pipeline crossing (HDD) will have been completed and are likely to have been restored by this phase of the project.

Some additional habitat loss or degradation may occur if materials are allowed to escape from operational well pad and other sites. However, embedded mitigation and application of additional mitigation, and the appropriate Management Plans are expected to prevent this.

Overall, however, a similar level of potential impact on species habitats is likely during this Project phase compared to the previous phase.

14.7.11.1.2 Population changes

As the main phase of intrusive works will have been completed, direct pressures on animal populations within the project area should be low to insignificant overall.

However, there will still be some human presence that may generate similar impacts to those identified for the previous phases of works, although at this stage of the project human presence within the park should be reduced when compared to the previous project phases.

14.7.11.1.3 Disturbance

Animals are likely to be disturbed by the presence of people in the landscape, vehicle movements, noise and vibration from various stages of the project. However, at this stage of the project human presence within the park should be reduced when compared to the previous project phases. Nevertheless, vehicle-animal interactions will probably be the main source of potential impact. The barriers around well pad sites in the park will help to reduce disturbance to animals significantly as they should not be able to see activity within the well pad site.

14.7.11.1.4 Barrier Effects

No new barrier effects are expected in this phase and the completion and restoration of the pipelines RoWs (if they are not used as access roads) should improve connectivity for animals moving between the well pad sites in comparison to previous Project phases. Nevertheless, some barrier effects will remain due to the physical presence of the established Project infrastructure.

14.7.11.1.5 Indirect Impacts

Potential impacts on habitats and species that are caused by indirect factors, such as human in-migration, will be similar to the previous phase and have been discussed above. The causes of potential indirect impacts will be similar to those for the previous phase of the project.

14.7.11.1.6 Overview of potential impacts

For this project phase, potential and residual impacts have been presented together. These have been combined because, despite changes to the types of impact and the restoration of some habitats, the significance of both potential and residual impacts likely to occur are similar to the previous phase. Therefore the potential and residual impact outcomes have been combined to avoid unnecessary repetition.

Table 14-25 summarises the potential and residual impacts on all receptors, as a result of direct or indirect impacts.

14.7.11.2 Additional Mitigation and Enhancement

As in the previous project phase, the assessment of potential impacts indicates that additional mitigation will be required in order to reduce or avoid potentially significant impacts from the Project. The additional mitigation for potential direct and indirect impacts is presented in Sections 14.7.9.2 and 14.7.9.3 above.

14.7.11.3 Residual Impacts: Commissioning and Operations

Potential and residual impacts on terrestrial wildlife receptors considered likely to occur during this phase are summarised in Table 14-25 below. These impacts are termed residual impacts because they take into account the embedded mitigation and the additional mitigation discussed above, which will be implemented during this phase.

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives.

Table 14-25: Summary of Potential & Residual Impacts: Commissioning and Operations

			POTENTIAL IMPACTS				RESIDUAL IMPACTS			
Mammals	**Landscape Context**	**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species										
Chimpanzee	B D F	VERY HIGH	LOW	MODERATE ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Rothschild's Giraffe	A	VERY HIGH	MEDIUM	HIGH ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Lelwel Hartebeest	A	VERY HIGH	MEDIUM	HIGH ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
African Elephant	A B C F	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Lion	A B	VERY HIGH	HIGH	CRITICAL ADVERSE	MEDIUM	MODERATE ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Spotted Hyena	A	HIGH	MEDIUM	MODERATE ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Bohor Reedbuck	A	HIGH	MEDIUM	MODERATE ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE
Medje Mops Bat	D	HIGH	NEGLIGIBLE	LOW ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Trevor's Free-tailed Bat	D	HIGH	NEGLIGIBLE	LOW ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Savanna/Helios Pipistrelle	D	HIGH	NEGLIGIBLE	LOW ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Charming Thicket Rat	(Forest?)	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	INSIGNIFICA NT	LOW	LOW ADVERSE
Ugandan Lowland Shrew	D	HIGH	NEGLIGIBLE	LOW ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Uganda Mangabey	D	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	INSIGNIFICA NT	LOW	LOW ADVERSE
Uganda kob	A B	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE

			POTENTIAL IMPACTS				RESIDUAL IMPACTS			
Mammals	**Landscape Context**	**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
Russet free-tailed bat	(Forest?)	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW**	LOW	**MODERATE ADVERSE**
Other Notable Species (not CHQS)										
Hippopotamus	A C	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Leopard	A B D F	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Giant pangolin	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Peters' Pygmy Mouse	A B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Ethiopian Pygmy / Mahomet Mouse	A B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Bunyoro rabbit	B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Alexander's cusimanse	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Duke of Abruzzi's Free-tailed Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Bibundi Butterfly Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Mongalia Free-tailed Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Silvered Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Light winged Lesser House Bat	A B	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**

Birds	Landscape Context	Sensitivity	Potential Direct impact Magnitude	Potential Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
CHQS Species										
White-backed Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Rüppell's Vulture	A B D	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Hooded Vulture	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
White-headed Vulture	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Lappet-faced Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Grey Crowned Crane	C	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Madagascar Pond-heron	C	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Pallid Harrier	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
African Crowned Eagle	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Black-rumped Buttonquail	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Denham's Bustard	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**
Fox Kestrel	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Lappet-faced Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Pel's Fishing Owl	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Shoebill	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**

Birds	Landscape Context	Sensitivity	Potential Direct impact Magnitude	Potential Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
Nahan's Partridge	D	HIGH	NEGLIGIBLE	LOW ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
African skimmer	A C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Amphibians	**Landscape Context**	**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species										
Adolf Friedrich's / Rugege Squeaker Frog	D	HIGH	NEGLIGIBLE	LOW ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Golden Puddle Frog	D	HIGH	NEGLIGIBLE	LOW ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Kivu Clawed Frog	D	HIGH	NEGLIGIBLE	LOW ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Christy's Grassland Frog	A B D	MEDIUM	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Uganda Clawed Frog	D	HIGH	NEGLIGIBLE	LOW ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Hyperolius langi	N/A	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
Hyperolius rwandae	N/A	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
Hyperolius lateralis	N/A	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
Leptopelis oryi	N/A	MEDIUM	NEGLIGIBLE	INSIGNIFICANT	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE
Other Notable Species (not CHQS)										
Lake Victoria Toad	A C	MEDIUM	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	INSIGNIFICANT	LOW	LOW ADVERSE

Reptiles	Landscape Context	Sensitivity	Potential Direct impact Magnitude	Potential Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
CHQS Species										
Adanson's Hinged Terrapin	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
African soft-shelled turtle	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Zaire Hinged Terrapin	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Smooth Chameleon	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Common / Serrated Hinge-back Tortoise	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Mocquard's African Ground Snake	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Uganda House Snake, Yellow Forest / Brown File Snake	N/A	LOW	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Striped beaked snake *Psammophylax acutus*	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Other Notable Species (not CHQS)										
Northern Green Bush Snake/ Bequaert's Green Snake	A	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Sudan Beaked Snake	A B C	LOW	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Reticulated Centipede-eater	A B C	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Nile Crocodile	A C	LOW	LOW	**LOW ADVERSE**	MEDIUM	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**INSIGNIFICANT**

Butterflies & Dragonflies	Landscape Context	Sensitivity	Potential Direct impact Magnitude	Potential Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
CHQS Species										
17 butterfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
5 butterfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Mylothris hylara	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**
2 dragonfly species	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
2 dragonfly species	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**
Other Notable Species (not CHQS)										
10 butterfly species	A D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**
5 dragonfly species	A C	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**

The Commissioning and Operations phase will reduce the significant direct effects on terrestrial wildlife as activity will generally be at a much lower intensity than in previous phases. Direct disturbance to species will be minimised because they tend to habituate to steady noise from industrial operations and it is the sight of people that will probably cause the most disturbance though presence will be reduced compared to previous phases.

In the park the well pads will be surrounded by barriers to prevent animals from approaching the site fence line as well as screening people within the compounds from view, which will be less disturbing for animals that should habituate to the operating sites.

However, although mitigation will have positive effects, for the most sensitive species, including Rothchild's giraffe, Lelwel hartebeest, elephant, lion, spotted hyena, Bohor reedbuck, Uganda kob and Denham's bustard the direct residual impacts will remain at **Moderate** and will therefore still be significant.

Outside of the park the main source of disturbance will be the Industrial Area (and CPF). However, there are no significant mammal species to be disturbed and it is likely that bird species present in the area will become habituated to it.

In contrast, the indirect impacts caused by population movements and in-migration to the region will probably remain elevated, and at a similar or higher significance compared to the Construction and Pre-Commissioning Phase. As in previous phases of the Project, the species particularly at risk from indirect impacts are likely to be associated with Context A (the MFPA) and Context D (Tropical High Forest). This is because these landscapes have elevated sensitivity and are therefore more vulnerable to increased pressures on natural resources within these contexts.

It is expected that the mitigation to deal with indirect impacts would compensate for some of this increase meaning that the significance of indirect impact is likely to be similar for most species for this phase compared to the preceding phase. Following implementation of the mitigation strategy, the overall residual impact on some species would therefore remain **Moderate** significant.

It should be noted that for the most sensitive species, it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation. This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain (for Critical Habitat and CHQS) is required. These measures are discussed at the end of this chapter (see Section 14.8).

14.7.12 Assessment of Impacts: Decommissioning

14.7.12.1 Introduction

This section describes the assessment of potential and residual impacts during the Decommissioning phase of the Project.

The details of this phase are not yet confirmed but are likely to include many of the same elements of the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases. As part of decommissioning it is understood that all well pads and other sites will be restored and all above ground infrastructure will be removed. Flowlines will be left *in situ* after being emptied, cleaned and sealed.

The assessment also assumes that the receptor sensitivity will not have changed, although the conservation status of some species could have changed by the time the Project reaches the Decommissioning phase.

The end goal of decommission is to remove infrastructure and to restore habitats, and that should have an overall positive effect on receptors, once the actual restoration works have been completed.

14.7.12.2 Potential Impacts

Potential impacts on identified terrestrial wildlife receptors, i.e. those based on embedded mitigation (but not additional mitigation) considered to be likely during the Decommissioning phase, are discussed below. During the actual decommissioning works potential impact are likely to similar to those associated with the initial site clearance.

The only potentially significant impacts that are likely to occur relate to the main savanna species that will be present in the area of the well pads in the MFNP. There will be disturbance, vehicle movements, earthworks, etc., but the duration of this will be such that sites are expected to be rapidly cleared and measures taken to reinstate them.

It will take a few years for the well-pad and other sites to establish vegetation cover but with regular monitoring and remedial action effective restoration should be achievable.

The restoration will generate some disturbance to animals but this will be of short duration overall.

14.7.12.2.1 Loss, degradation or fragmentation of species habitat

During this phase site clearance and removal of infrastructure will take place. Restoration of habitats will commence at cleared sites. This should reduce fragmentation and have a positive effect against habitat degradation.

During works some habitat loss or degradation may occur if materials are allowed to escape from working areas, although embedded mitigation to control run off, chemical storage, release of contaminants and erosion should prevent this.

14.7.12.2.2 Population changes

As the main phase of intrusive works will have been completed, direct pressures on populations within the project area will be reduced overall. Decommissioning and restoration will benefit species within the park as disturbance should decrease and available habitat increase.

However, there will be a temporary increase in human presence within the park during this phase, which may impact on populations indirectly due to illegal snare setting, poaching or other direct loss of species, as well as potential disturbance issues.

14.7.12.2.3 Disturbance

Animals are likely to be disturbed by the short-term increase in presence of people in the landscape, vehicle movements, noise and vibration. However, at this stage of the Project human presence within the park will be reduced in comparison to Site Preparation and Enabling Works and Construction and Pre-Commissioning phases and declining as the various sites are restored. However, vehicle-animal interactions will probably be the main issue in this Project phase.

14.7.12.2.4 Barrier Effects

No new barrier effects are expected in this phase, although there may be some temporary issues as restoration works get underway.

14.7.12.2.5 Indirect Impacts

Potential impacts on habitats and species that are caused by indirect factors, such as in-migration will be similar in all phases and have been discussed above, where some significant potential impacts have been identified. The causes of potential indirect impacts will be similar to those for previous phases of the Project.

14.7.12.2.6 Overview of potential impacts

For this project phase, potential and residual impacts have been presented together. These have been combined because, despite changes to the types of impact and the restoration of some habitats, the significance of both potential and residual impacts likely to occur are similar to the previous phase. Therefore the potential and residual impact outcomes have been combined to avoid unnecessary repetition.

Table 14-26 summarises the potential and residual impacts on all receptors, as a result of direct or indirect impacts.

14.7.12.3 Additional Mitigation and Enhancement

As in the previous project phase, the assessment of potential impacts indicates that additional mitigation will be required in order to reduce or avoid significant impacts from the Project. The additional mitigation for direct and indirect impacts is presented in Sections 14.7.9.2 and 14.7.9.3 above.

14.7.12.4 Residual Impacts: Decommissioning

Potential and residual impacts on terrestrial wildlife receptors considered likely to occur during this phase are summarised in Table 14-26 below. These impacts are termed residual impacts because they take into account the embedded mitigation and the additional mitigation discussed above, which will be implemented during this phase.

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives. The assessment also assumes that the receptor sensitivity will not have changed, although it is actually quite likely that the conservation status of most species will have changed (possibly significantly) by the time the Project reaches the decommissioning phase.

Table 14-26: Summary of Potential & Residual Impacts: Decommissioning

			POTENTIAL IMPACTS				RESIDUAL IMPACTS			
Mammals	**Landscape Context**	**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species										
Chimpanzee	B D F	VERY HIGH	LOW	**MODERATE ADVERSE**	MEDIUM	**HIGH ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Rothschild's Giraffe	A	VERY HIGH	MEDIUM	**HIGH ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Lelwel Hartebeest	A	VERY HIGH	MEDIUM	**HIGH ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
African Elephant	A B C F	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Lion	A B	VERY HIGH	HIGH	**CRITICAL ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Spotted Hyena	A	HIGH	MEDIUM	**MODERATE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Bohor Reedbuck	A	HIGH	MEDIUM	**MODERATE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**
Medje Mops Bat	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Trevor's Free-tailed Bat	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Savanna/Helios Pipistrelle	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Charming Thicket Rat	(Forest?)	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**
Ugandan Lowland Shrew	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Uganda Mangabey	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**
Uganda kob	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**

			POTENTIAL IMPACTS				RESIDUAL IMPACTS			
Mammals	**Landscape Context**	**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
Russet free-tailed bat	(Forest?)	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW**	LOW	**MODERATE ADVERSE**
Other Notable Species (not CHQS)										
Hippopotamus	A C	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Leopard	A B D F	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Giant pangolin	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Peters' Pygmy Mouse	A B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Ethiopian Pygmy / Mahomet Mouse	A B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Bunyoro rabbit	B	MEDIUM	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Alexander's cusimanse	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Duke of Abruzzi's Free-tailed Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Bibundi Butterfly Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Mongalia Free-tailed Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Silvered Bat	B D	MEDIUM	LOW	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Light winged Lesser House Bat	A B	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**

Birds	Landscape Context	Sensitivity	Potential Impact Character	Potential Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
CHQS Species										
White-backed Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Rüppell's Vulture	A B D	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Hooded Vulture	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
White-headed Vulture	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Lappet-faced Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Grey Crowned Crane	C	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Madagascar Pond-heron	C	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Pallid Harrier	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
African Crowned Eagle	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Black-rumped Buttonquail	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Denham's Bustard	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**
Fox Kestrel	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Lappet-faced Vulture	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Pel's Fishing Owl	A	HIGH	MEDIUM	**MODERATE ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**
Shoebill	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**

Birds	Landscape Context	Sensitivity	Potential Impact Character	Potential Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
Nahan's Partridge	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**HIGH ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
African skimmer	A C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Amphibians	**Landscape Context**	**Sensitivity**	**Potential Direct Impact Character**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species										
Adolf Friedrich's / Rugege Squeaker Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Golden Puddle Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Kivu Clawed Frog	D	HIGH	NEGLIGIBLE	**LOW ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Christy's Grassland Frog	A B D	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**
Uganda Clawed Frog	D	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**
Hyperolius langi	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**
Hyperolius rwandae	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**
Hyperolius lateralis	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**
Leptopelis oryi	N/A	MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**
Other Notable Species (not CHQS)										
Lake Victoria Toad	A C	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE**	NEGLIGIBLE	**INSIGNIFICA NT**	LOW	**LOW ADVERSE**

Reptiles	Landscape Context	Sensitivity	Potential Impact Character	Potential Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
CHQS Species										
Adanson's Hinged Terrapin	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
African soft-shelled turtle	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Zaire Hinged Terrapin	C	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Smooth Chameleon	A B	HIGH	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Common / Serrated Hinge-back Tortoise	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Mocquard's African Ground Snake	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Uganda House Snake, Yellow Forest / Brown File Snake	N/A	LOW	LOW	**INSIGNIFICANT**	LOW	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Striped beaked snake *Psammophylax acutus*	N/A	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	NEGLIGIBLE	**INSIGNIFICANT**
Other Notable Species (not CHQS)										
Northern Green Bush Snake/ Bequaert's Green Snake	A	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Sudan Beaked Snake	A B C	LOW	MEDIUM	**LOW ADVERSE**	MEDIUM	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**INSIGNIFICANT**
Reticulated Centipede-eater	A B C	MEDIUM	MEDIUM	**MODERATE ADVERSE**	MEDIUM	**MODERATE ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Nile Crocodile	A C	LOW	LOW	**INSIGNIFICANT**	MEDIUM	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**INSIGNIFICANT**

Butterflies & Dragonflies	Landscape Context		Sensitivity	Potential Impact Character	Potential Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
CHQS Species											
17 butterfly species	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
4 butterfly species	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**
Mylothris hylara	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
2 dragonfly species	D		HIGH	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE ADVERSE**	NEGLIGIBLE	**LOW ADVERSE**	LOW	**MODERATE**
2 dragonfly species	D		MEDIUM	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
Other Notable Species (not CHQS)											
10 butterfly species	A	D	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**
5 dragonfly species	A	C	MEDIUM	LOW	**LOW ADVERSE**	LOW	**LOW ADVERSE**	NEGLIGIBLE	**INSIGNIFICANT**	LOW	**LOW ADVERSE**

Assuming the embedded and additional mitigation is undertaken as proposed, for most species the residual impacts will not be significant. However, there will still be **Moderate** significant direct residual impacts on the most sensitive priority species, including Rothchild's giraffe, Lelwel hartebeest, elephant, lion, spotted hyena, Bohor reedbuck, Uganda kob and Denham's bustard, present in Landscape Context A during this phase of the works.

During and after decommissioning there may still be indirect impacts caused by human population movements and in-migration pressures to the region. It is considered that these indirect impacts may be more significant than the direct impacts and likely to require more complex and adaptive measures to mitigate, as discussed in Sections 14.7.9.3 above, because their exact extent and nature cannot be known in advance. Following implementation of the mitigation strategy, the overall residual impact on some species would therefore remain at **Moderate** significance.

It should be noted that for the most sensitive species, it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation. This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain for Critical Habitat and CHQS is required. These measures are discussed below (see Section 14.8).

14.8 Biodiversity Loss/Gain Accounting and Measures to Achieve Net Gain

14.8.1 Introduction

In consideration of the objectives of PS6 there is a requirement to achieve no net loss of Natural Habitat and net gain of Critical Habitat. From the above impact assessment, it should be noted that for the most sensitive species, particularly those that comprise CHQS, it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation. This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain for Critical Habitat lost or compromised as a result of the Project and CHQS is required.

However, there are limited options to provide no net loss/net gain for residual impacts outside of the Primary Project Area and therefore net gains will need to be achieved within the same landscape as Project impacts. This creates technical challenges for reporting and partitioning the effects of: (i) direct and indirect/cumulative Project impacts, (ii) other pressures not related to the Project, and (iii) no net loss/net gain interventions that all occur in the same place.

The Project therefore takes a pragmatic outcome-focused approach. This means no distinction has been made between the components of additional mitigation that are 'minimisation' or 'offsets'. Instead the focus is on demonstrating that the sum of all mitigation is sufficient to lead to improvements over the baseline for Critical Habitats and CHQS. This approach also applies to ***Chapter 13: Terrestrial Vegetation*** and ***Chapter 15: Aquatic Life***.

14.8.2 Biodiversity Loss/Gain Accounting

In order to identify how and where no net loss or net gain can be achieved and how much net gain is required biodiversity loss-gain forecasting being developed for the Project using available data (see Ref 14.98, methods for preliminary findings included in Appendix O.4).

Appropriate methods for forecasting losses for each priority biodiversity feature were identified based on (i) receptor sensitivity (as defined through the ESIA), (ii) the likelihood of residual impacts based on the ESIA outcomes and further expert assessment and, (iii) the availability of information on species' status. Individual forecasts of residual losses are therefore being developed for:

- Critical Habitat-qualifying threatened ecosystems;
- Natural Habitats; and
- Six large mammal species for which detailed habitat-association or population data was available.

For priority species for which only broad habitat association is known, forecasts are being derived from estimates of impacts to those habitats. For species with lower receptor sensitivity, lower likelihood of residual impacts, or less available data, qualitative forecast is being provided. In these particular cases, monitoring should be conducted to verify the existence (or not) of impacts to these features and their significance.

The preliminary forecast development considers direct impacts (limited to footprint and disturbance impacts), and indirect (limited to increase consumption of natural resources due to in-migration) impacts of the Project and of associated facilities, as defined in the ESIA.

This is an iterative process and the initial forecasts being developed need to be completed and will be further revised as required when further data and information becomes available about biodiversity, Project impacts and mitigation efficacy. Robust monitoring and evaluation of receptors and indicators will enable the Project to update this preliminary forecast and assess whether the type, scale or intensity of mitigation requires adjustment to ensure biodiversity outcomes are achieved.

The Project is likely to have residual impacts on a variety of priority species and other biodiversity features (i.e. Natural Habitats and Critical Habitat-qualifying ecosystems). However there is a high degree of variation between features in: (i) the likelihood and expected significance of these impacts, (ii) available information on each feature's status and (iii) the feasibility of obtaining better information on the status of the feature.

Three different approaches are therefore being used to assess potential losses for priority species and biodiversity features. The three approaches are:

1. Quantification of losses based on species population data and quantification of Project impacts. The degree of quantification depends on available information, and can vary from percentage (%) of population loss to providing an order-of-magnitude numerical estimate of population losses;
2. Quantification of habitat loss and degradation either for determining losses to ecosystems or as a proxy for assessing extent of habitat loss for species. Extent of loss is based on both the extent and quality of habitat; and
3. No quantitative assessment of residual impacts. Establish appropriate monitoring baseline and undertake ongoing monitoring and periodic review to verify implementation of mitigation responses (particularly for indirect impacts) and absence of significant residual impacts.

Using an outcome-based approach, the Project therefore aims to demonstrably deliver a Net Gain within the same landscape by leaving priority species and biodiversity features in a better situation than if the Project had not taken place. The preliminary report (Ref 14.98) presented in Appendix O.4 provides an overview of initial outputs from this process which will allow quantifying some of the qualitative results of this ESIA.

These forecasts are still being developed, based on available data and on a large number of assumptions that are detailed in the report. It should be noted that, where appropriate, precautionary estimates are used in order to ensure that the resulting forecasts are cautious, without being unrealistic.

The assessment should be understood as an initial order-of-magnitude forecast of impacts that is still being developd and should be refined using monitoring of actual impacts.

14.8.3 Overview of preliminary Loss/Gain Accounting outcome

The ongoing loss/gain accounting exercise is presented in Appendix O4 (Ref. 14.98). The main preliminary findings and implications of this analysis are summarised as follows:

- Direct footprint impacts are expected to be relatively minor, generally between <0.1 and 0.3% of the landscape extent for all priority biodiversity features. Avoidance and minimisation of footprint appears to have been quite successful. It will be essential to ensure this design is adhered to, for example through implementation of the Site Clearance and Restoration Management Plans. The Avoidance Protocol (Ref. 14.100) should continue to be applied to any further development and any further opportunities for minimising footprint explored;
- Disturbance may be significant, variably affecting some proportions of Rothschild's Giraffe, Lion, Uganda Kob, Lelwel Hartebeest and African Elephant populations within the MFPA. This is because the Project activities are concentrated in the same area of MFPA that is most used by these species. The quantification is still being developed, however with high confidence intervals associated with these potential impacts. Implementation of planned mitigation is critical and should be accompanied by monitoring and evaluation at an intensity and frequency that permits mitigation to be adapted or enhanced where impacts are seen to be significant;

- The assessment of potential indirect impacts is based on a range of assumptions about the extent of in-migration, scenarios about the impact of in-migrants and the resilience of existing protected areas;
- Under an optimistic (i.e. least impacting) scenario, indirect impacts would be largely restricted to outside protected areas. However, losses outside protected areas could impact the remaining extent of Natural Habitat and Critical Habitat-qualifying threatened ecosystems (equivalent to 1-3% of landscape extent); and
- Under a pessimistic scenario, indirect impacts would extend into existing protected areas, and could be significant for the majority of terrestrial priority biodiversity features. Impacts on this scale would likely be impossible to offset.

The scale of potential indirect impacts, and implications for biodiversity, are expected to be significant. This emphasises the need for further pre-emptive mitigation to avoid and minimise these impacts and highlights the need for these concepts to be implemented at a scale and intensity and on a timeline that ensures they are truly pre-emptive.

14.8.4 Measures to Achieve Net Gain

Based on the impact assessment results, which indicate that there will be some significant residual impacts for CHQS remaining after implementation of embedded and additional mitigation, further requirements for mitigation at a landscape level will be required to achieve no net loss (for Natural Habitats) and net gain (for Critical Habitats).

Activities to achieve net gain will include measures to improve the quality of habitat preferred by priority species mainly through management changes in protected areas and in specific landscape contexts which are associated with CHQS that are likely to be subject to significant residual direct impacts. As noted, these species comprise Rothchild’s giraffe, Lelwel hartebeest, elephant, lion, spotted hyena, Bohor reedbuck, Uganda kob and Denham’s bustard and are associated with MFPA and savanna habitats. Therefore, specific measures to achieve net gain in these landscapes are proposed.

In addition, the assessment indicates that there are likely to be significant residual indirect impacts for certain CHQS. These include species that may be subject to direct impacts within the MFPA, as well as other species that are associated with other landscape contexts, principally forest habitats. These species are likely to be subject to indirect impacts due to human population changes that will put these habitats under pressure.

Therefore, in addition to the specific embedded and additional mitigation measures presented above, three broad mitigation concepts have been identified for addressing indirect impacts and achieving gains towards net positive outcomes. These concept strategies (also referred to as ‘Biodiversity Conservation Initiatives’) form the core of the approach to achieving net gain / no net loss for the Project in line with requirements of IFC PS6, and are part of the Net Gain Strategy (that some may refer to as “Offset Strategy”) and Implementation Plan. The concepts are summarised below.

14.8.4.1 Reducing human pressures and increasing resilience of the Murchison Falls Protected Area (MFPA)

Measures to reduce human pressures and increase resilience of the MFPA: through enhanced park protection and community-based management. This will also include measures to protect and maintain connectivity of the savanna corridor outside the MFNP and including Bugungu Wildlife Reserve: manage in-migration impacts to savanna habitat and associated species by addressing threats and maintaining connectivity within and around Bugungu Wildlife Reserve. The following will be considered (Subject to feasibility study):

- In-kind Support to UWA for:
  - Equipment needed to enhance its ability to protect the MFPA;
  - Recruitment, training and deployment of a rapid reaction team (RRT) for MFPA;
  - Training in community conservation; and

  - Strategic and tactical support to UWA including training, capacity building and independent data management, analysis and reporting.

- Community-based interventions including:
  - Establishing community governance structures such as Village Saving and Loans Associations (VSLAs) and Community Land Associations (CLAs) assisting local communities to establish and develop PES or micro-credit schemes or animal husbandry and, promote alternative wildlife-friendly enterprises
  - Recruitment and training of village wildlife scouts to empower and involve communities in park management;
  - Promotion of alternative fuel use and clean cooking stoves to reduce level of fuelwood harvesting;
  - Identify areas with high incidence of human-wildlife carnivore conflict and assess means to address this, for example community-based insurance schemes linked to land-use planning; and
  - Assist local communities to establish and develop simple wildlife-friendly management plans.

14.8.4.2 Conserving and Restoring Wetlands and Riparian Vegetation

Actions to manage and restore wetlands along the southern shore of the Albert Delta Ramsar site: manage anticipated impacts of in-migration on wetland habitat, fisheries and associated biodiversity around the Albert Delta Ramsar site through community-based management. The following will be considered (Subject to feasibility study):

- Organisation/establishment of wetland user groups/management committees;
- Developing agreed community management rules and regulation approaches;
- Environmental awareness raising in local communities;
- Establishing nurseries for revegetation of papyrus (and/or applying ecological engineering approaches to restoration);
- Participatory monitoring and evaluation of wetland areas and resources; and
- Micro-credit schemes to support livelihood diversification.

14.8.4.3 Conserving and Restoring Forests [Landscape Contexts D & F]

Measures to conserve and restore forests and forest connectivity along the eastern shore of Lake Albert (including Budongo and Bugoma FRs)

As part of reduction effort of in-migration impacts on forests, in order to maintain and restore key forest corridors and enhance protection of threatened species; the following will be considered (Subject to feasibility study):

- Establishing agroforestry systems (combining shrub/tree planting with agricultural practices to create more diverse, healthy, productive and profitable sustainable land-use;
- Support establishment of CLAs through which to coordinate and implement PES and micro-credit schemes to support livelihood diversification;
- Promotion of alternative fuel use and clean cooking stoves to reduce rate of fuelwood harvesting;
- Establishing nurseries for community reforestation and sustainable resource extraction (e.g. wood production and NTFPs);
- Specific activities to target the conservation of high priority species (e.g. actions to reduce hunting pressures (e.g. removal of snares) and activities that combat illegal hunting and trading will be important); and

- Enhanced management of existing FRs will require support to the Government for enforcement activities (e.g. improved patrolling and boosting community conservation efforts).

These concepts will be developed in detail by the Project Proponents and a joint approach will be pursed with other stakeholders to identify specific actions, define targets and monitoring requirements and to work towards achieving Net Gain in relation to Priority Biodiversity identified in this assessment. The assessment will therefore inform development of the BMP and in turn be updated based on the scale of measured impacts.

14.9 Monitoring

There are a significant number of mitigation measures that will be implemented as part of this project. These are necessary to ensure that potential impacts are managed and that significant impacts are controlled and reduced.

In order to understand the effectiveness of these mitigation measures it will be necessary, as part of the various proposed Management Plans, to undertake monitoring to determine whether the mitigation measures are being successful and that targets set are being achieved. The monitoring will build on existing baseline and/or new baseline studies and will then consist of monitoring of defined parameters, for example land-cover types, habitat quality, population numbers, and species distributions.

In this way, the feedback mechanisms can be employed to ensure that any deterioration of the status of defined indicators can be monitored and timely corrective actions taken.

In addition, targeted monitoring to validate the assumptions used in the net gain forecasts will be required to narrow confidence intervals and ensure that the nature, scale and intensity of mitigation is appropriate. To be useful it has to be conducted on a timeline that realistically allows for adaptation of mitigation measures prior to significant impacts occurring. More broadly, monitoring will inform development of mitigation within the BAP and in turn be updated based on the scale of measured impacts.

Long term monitoring of the status and trends of net gain indicator species will be required to ensure that the indicatives are effective and so that where necessary corrective actions can be taken to achieve the net gain objectives.

14.10 In-Combination Effects

As described in ***Chapter 4: Project Description and Alternatives***, the Project has a number of supporting and associated facilities that are being developed separately (i.e. they are subject to separate permitting processes and separate ESIAs or EIAs). These facilities include:

- Tilenga Feeder Pipeline;
- East Africa Crude Oil Export Pipeline (EACOP);
- Waste management storage and treatment facilities for the Project;
- 132 kV Transmission Line from Tilenga Central Processing Facility to Kabaale Industrial Park; and
- Critical oil roads.

As these facilities are directly linked to the Project and would not be constructed or expanded if the Project did not exist, there is a need to consider the in-combination impacts of the Project and the supporting and associated facilities.

This is distinct from the Cumulative Impact Assessment (CIA) which considers all defined major developments identified within the Project's Area of Influence (and not just the associated facilities) following a specific methodology which is focussed on priority Valued Environmental and Social Components (VECs) (see ***Chapter 21: Cumulative Impact Assessment***).

The in-combination impact assessment considers the joint impacts of both the Project and the supporting and associated facilities. The approach to the assessment of in-combination impacts is presented in ***Chapter 3: ESIA Methodology***, Section 3.3.5.

The identified residual impacts of the Project listed in Table 14-27 below are predicted to have the potential to be exacerbated due to in-combination effects with supporting and associated facilities. A comment is provided on the potential in-combination impacts and the need for additional collaborative mitigation between project proponents to address these impacts.

Table 14-27: In-combination Impacts

Description of Potential Impact of Project	***Potential In-combination impacts with associated facilities***
Loss, degradation or fragmentation of species habitat, population changes, disturbance, barrier effects – direct and indirect *Direct loss and degradation of habitats due to site clearance and construction of Project facilities.* *Direct loss of population due to Project vehicle-animal collisions, fire risk, and decrease of prey species for predators due to Project activities* *Direct disturbance (visual, artificial lighting, noise, vibration), increased Project vehicles on roads.* *Direct barrier effects from flowline construction and access and oil roads and an increase in number of Project vehicles on roads.* *Project-associated induced access and in-migration leading to land-use change.* *Indirect loss of population due to vehicle-animal collisions, poaching, human-wildlife conflict, transmission of zoonotic diseases and fire risk.* *Project induced in-migration and improved access leading to increased direct disturbance (visual, noise, vibration), increased (non-project) vehicles on roads and people moving through forests.*	Site preparation (clearance) and construction of the supporting and associated facilities may impact directly on species and their habitats protected areas and forests, leading to habitat loss and degradation. In addition, the activities might lead to prey species being displaced, resulting in a loss of potential food for predators (e.g. lion, leopard and hyena), causing predators to themselves shift territories and suffer potential intra-species aggression, resulting in serious injury and mortality. The activities might also exacerbate the risk of fire outbreaks. The risk of vehicle-animal collisions will increase due to the increased traffic. Species most at risk from direct effects from supporting and associated facilities include: chimpanzee; African elephant; lion; spotted hyena; leopard; Uganda mangabey; charming thicket rat; and giant pangolin and all other forest related species. The combination of activities will further increase potential disturbance associated with increased traffic and other activities (e.g. ones generating light, noise) to animal species. Species most at risk include those inhabiting the southern part of MFPA, Bugungu Wildlife Reserve, Budongo Central Forest Reserve and other CFRs): chimpanzee; hartebeest; elephant; lion; hyena; Uganda mangabey; charming thicket rat; leopard; giant pangolin. Multiple activities could exacerbate the barrier effect. Species most at risk include: chimpanzee; hartebeest; elephant; lion; leopard; hyena; Uganda mangabey; charming thicket rat; giant pangolin; amphibians; and reptiles. The oil roads will further improve access within the region and allow more people to travel to previously isolated areas (such as Bugungu Wildlife Reserve, Budongo Central Forest Reserve and the southern part of the MFPA). This will exacerbate the Project's effects with respect to increased human settlement from in-migration driving land-use change and settlement patterns, increased demand for natural resources and wood-fuel in particular, increased fire risk leading to habitat loss and degradation. Small unprotected forests will be especially at risk of deforestation and degradation. It is also expected to be associated with increased poaching and vehicle-animal collision. There may be an increase in human-wildlife conflict as people settle in the area and keep livestock close to a predator's territory. Species most at risk from indirect effects include: chimpanzee; hartebeest; elephant; lion; hyena; Uganda mangabey; charming thicket rat; leopard; giant pangolin; vultures; raptors; and amphibians. An increased disturbance is also expected in relation to the in-migration. Species most at risk include: chimpanzee; hartebeest; elephant; lion; hyena; Uganda mangabey; charming thicket rat; leopard; giant pangolin.

Addressing impacts that are out of the Project's immediate sphere of control and which may be only partially attributable to the Project requires a collaborative strategic approach involving multiple stakeholders. The following collaborative approach is proposed:

- Project Proponents will invite other developers to participate in joint planning initiatives with local government and other relevant stakeholders, and will continue to share best practices to allow other developers to learn from successful implementation of mitigation measures addressing impacts on terrestrial wildlife for the Project, also aiming at minimising potential combined disturbance and barrier-effects;
- The Project Proponents will invite other developers, local and national government and other relevant stakeholders to participate in joint planning of the mitigation concepts for dealing with likely residual indirect impacts (as presented in section 14.8.2);
- Strategic collaboration platforms will be established with local and regional authorities, UWA, NFA development and conservation NGOs and other stakeholders as appropriate to regularly evaluate and review the extent of impacts, share understanding of causes and identify adapted or additional mitigation requirements;
- Project Proponents will invite other developers to participate in joint planning initiatives with local government and other relevant stakeholders to optimise traffic flows in consideration of required vehicle movements for all developments and provide a platform to share 'lessons learned' in relation to vehicle and traffic management; and
- The Project Proponents will invite other developers, local and national government and other relevant stakeholders to participate in joint planning initiatives to address influx. Feasibility of jointly sponsoring a regional level Influx Management Strategy will be assessed.

14.11 Unplanned Events

Further details on unplanned events relevant to the Project are detailed in ***Chapter 20: Unplanned Events***.

14.12 Cumulative Impact Assessment

Chapter 21: Cumulative Impact Assessment provides an assessment of the potential cumulative effects of the Project together with other defined developments in the Project AOI. The CIA has focussed on VECs that were selected on the basis of set criteria including the significance of the effects of the Project, the relationship between the Project and other developments, stakeholder opinions and the status of the VEC (with priority given to those which are of regional concern because they are poor or declining condition).

On the basis of the selection process, three relevant VECs (Critical and Natural Habitat and Associated Species, Nature-based Tourism in Protected Areas and Bushmeat) were considered to be priority VECs in relation to biodiversity and are considered further in the CIA.

14.13 Conclusions

This chapter assesses the potential and residual impacts of the Project on terrestrial wildlife within the Project AoI. In consideration of the objectives of PS6, there is a requirement to achieve no net loss of natural habitat and net gain of Critical Habitat. The assessment has defined priority species as receptors, based on a number of criteria including whether they are CHQS but also if they are otherwise of stakeholder interest. There is therefore a large number of receptors and the assessment is therefore quite complex.

The presence and sensitivity of receptors has been identified based on numerous field and desk based studies, some of which are at a landscape level and others which were commissioned specifically for this assessment. It should be noted, however, that although some species are relatively well studied (certainly recently), for most species there is less known about their distribution, the threats they are under and their population trends, and therefore the precautionary principle has been applied when assessing impacts and developing mitigation.

Potential impacts have be considered to be direct, i.e. those impacts that may occur as a consequence of the project design or activities and indirect, which may occur as a result of induced effects, for example an associated increase in human population that puts pressure on biodiversity through habitat loss, pollution or human-wildlife interactions.

The assessment of potential impacts takes into account embedded mitigation that has been designed into the Project, as described in ***Chapter 4: Project Description and Alternatives***. This embedded mitigation addresses the requirements of the mitigation hierarchy with a strong emphasis on avoidance as a first stage in the hierarchy and therefore the Project design. To this end, extensive surveys have been undertaken of all Project components within the Project Area, including well pads, camps, flow lines, access roads, borrow pits and all other identified Project elements, in order to ensure that sensitive features have been mapped, evaluated and where possible avoided.

However, in any project it is not possible to avoid all impacts (particularly where these are more intangible, such as seasonal restrictions) and therefore, on an iterative basis, further additional mitigation has been identified. This additional mitigation comprises generic mitigation as well as some species specific mitigation where appropriate.

14.13.1 Residual direct Impacts

The findings from the assessment of direct impacts indicate that, taking all embedded and additional mitigation into account, some **Moderate** (significant) residual impact might remain. This is for species associated with MFNP and savanna habitats across all phases of the project. This includes the CHQS species of Rothchild's giraffe, Lelwel hartebeest, elephant, lion, spotted hyena, Bohor reedbuck, Uganda kob and Denham's bustard. These impacts remain significant mainly because of the high sensitivity of these species and their presence within the MFNP landscape, where direct impacts on these species cannot be fully mitigated. This is because these habitats are where most of the Project infrastructure and main activities will be present.

In contrast, direct impacts on species not recorded as being present within the Project footprint, or considered unlikely to be present in the Project footprint, are lower and are not significant. However, for these species there may alternatively (or in addition) be indirect impacts.

Table 14-28 below provides a summary of the residual direct impacts significance for each stage of the Project, taking embedded and additional mitigation into account.

Table 14-28: Summary of Residual Direct Impacts by Project Phase

Mammals	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
CHQS Species						
Chimpanzee	B D F	VERY HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Rothschild's Giraffe	A	VERY HIGH	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Lelwel Hartebeest	A	VERY HIGH	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
African Elephant	A B C F	HIGH	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Lion	A B	VERY HIGH	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Spotted Hyena	A	HIGH	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Bohor Reedbuck	A	HIGH	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Medje Mops Bat	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Trevor's Free-tailed Bat	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE

Mammals	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
Savanna/Helios Pipistrelle	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Charming Thicket Rat	Unknown	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Ugandan Lowland Shrew	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Uganda Mangabey	D	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Uganda kob	A B	HIGH	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Russet free-tailed bat	Unknown (Forest?)	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Other Notable Species (not CHQS)						
Hippopotamus	A C	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Leopard	A B D F	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Giant pangolin	B D	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Peters' Pygmy Mouse	A B	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Ethiopian Pygmy / Mahomet Mouse	A B	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Bunyoro rabbit	B	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Alexander's cusimanse	B D	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Duke of Abruzzi's Free-tailed Bat	B D	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Bibundi Butterfly Bat	B D	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Mongalia Free-tailed Bat	B D	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Silvered Bat	B D	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Light winged Lesser House Bat	A B	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Birds	**Landscape Context**	**Sensitivity**	**Site Preparation and Enabling Works**	**Construction and Pre-Commissioning**	**Commissioning and Operations**	**Decommission**
CHQS Species						
White-backed Vulture	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Rüppell's Vulture	A B D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Hooded Vulture	A B	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
White-headed Vulture	A B	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Lappet-faced Vulture	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Grey Crowned Crane	C	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Madagascar Pond-heron	C	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Pallid Harrier	A B	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
African Crowned Eagle	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Black-rumped Buttonquail	A B	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Denham's Bustard	A	HIGH	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Fox Kestrel	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Lappet-faced Vulture	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE

Birds	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommission
Pel's Fishing Owl	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Shoebill	C	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Nahan's Partridge	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
African skimmer	A C	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Reptiles	**Landscape Context**	**Sensitivity**	**Site Preparation and Enabling Works**	**Construction and Pre-Commissioning**	**Commissioning and Operations**	**Decommission**
CHQS Species						

Amphibians	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommission
CHQS Species						
Adolf Friedrich's / Rugege Squeaker Frog	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Golden Puddle Frog	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Kivu Clawed Frog	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Christy's Grassland Frog	A B D	MEDIUM	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Uganda Clawed Frog	D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Hyperolius langi	N/A	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Hyperolius rwandae	N/A	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Hyperolius lateralis	N/A	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Leptopelis oryi	N/A	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Other Notable Species (not CHQS)						
Lake Victoria Toad	A C	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Adanson's Hinged Terrapin	C	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
African soft-shelled turtle	C	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Zaire Hinged Terrapin	C	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Smooth Chameleon	A B	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Common / Serrated Hinge-back Tortoise	N/A	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Mocquard's African Ground Snake	N/A	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Uganda House Snake, Yellow Forest snake, Brown File Snake	N/A	LOW	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Striped beaked snake (*Psammophylax acutus*)	N/A	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Other Notable Species (not CHQS)						
Northern Green Bush Snake/ Bequaert's Green Snake	A	MEDIUM	LOW ADVERSE	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Sudan Beaked Snake	A B C	LOW	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Reticulated Centipede-eater	A B C	MEDIUM	LOW ADVERSE	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT

Reptiles	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommission
Nile Crocodile	A C	LOW	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Butterflies and Dragonflies	**Landscape Context**	**Sensitivity**	**Site Preparation and Enabling Works**	**Construction and Pre-Commissioning**	**Commissioning and Operations**	**Decommission**
CHQS Species						
17 butterfly species	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
5 butterfly species	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Mylothris / Milithrus hylara	D	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
2 dragonfly species	D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
2 dragonfly species	D	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Other Notable Species (not CHQS)						
10 butterfly species	A D	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
5 dragonfly species	A C	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT

14.13.2 Residual indirect Impacts

The assessment indicates that there could be potential indirect impacts on a variety of priority species across different landscapes and that the indirect impacts are overall expected to be more significant than the direct ones.

Within the MFNP and savanna habitats, there may be indirect impacts associated with increased human-wildlife interactions such as poaching, mainly because there will be more people in the vicinity due to elevated economic activity in the area. Such population changes are expected to increase pressure on ecological resources such as forests and water. Consequently species in these landscapes could be affected by a combination of both direct and indirect impacts. These impacts are significant (Moderate).

In addition to potential indirect impacts on species in the MFNP and savanna landscapes there will be potential indirect impacts on species associated with other landscapes such as forests and aquatic habitats. Species that may be particularly affected include chimpanzees and other forest species. These impacts could be significant (Moderate), due to induced human population changes (increases) within the Project AoI.

Loss of habitat, as well as increased human-wildlife interactions (e.g. poaching, fire, disease), are expected to be the main causes of impact to these species. Consequently there will be a need for some broader strategies and initiatives, involving other stakeholders (see section 14.7.9.3 above), to manage and reduce the indirect impacts on these priority species and the habitats upon which they are dependent. Table 14-29 below summarises the residual indirect impacts significance on priority species.

Table 14-29: Summary of Residual Indirect Impacts by Project Phase

Mammals	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommission
CHQS Species						
Chimpanzee	B D F	VERY HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Rothschild's Giraffe	A	VERY HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Lelwel Hartebeest	A	VERY HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE

Mammals	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommission
African Elephant	A B C F	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Lion	A B	VERY HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Spotted Hyena	A	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Bohor Reedbuck	A	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Medje Mops Bat	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Trevor's Free-tailed Bat	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Savanna/Helios Pipistrelle	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Charming Thicket Rat	Unknown	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Ugandan Lowland Shrew	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Uganda Mangabey	D	MEDIUM	LOW	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Uganda kob	A B	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Russet free-tailed bat	Unknown (Forest?)	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Other Notable Species (not CHQS)						
Hippopotamus	A C	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Leopard	A B D F	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Giant pangolin	B D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Peters' Pygmy Mouse	A B	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Ethiopian Pygmy / Mahomet Mouse	A B	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Bunyoro rabbit	B	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Alexander's cusimanse	B D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Duke of Abruzzi's Free-tailed Bat	B D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Bibundi Butterfly Bat	B D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Mongalia Free-tailed Bat	B D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Silvered Bat	B D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Light winged Lesser House Bat	A B	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Birds	**Landscape Context**	**Sensitivity**	**Site Preparation and Enabling Works**	**Construction and Pre-Commissioning**	**Commissioning and Operations**	**Decommission**
CHQS Species						
White-backed Vulture	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Rüppell's Vulture	A B D	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Hooded Vulture	A B	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
White-headed Vulture	A B	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Lappet-faced Vulture	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE

Birds	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommission
Grey Crowned Crane	C	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Madagascar Pond-heron	C	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Pallid Harrier	A B	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
African Crowned Eagle	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Black-rumped Buttonquail	A B	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Denham's Bustard	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Fox Kestrel	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Lappet-faced Vulture	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Pel's Fishing Owl	A	HIGH	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Shoebill	C	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Nahan's Partridge	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
African skimmer	A C	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE

Reptiles	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommission
CHQS Species						

Amphibians	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommission
CHQS Species						
Adolf Friedrich's / Rugege Squeaker Frog	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Golden Puddle Frog	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Kivu Clawed Frog	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Christy's Grassland Frog	A B D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Uganda Clawed Frog	D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Hyperolius langi	N/A	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Hyperolius rwandae	N/A	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Hyperolius lateralis	N/A	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Leptopelis oryi	N/A	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Other Notable Species (not CHQS)						
Lake Victoria Toad	A C	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Adanson's Hinged Terrapin	C	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
African soft-shelled turtle	C	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Zaire Hinged Terrapin	C	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Smooth Chameleon	A B	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE

Reptiles	Landscape Context	Sensitivity	Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommission
Common / Serrated Hinge-back Tortoise	N/A	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Mocquard's African Ground Snake	N/A	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Uganda House Snake, Yellow Forest snake, Brown File Snake	N/A	LOW	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Striped beaked snake (*Psammophylax acutus*)	N/A	MEDIUM	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Other Notable Species (not CHQS)						
Northern Green Bush Snake/ Bequaert's Green Snake	A	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Sudan Beaked Snake	A B C	LOW	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Reticulated Centipede-eater	A B C	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Nile Crocodile	A C	LOW	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT
Butterflies and Dragonflies	**Landscape Context**	**Sensitivity**	**Site Preparation and Enabling Works**	**Construction and Pre-Commissioning**	**Commissioning and Operations**	**Decommission**
CHQS Species						
17 butterfly species	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
5 butterfly species	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
Mylothris / Milithrus hylara	D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
2 dragonfly species	D	HIGH	LOW ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE	MODERATE ADVERSE
2 dragonfly species	D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
Other Notable Species (not CHQS)						
10 butterfly species	A D	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE
5 dragonfly species	A C	MEDIUM	INSIGNIFICANT	LOW ADVERSE	LOW ADVERSE	LOW ADVERSE

14.13.3 Residual Impact and No Net Loss/Net Gain

From the above impact assessment, it should be noted that for the most sensitive species, particularly those that comprise CHQS it is difficult to mitigate down to an insignificant condition using standard Project level mitigation.

This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain for Critical Habitat lost or compromised as a result of the Project and CHQS is required. These actions consist of the concept strategies (biodiversity conservation initiatives) (summarised in Section 14.8.4 above), which will be scoped and developed to achieve the quantitative targets presented in the report. These will be organised around three main priority areas aiming at improving protection of existing protected areas, particularly savanna, wetlands and forests; improving connectivity between areas of natural habitat; and improving the quality of existing habitats.

These initiatives will include working together with other developers, local and national government agencies and other relevant stakeholders through partnerships and other arrangements. The success of these initiatives relies therefore heavily on an optimum multiple Parties partnership.

Given the complexity of the Project, the Project Proponents will adopt a practice of adaptive management in which the implementation of defined mitigation and management measures will be responsive to changing conditions. Long term monitoring of agreed indicators will then be required to ensure that the identified requirements for no net loss / net gain and fulfilment of all defined mitigation management objectives have been achieved.

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15 – Aquatic Life

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15 Aquatic Life

15.1 Introduction

This Environmental and Social Impact Assessment (ESIA) chapter details the baseline characterisation and assesses potential impacts of the Project on receptors related to aquatic life, including 'truly' aquatic groups; fish, macroinvertebrates, phytoplankton and their habitats. This chapter should also be read and considered in conjunction with ***Chapter 10: Surface Water***. Semi-aquatic fauna and flora (e.g. mammals, reptiles and amphibians) that depend on both terrestrial and aquatic systems are covered in ***Chapter 14: Terrestrial Fauna***.

This chapter identifies the relevant sensitive aquatic life receptors within the Project Area and the Project Area of Influence (AoI) and the assessment considers the potential for these receptors to be impacted by Project activities. The Study Areas is defined further in section 15.4. The approach to the assessment follows the recommendations of the Ugandan legislation, International Finance Corporation (IFC) Performance Standard 6 (PS6): Biodiversity Conservation and Sustainable Management of Living Natural Resources and other applicable standards. The chapter describes the existing baseline conditions, including presence (or likely presence) of priority species. Priority species include those species identified as Critical Habitat Qualifying Species (CHQS) as well as certain other species that, although not CHQS, are regarded by stakeholders as being of conservation concern. This is based on review of previous studies and the results of fieldwork undertaken directly for this ESIA by the Project ESIA team.

Species assessed have been prioritised based on the following parameters:

- Species that are identified as a CHQS (Ref. 15-1). This is the main criterion for inclusion as a priority species in this assessment and all species listed as CHQS have been included in this assessment; and
- Some species that are not identified as CHQS, but which have been highlighted in field studies as being of particular interest, for example they have not previously been recorded in the region and/or their conservation status is of importance or under review.

It should be noted that the assessment and therefore development of mitigation is not focused on species that are considered not to be priority species; however, mitigation measures that have been developed for the priority species will also provide mitigation for other species, as many, if not most of these, are dependent on or associated with habitats and landscape contexts with which priority species are associated.

The assessment then presents the potential impacts, both direct and indirect, on the identified receptors (priority species), in order to demonstrate that all of the likely impacts on aquatic life and habitats, and associated receptors have been adequately considered.

Taking agreed mitigation for potential direct and indirect impacts into account, the residual impacts on the identified receptors are evaluated. This is important because these are the actual impacts of the project that can be predicted at this stage.

This chapter demonstrates how the Project has adhered to the 'mitigation hierarchy' as defined in IFC PS6, i.e. that impacts should be progressively avoided, minimised and restored, or offset if necessary, with priority given to the actions which are earliest in the hierarchy and consequently least disruptive to the receptor. Therefore, the Project has sought and will continue to seek to avoid impacts on aquatic biodiversity.

An important aspect of the ESIA process is the Project design, which is essential in understanding how the project will interact with the environment and therefore what the impacts are likely to be. As part of the design through the early stages of Project development and latterly through the Front End Engineering Design (FEED) process, alternatives were considered and decisions were taken that resulted in avoidance of some receptors and potential impacts completely. ***Chapter 4: Project Description and Alternatives*** describes the Project description, avoidance features and alternatives discussed as part of this ESIA. Where considered necessary, further detail has been provided within this chapter. Consideration of alternatives that seek to avoid impacts altogether is an early and significant step in the mitigation hierarchy as required by the IFC PSs.

When avoidance of impacts has not been possible, measures to reduce impacts to an acceptable level and to restore biodiversity will be implemented. Offsetting is only considered if there are residual impacts even after implementing the earlier actions in the mitigation hierarchy. Given the complexity of the Project, the Project will adopt a practice of adaptive management in which the implementation of defined mitigation and management measures will be responsive to changing conditions. Long term monitoring of agreed indicators will then be required to ensure that the identified requirements for no net loss / net gain and fulfilment of all defined mitigation management objectives have been achieved.

The Project Area is extensive covering approximately 110,000 hectares (the Project Footprint itself covers around 1,170 hectares, equating to 1.1 % of Project Area) and is divided between the western part of the Murchison Falls National Park (MFNP), large areas of aquatic habitats north and south of the Victoria Nile, as well as transitional, modified and natural habitat adjacent to Lake Albert. It also covers part of Murchison Falls-Albert Delta Wetland System Ramsar site.

Elements of the Project Area have previously been subject to field study, particularly as part of ESIAs prepared for exploratory wells and seismic operations. In addition, there are numerous high level reviews of biodiversity within the region which provide useful background information on aquatic vegetation cover, species presence and distribution as well as relative importance/sensitive of species, e.g. CHQS under the criteria and thresholds given in IFC PS6 (Ref. 15-2), which forms a focus for this ESIA.

The preparatory survey work undertaken for the ESIA has helped to establish baseline conditions and define the potential aquatic life receptors which may be impacted directly or indirectly by the Project. Identification of specific receptors and understanding their ‘sensitivity’ or ‘value’ from the initial stages in the ecological impact assessment process, considers how the Project is likely to interact with these identified receptors during Site Preparation and Enabling Works, Construction and Pre-Commissioning, Commissioning and Operations and Decommissioning Phases, and what the potential impacts may be.

15.2 Scoping

Scoping for the project has been completed and the Scoping report submitted to the National Environment Management Authority (NEMA) in December 2015 (Ref. 15-3). The Scoping report identified background information regarding aquatic receptors associated with the Project, based on information available at that time. This comprised mainly information based on the CA-1 and LA-2 Environmental Baseline Reports (EBS) (Ref. 15-4). Reference was also made to on-going studies being undertaken in parallel at that time, the main findings of which, now available, are discussed in the baseline section below.

An objective of the Scoping report was to set out the terms of reference for the ESIA with regard to future survey and assessment.

The Scoping process also identified potential impacts on aquatic life that could occur as a result of the construction, operation and decommissioning of the Project. These potential impacts are summarised in Table 15-1. It is worth noting that the Project phasing and identified list of potential impacts have evolved during the completion of this ESIA and consequently build and expand on those originally identified in Table 15-1 during the Scoping phase.

Table 15-1: Potential Aquatic Life Impacts identified within the Scoping Report

Potential Impact	Potential Cause	Potential Sensitivity	Phase
Potential impacts on water quality of aquatic habitats likely to influence priority species.	Construction activities with potential to discharge contamination (e.g. spillage of oils, fuel and chemicals) and process water and foul water from operational camps.	Aquatic habitats likely to comprise Critical Habitats (e.g. MFNP and Bugungu Wildlife Reserve) and other aquatic habitats (lake inshore zones, rivers, streams and wetlands) within or hydrologically	Construction Operation Decommissioning

Potential Impact	Potential Cause	Potential Sensitivity	Phase
		connected to the Project Area. Also likely to influence priority species	
Potential impacts on diversity and productivity of algae in aquatic environments likely to influence Critical Habitats.	Construction activities with potential to discharge contamination (e.g. spillage of oils, fuel and chemicals), sediment laden runoff and process water and foul water from operational camps.	Aquatic habitats likely to comprise Critical Habitats (e.g. MFNP and Bugungu Wildlife Reserve) and other aquatic habitats (lake inshore zones, rivers, stream wetlands).	Construction Operation Decommissioning
Potential impacts on water quality in open water environments (e.g. River Nile and shores of Lake Albert). Induced impacts may be linked to improved access and infrastructure allowing more rapid exploitation of natural resources, likely to influence aquatic priority species.	Construction activities with potential to discharge contamination (e.g. spillage of oils, fuel and chemicals), runoff and process water and foul water from operational camps.	Priority species such as macro-invertebrates and fish in open water conditions (e.g. River Nile and shores of Lake Albert).	Construction Operation Decommissioning
Impact on fisheries (including spawning grounds) likely to influence aquatic priority species. May be linked to in-migration, induced access and improvements in infrastructure allowing more rapid exploitation of natural resources (e.g. fisheries). May include introduction or spread of invasive or alien species.	Construction activities with potential to discharge contamination (e.g. spillage of oils, fuel and chemicals), sediment laden runoff and process water and foul water from operational camps.	Aquatic Critical Habitats likely to comprise priority species habitat such as fisheries and spawning grounds including lake inshore zones, rivers, and wetlands.	Construction Operation Decommissioning

15.3 Legislative Framework

This Section summarises the relevant legislation and standards pertaining to aquatic life. These include Ugandan legislation, relevant international conventions and agreements and the provisions of recognised environmental standards and guidelines. For the purposes of this study, a consistent set of standards were required to frame the interpretation of the results of field surveys, where appropriate. This study applied the standards as presented in Table 15-2 below.

Additional details are also provided within ***Chapter 2: Policy, Regulatory and Administrative Framework*** and Table 14-2 in ***Chapter 14: Terrestrial Wildlife.***

15.3.1 National Standards

The Constitution of the Republic of Uganda (1995) (Ref. 15-5), sets out the concepts of sustainable development and environmental rights. Within this are specific objectives relating to the environment (Section XXVII) and protection of natural resources (XIII). A summary of these two objectives is set out below:

15.3.1.1 XXVII The Environment

The State shall promote sustainable development and public awareness of the need to manage land, air and water resources in a balanced and sustainable manner for the present and future generations.

(i) The utilisation of the natural resources of Uganda shall be managed in such a way as to meet the development and environmental needs of present and future generations of Ugandans; and, in particular, the State shall take all possible measures to prevent or minimise damage and destruction to land, air and water resources resulting from pollution or other causes.

(ii) The State shall promote and implement energy policies that will ensure that people's basic needs and those of environmental preservation are met.

(iii) The State, including local governments, shall:

- create and develop parks, reserves and recreation areas and ensure the conservation of natural resources;
- promote the rational use of natural resources so as to safeguard and protect the biodiversity of Uganda.

15.3.1.2 XIII Protection of Natural Resources

The State shall protect important natural resources, including land, water, wetlands, minerals, oil, fauna and flora on behalf of the people of Uganda.

The National Environment Act Chapter 153, (1995) (Ref. 15-6) sets out the principles of environmental management and the rights to a decent environment. Environmental standards relating to the aquatic environment include setting standards for water quality for a number of uses including (but not limited to) drinking water, recreational, agricultural, wildlife and fisheries purposes. Standards have also been set for the discharge of effluent into water. This legislation prohibits the discharge of any hazardous substance, chemical, oil or mixture containing oil in any waters or any other segment of the environment except in accordance with the prescribed guidelines. The legislation sets out the requirement for a pollution licence and the 'polluter pays' principle.

The Act also includes schedules relating to what should be considered for ESIA. Section 19 (6) (j) of the Act specifically points out the need for an ESIA for 'exploration for the production of petroleum in any form'.

The Water (Waste Discharge) Regulations (1998) (Ref. 15-7) set standards for the discharge of treated effluent and waste before discharge, and also prohibits the discharge of effluent or waste on land and into the aquatic environment. Such discharges must comply with the standards established unless a permit in the format specified in the First Schedule is issued.

The Wildlife Policy (1999) (Ref. 15-8) recognises that wildlife is a key socio-economic resource for Uganda, and outlines the status and threats to wildlife in Uganda. The policy also defines the protected areas in Uganda and their conservation importance.

The Ugandan Red List produced by the Wildlife Conservation Society (2016) sets out the Nationally Threatened Species for Uganda (Ref. 15-9). This initiative is led by the International Union for the Conservation of Nature (IUCN) with the global Red List of Threatened Species, which has become recognised as the global conservation standard, drawing attention to the most critically threatened species around the world.

IUCN introduced guidelines for regional or national assessment of biodiversity, as the global ranking does not necessarily serve individual countries whose biodiversity may have specific and distinct threats which are different to those at the global level. The Ugandan Red List contains the following taxa: Mammals, Birds, Reptiles, Amphibians, Butterflies, Dragonflies and Vascular Plants. Truly aquatic species are not included on this list, therefore, this document has not been used to inform the assessment of impacts on the species assessed in this chapter.

15.3.2 International Standards

There are several key pieces of international legislation and guidance that refer to aquatic life which are applicable in Uganda.

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) – UNESCO (1971) (Ref. 15-10) is of particular relevance to aquatic biodiversity and the Project. As discussed elsewhere in this Chapter, the Project is located near to (and partially within) the Ramsar designated Murchison Falls-Albert Delta Wetland System. The Convention on Wetlands (Ramsar, Iran, 1971) is an intergovernmental treaty whose mission is "*the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world*".

The Ramsar Strategic Plan 2016 – 2024 (Ref. 15-11) sets a number of strategic and operational goals, which aim to preserve wetlands and encourages their sustainable use. One of these goals is *"Enhanced sustainability of key sectors such as water, energy, mining, agriculture, tourism, urban development, infrastructure, industry, forestry, aquaculture and fisheries, when they affect wetlands, contributing to biodiversity conservation and human livelihoods."*

The IFC PSs, in particular PS1 on Assessment and Management of Environmental and Social Risks and Impacts and PS6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources are important to the Project and the assessment of impacts on aquatic life. The key provision of PS6 is the protection and conservation of biodiversity, ecosystem services, and sustainable management of natural resources. It requires the identification of potential impacts on IFC features on Modified, Natural and Critical Habitat, as well as legally protected and internationally recognised areas, with no net loss of critical habitat as an absolute requirement.

It should be noted that a consistent set of standards are generally required to frame the discussion of the results of field surveys and/or assessments. However, in the context of aquatic ecology surveys there are no 'standards' as such to compare results against and therefore the legislation identified above is presented mainly to put this element of the assessment into legislative context. Key international guidance, legislation and standards are summarised in Table 15-2 and Table 15-3 below, and also discussed in detail in ***Chapter 13:Terrestrial Wildlife*** and ***Chapter 14: Terrestrial Vegetation***.

Table 15-2: Legislation Relevant to Aquatic Biodiversity

Legislation/ Guidelines	Key Provisions/ Requirements	Application to the ESIA and limitations
International Union for the Conservation of Nature (IUCN) Red List (2017). (Ref 15-12)	Provides taxonomic, conservation status and distribution information on plants, fungi and animals that have been globally evaluated using the IUCN Red List Categories and Criteria.	Used to establish baseline conservation status of species
TEP Uganda Biodiversity Charter (2015). (Ref 15-13)	Defines TEP Uganda's biodiversity objectives.	Requirement for protection of biodiversity and implementation of appropriate mitigation.
The ESIA Guidelines published by NEMA in 1997 (and Energy Sector EIA Guidelines in 2004). (Ref 15-14)	Defines the ESIA process and procedures to be undertaken.	General requirements for good practice in baseline data collection. Not a survey standard as such.
Uganda Wildlife Act, Cap 200 (2000). (Ref 15-15)	Designed to protect wildlife resources and enable derivation of benefits.	Identifies restrictions on collection of species from the wild. Not a survey standard as such.
The Wildlife Policy (1999). (Ref 15-16)	Outlines the status and threats to wildlife in Uganda and defines the protected areas in Uganda and their conservation importance.	Refers to protected areas used to define scope of surveys. Not a survey standard as such.
The Fish Act (Cap 197) (200) Ref (15-17)	The Act makes provision for the control of fishing, the conservation of fish, purchase, sale, marketing and processing of fish and matters connected therewith.	Section 12, subsection (4) stipulates that 'except where otherwise expressly provided by any written law, no person shall divert the waters of any lake, river, stream, pond or private waters in which fish, their eggs or progeny have been introduced with the consent of the chief fisheries officer, unless the ditch, channel, canal or water pipe conducting the water is equipped at or near the entrance or intake with a screen or a filter of a design approved in writing by the chief fisheries officer, that is capable of preventing the passage of fish, their eggs or progeny into the

Legislation/ Guidelines	Key Provisions/ Requirements	Application to the ESIA and limitations
		ditch, channel, canal or water and where the chief fisheries officer so directs there is also provided a by-pass. The proponent is required to liaise with the Chief Fisheries Officer to obtain approval for the designs of proposed water abstraction facilities
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) – UNESCO (1971). (Ref 15-10)	Defines criteria for the designation of Ramsar sites and is convention to which the Ugandan Government is a signatory.	General controls on activities in the Victoria Nile Ramsar Site. Not a survey standard as such.
Convention on Biological Diversity (CBD) – United Nations (1993). (Ref 15-18)	International convention to which the Ugandan Government is a signatory agreeing to protect biological diversity.	Identifies restrictions on collection of species from the wild. Not a survey standard as such.
Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) – United Nations Education Scientific Organisation (UNESCO) (1972). (Ref 15-19)	International convention to which the Ugandan Government is a signatory agreeing to protect biological diversity and World Heritage Sites.	Refers to protected areas used to define scope for surveys. Not a survey standard as such. There are no UNESCO World Heritage sites within the Project Area.
African Convention on the Conservation of Nature and Natural Resources – Organisation of African Unity (OAU) (1968). (Ref 15-20)	International convention to which the Ugandan Government is a signatory agreeing to relate to protection of natural resources.	Identifies restrictions on collection of species from the wild and the damage to habitats. Not a survey standard as such.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1975). (Ref 15-21)	International convention to which the Ugandan Government is a signatory agreeing to prevent or control trade in certain endangered species.	Identifies restrictions on collection of species from the wild. Not a survey standard as such.
Environmental, health, and safety guidelines for onshore oil and gas development (French). IFC E&S. Washington, D.C. : World Bank Group.(DRAFT 2017) (Ref 15-22)	Provides a summary of Environment, Health and Safety issues associated with onshore oil and gas development, along with recommendations for their management	Provides guidance on waste water treatment, hazardous substances, pollution prevention and spill response planning. Not a survey standard as such.
Final Report: Nile Basin Initiative Nile Equatorial Lakes Subsidiary Action Program Environment And Social Management Plan For The Lakes Edward And Albert Fisheries And Water Resources Project Mid-Term Diagnostic Report, Lakes Edward and Albert fisheries pilot project (Development Consultants International Ltd., 2007) (Ref 15-23)	This report provides key findings as baseline information on the ecosystem functions in Lake Albert and Lake Edward, their fisheries and biodiversity, in-lake pollution status, catchment degradation processes, hydrological processes, fisheries, socio-economics of the fisheries, fisheries biostatistics, fish landing infrastructure, hygiene and fish quality problems and the status of policies, laws and institutions in the basins of the two lakes.	This provides measurements of lake water quality and characteristics in both lakes and at selected stations in order to see prospects for pollution threats and pollution hot spots.
Nile Basin Initiative Nile Equatorial Lakes Subsidiary Action Program Environment And Social Management Plan For The Lakes Edward And Albert Fisheries And	Nile Basin Initiative aim is to contribute to poverty reduction and sustainable socio-economic development through equitable	During the LEAF study a total of1161 surface water profiles were taken from Lake Albert and analysed for basic physio-

Legislation/ Guidelines	Key Provisions/ Requirements	Application to the ESIA and limitations
Water Resources Project (April, 2011) (Ref 15-24)	utilization of and benefits from the common Nile Basin water resources. The LEAF Pilot Project objective is to avail the Governments of Uganda and the DRC with a sustainable investment and management plan for the joint use of the water and fisheries resources of Lakes Edward and Albert. This Feasibility Report provides information on the aquatic environment of Lake Albert, including characteristics of the catchment area and its degradation, hydrological regime and water resources, water quality and pollution.	chemical (dissolved oxygen, temperature, conductivity, and pH) and microbiological parameters. Water sampling stations are located within the likely Project Area of Influence, and water quality results are of relevance to the Tilenga ESIA.
The Environmental Monitoring Plan for the Albertine Graben 2012-2017 (Ref 15-25)	NEMA in partnership with other stakeholders from the Environmental Information Network (NIS) produced an Environmental Monitoring Plan for the Albertine Graben (AG Environmental Management Plan (EMP)). The AG EMP is intended as a guiding tool in tracking potential impacts of oil and gas-related developments on the environment of the Albertine Graben.	The monitoring plan lists a number of environmental monitoring indicators that should be used to monitor a defined list of five major Valued Ecosystem Components (VECs): aquatic, terrestrial, physical, chemical, society, and management & business. Chemical and physical indicators are listed for soil, water and air quality. Furthermore, the AG EMP gives a detailed summary of the work plans for the secondary baseline data collection must be also guided by the AG EMP and approved by NEMA.
Chartered Institute for Ecology and Environmental Management, 2016, Guidelines of Ecological Impact Assessment (CIEEM)	The aim of the Guidelines to promote good practice, promote a scientifically rigorous and transparent approach to Ecological Impact Assessment (EcIA), provide a common framework to EcIA in order to promote better communication and closer cooperation between ecologists involved in EcIA; and provide decision-makers with relevant information about the likely ecological effects of a project.	This is a British Standard, but is being used as best practice throughout this ESIA.

Table 15-3: Standards Relevant to Aquatic Biodiversity

Standards	Key Provisions/ Requirements	Application to the ESIA and limitations
IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. (Ref 15-26)	Requirement for integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement; and (iii) the client's management of environmental and social performance throughout the life of the project.	This Performance Standard sets the overall approach to undertaking the ESIA for the Project.
IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. (Ref 15-2)	Protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development	Identification of potential impacts on qualifying features related to and which define modified, natural and critical habitat, as well as legally protected and internationally recognized areas. Protection and conservation of biodiversity through implementation of the mitigation hierarchy.
Environmental, health, and safety guidelines for onshore oil and gas development (French). IFC E&S. Washington, D.C. : World Bank Group.(DRAFT 2017) (Ref 15-22)	The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These EHS Guidelines are applied as required by their respective policies and standards.	The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

15.4 Spatial and Temporal Boundaries

15.4.1 Spatial Boundaries

To assess impacts on aquatic receptors, it is essential to understand the nature (e.g. activities, timing and duration) and location of each of the different elements of a development, including any infrastructure or activities within or near to water (e.g. Victoria Nile Ferry crossing, Horizontal Directional Drilling (HDD) and water abstraction) that will be required to serve the development. It is similarly essential to understand the value, location and sensitivity of each ecological receptor to impact pathways and mechanisms for effects from the Project. It will then be possible to identify potentially significant receptors and to define potential impacts on those receptors within or close to the Project footprint, as well as receptors that may be situated some distance from the main Project activities.

The Project Area (identical to the Secondary Study Area for Aquatic Life) covers the entire area of CA-1, EA-1A and LA-2 North and includes habitats and associated aquatic fauna and flora that may be affected by changes during the different phases associated with the Project . Further information on the Project Area, Project AoI and Study Area is included within ***Chapter 3: ESIA Methodology*** and ***Chapter 4: Project Description and Alternatives***.

Two spatial Study Areas have been defined for the purposes of the Aquatic Life assessment and are discussed below.

15.4.1.1 Primary Study Area

The Primary Study Area comprises any waterbodies within 500m of the direct footprint of the Project's key infrastructure and any waterbodies (including seasonal) that are crossed by this infrastructure and construction (see Figure 15-1).

The Primary Study Area includes the Victoria Nile adjacent to and immediately downstream of the proposed pipeline crossing (for the purpose of this assessment this would be limited to 500m downstream of such crossings), the Nile Delta, Lake Albert (within 500m of the water abstraction points), and smaller rivers, Sambiye, Tangi and Ngazi. Detailed information is included in section 15.7.2. It also includes part of the Murchison Falls-Albert Delta Wetland System Ramsar site and MFNP, as shown in Figure 15-1. Both of these sites are partially within the Primary Study Area, although their boundaries also extend beyond, into the Secondary Study Area.

15.4.1.2 Secondary Study Area[1]

The Secondary Study Area comprises waterbodies that would be affected by Project activities that are within the Project Area and hydrologically connected (i.e. downstream of the Primary Area or are connected by groundwater) and could reasonably be expected to be affected by project activities, for example due to downstream flow of contaminants following a pollution incident.

The Secondary Study Area also contains areas where some associated Project infrastructure may be placed, such as new roads constructed by others, and also areas where there may be induced impacts, such as increased pressures on aquatic biodiversity (e.g. water resources) from changes in local human populations associated with the Project.

The Secondary Study Area also encompasses the Tangi River (anything >500m downstream of the Project Infrastructure) and areas of Lake Albert, where no Project or associated infrastructure is planned, but which nevertheless may be affected by downstream flow, water quality changes or other changes brought about by the existence of the Project and induced impacts (e.g. project related in-migration).

[1] The Primary and Secondary Areas were defined based on the location of the Project Area and the hydrologically connected areas. The baseline surveys were completed to assess these areas. Landscape contexts as defined in 15.6.3 have been included where they lie within the Project Area.

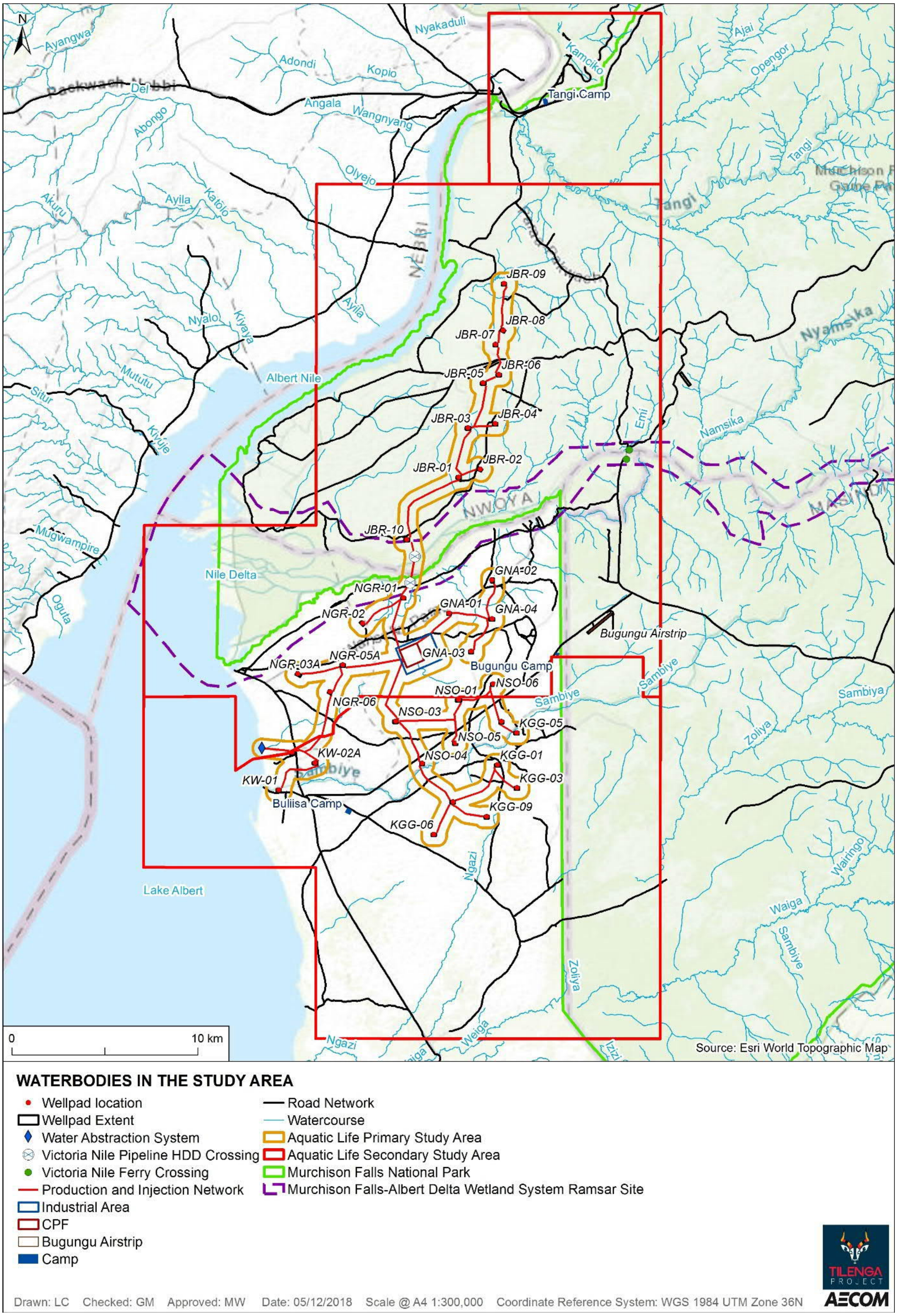


Figure 15-1: Waterbodies within the Primary and Secondary Study Areas

15.4.2 Temporal Boundaries

The proposed timescales for the different phases of the Project are set out in ***Chapter 4: Project Description and Alternatives***. Impacts associated with Site Preparation and Enabling Works and Construction and Pre-Commissioning phases may be different from those that may occur during Commissioning and Operations, although as the drilling of wells is likely to be phased over a number of years there could be some overlap between those phases.

The majority of site clearance, preparatory works, building of new roads, laying of pipelines and construction of well pads (including drilling) and the Central Processing Facility (CPF) will fall within the Site Preparation and Enabling Works and Construction and Pre-Commissioning phases. The Commissioning and Operations will include extraction of oil as well as maintenance of infrastructure and progressive drilling of new wells at established well pads.

Decommissioning will take place during the final phase of the project. Long term environmental planning and management should take any potential future impacts into account in determining and prioritising mitigation in good time in relation to the decommissioning of the Project.

A brief summary of the timescales is provided below:

- Site Preparation and Enabling Works Phase expected to take approximately 5 years;
- Construction and Pre-Commissioning is expected to take up to 7 years;
- Commissioning and Operations is expected to commence approximately 36 months after effective date of the main construction contract award. The lifetime of the Project is 25 years; and
- Decommissioning is planned for the end of the 25 year operation.

The phases overlap and in total the duration through all phases will be approximately 28 years. The duration of activities which may lead to potential aquatic life impacts differ between short and long term episodes, all of which are described within the assessment.

15.5 Baseline Data Collection

15.5.1 Introduction

The baseline element of this chapter is based on two types of data, comprising the desk study review of previous study reports(“secondary data”), and field surveys directed by the findings of the desk study activities (“primary data”).

Note that there is an overlap in these categories as some of the secondary data is derived from reports of survey data (so could be classed as primary data), but for the purposes of this chapter primary data is defined as field work undertaken directly for the Project by the Project ESIA team.

By presenting these data, the baseline and subsequently the assessment can focus on those species that are present or are likely to be present as receptors that will be directly or indirectly impacted by the Project. The approaches to undertaking the desk study, the field work and the ecological impact assessment, with regard to aquatic life, are summarised below.

15.5.2 Desk Study - Secondary Data

A secondary (desktop) data collection exercise was undertaken to provide further information on aquatic life. There was limited publicly available aquatic life data for this area of Uganda, particularly for the smaller watercourses that fall within the Project AoI. The information below provides an overview of previous studies which have been undertaken in relation to the aquatic environment which were used to help inform the existing baseline conditions outlined within this ESIA. The main documents reviewed were:

- WCS & eCountability, 2016. Biodiversity Surveys of EA2 (Vol 3): Fieldwork Data & Analysis (Ref. 15-27);
- WCS & eCountability, 2016. Phase 2 Biodiversity Study (Vol 2) – Assessment (Ref. 15-28);

- Total E&P Uganda Block EA1, EA1A and EA2 North: Critical Habitat Assessment: Interpretation and recommendations for ESIA (Ref. 15-29);
- Total & NaFIRRI. (2014) Survey of Fish Populations in the Victoria Nile/ Ramsar Site Area of MFNP (Ref. 15-30);
- Eco and Partners (2013) Proposed Nile Crossing Geotechnical Survey ESIA (Ref. 15-31);
- Biodiversity Solutions (2017) Quarterly Report - Survey of Biodiversity in the Delta Area of the Murchison Falls-Albert Delta Ramsar Site Uganda; and
- International Union for the Conservation of Nature (IUCN) database website (Ref. 15-12).

Note that not all taxa are covered by all of these studies, e.g. the Biodiversity Studies for EA-2 did not include a survey for macroinvertebrates. Other publications are referred to where these add to the baseline discussion. Table 15-4 summarises all secondary data sources used in this section.

Table 15-4: Secondary data sources

Document Title	Date of Information	ESIA-Relevant Content
Environmental Baseline in Exploration Area 2 (EA2) Review Report, Volumes 1 – 3 (AECOM, 2012)	Various	Summarises the findings of the Phase 1 Environmental Baseline Study (EBS) for Exploration Area 2 (EA-2, now known as License Area 2 (LA-2)). The study purpose was to identify and characterize important biodiversity that could potentially affected by a field development, both as a result of impacts resulting from operational activities, and from any development of offsets. The report refers to the physical environment only in the context of biodiversity and ecosystem services and is therefore of limited use.
Environmental Sensitivity Atlas for the Albertine Graben (NEMA, 2010)	2009	The Atlas identifies those areas that may need special consideration in the event of an oil spill within the Albertine Graben area. It contains information on the physical environment (geology, soils, surface and ground waters), receptors such as forest reserves, biodiversity and species of special importance, socio-economics like fishing, agriculture etc., coastal features and bathymetry of Lake Albert and the climate of the area. The Atlas mainly provides aggregate information related to the Albertine Graben; however, some maps contain useful data on the MFNP. The Atlas identifies those areas that may need special consideration in the event of an oil spill within the Albertine Graben area, i.e. shoreline wetlands which may harbour aquatic species of special importance; rare and threatened species; special habitats for migratory fish in search of breeding/nursery and feeding grounds. Zones of ecosystem services. There is incomplete information regarding fish species in relation to their specific habitats and breeding areas.
Ecosystem Services Review: Proposed Oil Development Activities in the Albertine Rift, Uganda (Treweek Environmental	2015	Notes risks to ecosystem services as a result of oil-related activity in the Albertine Graben have been identified in several previous studies and are being addressed as part of the “Impact Assessment” component of the Ecosystems Service Review of Proposed Oil Development Activities in the Albertine Rift, Uganda. The Partners’ planned activities, as well as operators of associated development, notably the refinery, also depend on

Document Title	Date of Information	ESIA-Relevant Content
Consultants, 2015)		ecosystem services. The future sustainability of supply of these services could be affected by Partner operations and by third party actions, as well as by underlying social and environmental trends. It is anticipated that the final report should contain information to aid in characterization of the biological environment with respect to: • Aquatic ecosystems (capture fisheries); • Land use (grazing lands); and • Wildlife-related ecosystem services (ecotourism, ethical and spiritual values, and wild food). Report presents clear links between project needs and available ecosystem services which should be considered in the Tilenga ESIA.
Environmental and Social Impact Statements for exploration/ appraisal phases in Block 1, prepared by various consultants including Atacama, AWE, Eco&Partner and BIMCO (August 2008 to February 2013)	2007-2013	Description of biological environment in the vicinity of exploration well pads.
Final Report: Nile Basin Initiative Nile Equatorial Lakes Subsidiary Action Program Environment And Social Management Plan For The Lakes Edward And Albert Fisheries And Water Resources Project Mid-Term Diagnostic Report, Lakes Edward and Albert fisheries pilot project (Development Consultants International Ltd., 2007)	2007	This report provides key findings as baseline information on the ecosystem functions in Lake Albert and Lake Edward, their fisheries and biodiversity, in-lake pollution status, catchment degradation processes, hydrological processes, fisheries, socio-economics of the fisheries, fisheries biostatistics, fish landing infrastructure, hygiene and fish quality problems and the status of policies, laws and institutions in the basins of the two lakes. It provides measurements of lake water quality and characteristics in both lakes and at selected stations in order to see prospects for pollution threats and pollution hot spots.

Document Title	Date of Information	ESIA-Relevant Content
Nile Basin Initiative Nile Equatorial Lakes Subsidiary Action Program Environment And Social Management Plan For The Lakes Edward And Albert Fisheries And Water Resources Project	April 2011	Nile Basin Initiative aim is to contribute to poverty reduction and sustainable socio-economic development through equitable utilization of and benefits from the common Nile Basin water resources. The LEAF Pilot Project objective is to avail the Governments of Uganda and the DRC with a sustainable investment and management plan for the joint use of the water and fisheries resources of Lakes Edward and Albert. This Feasibility Report provides information on the aquatic environment of Lake Albert, including characteristics of the catchment area and its degradation, hydrological regime and water resources, water quality and pollution. During the LEAF study a total of1161 surface water profiles were taken from Lake Albert and analysed for basic physio-chemical (dissolved oxygen, temperature, conductivity, and pH) and microbiological parameters. Water sampling stations are located within the likely Project Area of Influence, and water quality results are of relevance to the Tilenga ESIA.
The Environmental Monitoring Plan for the Albertine Graben 2012-2017 (NEMA & stakeholders, 2012)	2012	NEMA in partnership with other stakeholders from the Environmental Information Network (NIS) produced an Environmental Monitoring Plan for the Albertine Graben (AG Environmental Management Plan (EMP)). The AG EMP is intended as a guiding tool in tracking potential impacts of oil and gas-related developments on the environment of the Albertine Graben. As such, the monitoring plan lists a number of environmental monitoring indicators that should be used to monitor a defined list of five major Valued Ecosystem Components (VECs): aquatic, terrestrial, physical/chemical, society, and management & business. Chemical and physical indicators are listed for soil, water and air quality. Furthermore, the AG EMP gives a detailed summary of the work plans for the secondary baseline data collection must be also guided by the AG EMP and approved by NEMA.

Document Title	Date of Information	ESIA-Relevant Content
Lake Albert Development Project, Uganda Ecosystem Services Assessment Study	2014	The purpose of the ecosystem services review is to provide information on trends in patterns of ecosystem service use and supply which will be addressed at landscape level and to identify data gaps for future data collection. It is intended to provide information relevant to the ESIA as well as other existing efforts. The report includes concerns raised during consultation meetings. Detailed analysis of following ecosystem services was performed: • Capture fisheries • Trends in fish catches • Woody biomass for building materials and fuel • Wildlife--related ecosystem services including ecotourism, and wild food • Livestock---related ecosystem services including access to grazing land The information was used to provide input into the characterization of the baseline for ecosystem services. Follow up on the final Ecosystem Assessment Report – important for consideration in the Tilenga ESIA.
Proposed East Nile 3D Seismic Survey - Revised ESIA - Volume I and II, (BIMCO Consult Limited, 2012)	Surveys were undertaken in the period June to September 2011	Presents an assessment of a proposed 3D seismic survey project in the East Nile area of Block CA-1. It provides an overview of the project, the legislative framework, the stakeholders involved, the social and environmental aspects in the project area and an assessment of the potential impacts of the project. The document provides survey information on the North and South Nile areas, collated on the basis of both secondary data sources and primary data gathered during field surveys in June and September 2011 and during consultations. The secondary data sources generally refer to information on the MFNP. A total of 27 field survey locations in the North Nile area and 18 field survey locations in the South Nile area were chosen to confirm available desktop information on vegetation, habitats, species (mammals, birds, herpetofauna and invertebrates). A total of six water sampling points were also identified to carry out aquatic surveys
Surveying Crocodiles in the Victoria Nile / Ramsar Site of the MFNP. M.Behangana (Geo-Texon Consult Ltd on behalf of Total E&P Uganda)	August 2014	Ramsar Sensitivity Mapping, Crocodiles (x3)
Surveying Birds In The Ramsar Site Area Of Murchison Falls National Park. Nature Uganda on behalf of Total E&P Uganda	October 2014	Report on bird surveys in the Ramsar, relating to seismic surveys undertaken by TEP Uganda. Useful baseline data on species associated with the Ramsar.

Document Title	Date of Information	ESIA-Relevant Content
Survey Of Fish Populations In The Victoria Nile/ Ramsar Site. Area of MFNP The National Fisheries Resources Research Institute (NaFIRRI) on behalf of Total E&P Uganda.	April 2013 - March 2014	The study was undertaken between April 2013 and March 2014 and focused on seven primary data collection sites within the Ramsar. Commercial fisheries data was collected over the same period from two selected secondary data collection sites (Abok and Wanseko) closest to the experimental sites. Overall objective of the baseline study of fish populations and their habitats was to generate annual baseline data initially focusing on the fishes, their biology and ecology, the fish catches and value for key commercial fishes, their importance and associated livelihoods.
Strategic Environmental Assessment (SEA) of oil and gas activities in the Albertine Graben, Uganda, draft SEA report (PEPD and NEMA, 2013)	2013	An Albertine Graben wide report that only gives very brief and general overviews of wetland flora, aquatic fauna, specifically on fish, and identifies data gaps on these regarding biodiversity, economic valuation, temporal and spatial hydrodynamics data. It also gives a general overview of the terrestrial flora and fauna as well as protected and sensitive sites in the Albertine Graben. The report provides only limited data for Lake Albert and general and mostly outdated information for aquatic flora and fauna. http://www.petroleum.go.ug/documents.php?id=27.
The IUCN Red List website	Last update: December 2017	The International Union for Conservation of Nature (IUCN) aims to identify threatened and endangered species around the world. A recently introduced search tool allows identification of threatened species according to different criteria (location, species group and habitat). The site provides a list of threatened animal species and vegetation species of conservation concern. The Red List is constantly being updated but there are clear situations where species are data deficient (DD) and which therefore may not be accurately identified on the list, even though they are significant species, either because data concerning threats to them are not well recorded or because they may be locally rather than globally threatened. http://www.iucnredlist.org/.
The National Biodiversity Data Bank (NBDB) website	Last update: 2017	The National Biodiversity Data Bank (NBDB) aims to provide data and information on the country's biodiversity to scientists, conservationists, researchers, policy makers and other parties interested in the conservation and sustainable use of biological resources. The Biodiversity unit is based in the Makerere University Institute of Environment and Natural Resources (MUIENR) that acts as a central repository for biodiversity information within Uganda. The NBDB web site provides datasets related to plants, birds, mammals, amphibians, reptiles, insects and fish. Since 2000, biennial reports on the "State of Uganda's Biodiversity" are published by NBDB and to complement NEMA's "State of the Environment" reports. Specific request can be made to the MUIENR for data available on the web site. The biennial reports present general data and indices at country level, thus no specific data related to the project area are available. The last available report is dated 2017.

Document Title	Date of Information	ESIA-Relevant Content
State of the environment report for Uganda, (NEMA, 2010)	2010	After discussing environmental, social and economic issues in the country, the report presents the state of the environment through an assessment of the major natural resources: land resources; atmospheric resources; freshwater and aquatic resources; biodiversity resources; energy resources; and environmental vulnerability. In the concluding remarks, the report proposes future outlooks and policy options to address the identified challenges.
The Artisanal Fisheries of Lake Albert and the Problem of Overfishing (von-Sarnowski, A., 2004)	2004	Lake Albert contributes significantly to Uganda's fish production and ranks third behind Lakes Victoria and Kyoga. However, like the other large inland water bodies of East Africa, Lake Albert is heavily overfished. This is not only an ecological problem but also jeopardises the livelihood of the lakeshore population that depends almost exclusively on fishing and fish mongering. While socio-economic issues are presented there is a lack of accurate biological information such as location of breeding site/nursery grounds and sensitive area whose accurate demarcation and protection could enhance more effective management and reduce recruitment overfishing. http://www.tropentag.de/2004/abstracts/full/89.pdf
The Biodiversity of the Albertine Rift (Plumptre, A.J., et al, 2003)		Assessments of levels of biodiversity for mammals, birds, reptiles, amphibians, butterflies and plants for various Protected areas of the Albertine Rift (AR). The report evaluates the known levels of biodiversity in the different protected areas (PAs) in the Albertine Rift (for plants, mammals, birds, butterflies, fish, amphibians and reptiles) and ranks the different PAs for their biodiversity value. It identifies the presence of endemic or near endemic species and forms the basis for the subsequent designation of the Albertine Rift as a Biodiversity Hotspot among the Earth's biologically richest and most endangered terrestrial ecoregions. The information provided is on a park wide basis combining primary research data from a multitude of experts on the different taxa and their knowledge of MFNP Biodiversity as well as secondary information for the park. Highlights species richness, levels of endemism and threatened species that were known for the different protected areas of the AR. Also lists species that are classified threatened by IUCN.

Document Title	Date of Information	ESIA-Relevant Content
Lake Albert Strategic Environmental And Social Overview (ERM)	TBC	Physical and biological information on Lake Albert. Account of fish species. The report identifies inshore shallow areas e.g. Butiaba shelf, deltas, spits and lagoons as critical environments to maintain productivity and fishery of Lake Albert and thus extremely sensitive areas. The exclusion of these areas for exploration purposed should be considered. Physiological sensitivities of the Lake Albert biota to exposure to toxic hydrocarbons are unknown. The report identifies fisheries biological data as inadequate to ensure a sustainable fishery. Further the report acknowledges a lack of modern data on reproductive status, breeding seasons, breeding habitat, spawning habitat, size and age structure of populations, growth rates and migratory behaviour of endemic fish.
DFR Annual Report 2012	2011	The report provides general information on the fisheries industry in Uganda. Of particular interest to the ESIA is the Uganda Fisheries Laboratory Service (UFL) is identified as a local laboratory which consists of a microbiology section, sensory analysis section and the chemistry section. The microbiology and sensory analysis sections are complete. Some capabilities include Gas Chromatography Mass Spectrophotometer (GCMS) for pesticide residue analysis, Atomic Absorption Spectrophotometer (AAS); for heavy metal analysis and fume cabinets. Other than the analysis for pathogens in commercial fish there is no information on other analysis performed. With respect to the fisheries sub sector, the report acknowledges, amongst other issues: • Inadequate knowledge on the status of fish stocks in all water bodies on which to establish sustainable levels of fishing; • Breeding and nursery grounds are not identified, mapped and gazetted; • The resurgence of water hyacinth and the emergence of new weeds; • Prevalence of HIV/AIDS in the fishing communities; • Increased fishing pressure due to increased population; • Decline in bigger species of higher commercial value which are being replaced by smaller species of low commercial value; and • Poor data collection due to limited resources to cover a number of water bodies with many scattered small fish landing centers. Climatic changes remain a threat to the fishing and aquaculture development in the country and inadequate infrastructure for food safety and quality assurance.

Document Title	Date of Information	ESIA-Relevant Content
Phase 2 Biodiversity Study, Biodiversity Survey Round Three – Fish. WCS.	2015	Using the land-cover map digitized by WCS, and information on features of the Lake Albert lakeshore highlighted by the 2nd field survey round in Jan/Feb, a number of representative sampling sites in Block 2 have been identified (10 in total) based on the major habitat types' e.g. marginal and floating vegetation, rocky areas, lagoons, river mouths, sand/or muddy bottoms. Only one location is within the LA-2 North Block.
Fish Populations April 2013-March 2014	2013-2014	Fish survey site coordinates.
ESIA for Camps and others		Each report describes the proposed project, the legislative framework, the environmental and social baseline and an assessment of the potential impacts of the project. A description of the biological environment that provides site specific information related to flora, fauna and avifauna around the well pad (within a 2 km radius) is included The information provided in the report is site specific and only gives a short description of the fauna and flora species recorded near each study site.
Landcover Mapping For The Albertine Rift Oil Development Basin, Exploration Areas EA1-3. Interim Report	Feb 2015	Interim report setting out approach to landcover mapping for blocks EA1 to EA3 in the Albertine Rift, which proposes new landcover classification system. For this report 24 categories have been defined Very useful for identifying vegetation types and putting other ecological data into context.
Biodiversity Surveys of Murchison Falls Protected Area (A. J. Plumptre, S. Ayebare, H. Mugabe, B. Kirunda, R. Kityo, S. Waswa, B. Matovu, S. Sebuliba, M. Behangana, R. Sekisambu, P. Mulondo, T. Mudumba, M. Nsubuga, S. Isoke, S.Prinsloo and G. Nangendo, August 2015)	Aug 2015	Summarises the findings of a biodiversity survey of Murchison Falls Protected Area (MFPA - including MFNP, Bugungu and Karuma Wildlife Reserves). Covers large and small mammal surveys, birds, amphibians, reptiles and plants. Does not include invertebrates or aquatic species.

Document Title	Date of Information	ESIA-Relevant Content
Phase 2 Biodiversity Study Biodiversity Field Survey Report, Final Draft	Feb 2016	Field survey report for biodiversity surveys undertaken in EA-2 (now known as LA-2). Covers systematic survey to identify the presence of Species from eight taxa across the northern and southern areas of LA-2 (Buliisa and Kaiso Tonya focal areas), also incorporating ecosystems and habitats adjoining these areas. Sampling undertaken in all landcover and land use types as defined in Annex 3 both within and outside of protected areas. Included additional sampling of lake and shoreline for fish, fish nurseries and wetland bird species. Habitat condition scoring undertaken. Does not cover CA-1 area.
Phase 2 Biodiversity Study Critical Habitat Assessment Final (Review) Draft + Annexes	Feb 2016	Critical Habitat Assessment for the region. Identified natural, transitional and modified habitats. Critical Habitat and criteria for defining CH (species and other factors) are identified. Extremely useful study that will inform the ecological impact assessment of the ESIA.
"Critical Habitat Reports" ZIP File		[excludes those reports sent previously or in other batches]
Biodiversity Risk Profile and Critical Habitat Screening for Total E&P Uganda Block EA1, EA1A and EA2 North	Dec 2015	Preliminary report defining criteria for Critical Habitat Assessment.
Vegetation Mapping Survey GAP Analysis	Aug 2015	Short report reviewing previous mapping information for the MFCA reviewing all available and relevant vegetation information for the region and performing a gap analysis to inform revised land cover mapping.
Kasemene Well Site Environmental Audit Report	Oct 2012	Audit report to follow up requirements of the EIA Regulations 1998. No ecological content.
Ngege Field Environmental & Social Impact Statement - Including Well-Sites: Ngege-C, Ngege-E, Ngege-F & Ngege-H	Nov 2011	Each report describes the proposed project, the legislative framework, the environmental and social baseline and an assessment of the potential impacts of the project. A description of the biological environment that provides site specific information related to flora, fauna and avifauna around the well pad (generally within a 2 km radius) is included. The information provided in the report is site specific and only gives a short description of the fauna and flora species recorded near each study site.

Document Title	Date of Information	ESIA-Relevant Content
Strategic Plan for the Northern Albertine Rift of Uganda 2011 - 2020.	2012	The Plan attempts to develop a common management approach to the landscape in accordance with the obligations of the State for protection of natural resources as detailed in the Constitution, with Uganda's obligations under the Convention on Biological Diversity and other conventions, and in line with National Environment Statutes and Lands Acts.
Migration and Conservation in the Lake Albert Ecosystem, International Institute for Sustainable Development	2015	This document provides a valuable insight into the state of Lake Albert fisheries and the pressures of induced migration on sustainable fisheries management. It also provides evidence of fisheries management techniques that have been unsuccessful in the past.
WCS & eCountability, (2016). Phase 2 Biodiversity Study, Volume 2 – Critical Habitat Assessment	2016	Critical Habitat Assessment covering the Albertine Graben. Basis for subsequent TBC / FFI interpretative report (see below). Gives detailed reasoning for identification of CHQS and provides a lot of background information on CHQS in its appendix.
TBC and FFI (2017) Critical Habitat Assessment: Interpretation and Recommendations	2017	Report on behalf of Total E&P Uganda, Block EA-1, EA-1A and EA-2 North (now known as CA-1, EA-1A and LA-2 North, respectively). Identifies and refined Critical Habitat Qualifying Species (CHQS) and other features covering all PS6 criteria. Defines Landscape Context indicating presence and sensitivity of CHQS and other criteria.
WCS (2017) Implementation of Avoidance Gap Analysis for Research on Critical Habitat Species (2017)	2017	The report reviews data availability for CHQS: presents the information currently known on each CHQS (120 in total, of which); provides details of the additional survey and analysis requirements to enable reliable avoidance and mitigation of impacts; and, where appropriate, suggests the type of monitoring that should be carried out.
TBC & FFI (2017) Total E&P Uganda Block EA1, EA1A and EA2 North. Net Gain Pre-feasibility Report. Report on behalf of Total E&P Uganda. ..	2017	Presents a pre-feasibility study into options for achieving net gain of priority biodiversity for the Tilenga Project. Options for offsetting are limited and therefore approaches with most potential in the Project context are likely to focus on: a) Enhancing species and habitat management within existing protected areas, including MFPA and b) Community-based management of natural resources outside protected areas but within the Murchison Falls-Semliki landscape.
Uganda Wetlands Atlas	2017	Provides an overview of wetlands within Uganda, their value, legislative protection and threats to conservation.
State of Uganda's Biodiversity	2017	This document provides an overview of the importance of Uganda's biodiversity including wetlands and fish. It sets out the targets of the National Biodiversity Strategy and Action Plan (NBSAP)

15.5.3 Primary Data

15.5.3.1 Overview

The Project has the potential to have temporary and long term impacts on water quality and habitats in aquatic ecosystems of surface waters such as Lake Albert, the Victoria Nile and other waterbodies, which subsequently have the potential to impact various aquatic ecological receptors, including fish, aquatic invertebrates and algae. Field surveys were completed to identify and characterise these aquatic receptors to assess their sensitivity to potential impacts, determine the overall effects and propose appropriate mitigation measures.

This section provides details of aquatic life surveys undertaken within the Study Area, as well as presenting data sourced from primary sources. All of this information is then used to identify the existing baseline conditions which exist within the Project Area.

Field surveys conducted as part of the AWE Early Works Project Brief were undertaken during the dry season when all the seasonal streams were dry. Baseline studies for aquatic life in the Project Area were therefore not conducted by AWE.

15.5.3.2 Primary Data - Survey Locations

Building on previous studies which have been undertaken within the general Project Area, a primary baseline aquatic survey was undertaken specifically as part of the ESIA. The detailed survey methods used as part of this survey are set out in the baseline survey report which is included within Appendix P and elements studied are detailed in Table 15-5.

A review of satellite imagery and hydrographical maps was initially undertaken to identify the location of surface water bodies within the Study Area, including any potential flow routes. Based on the gap analysis, various specialist surveys were undertaken as part of the Primary Baseline Surveys. All surface water survey sites are highlighted in Figure 15-3.

Table 15-5: Different survey elements/receptors covered during primary aquatic baseline surveys

Target group	Justification
Fish	Receptor of important nature conservation value covered by IUCN red lists, and includes various CHQS. Group of significant commercial and cultural value.
Macroinvertebrates	Includes several species of high nature conservation value, good indicators of aquatic habitat quality, sensitivity to pollution. Group covered by IUCN red lists, and includes various CHQS.
Zooplankton	While these are generally not covered by IUCN red lists, they are key indicators of habitat function and quality (notably for lentic waters such as Lake Albert) and help provide an understanding of aquatic habitats and their sensitivity to impacts.
Phytoplankton	Limited available IUCN red lists for this group, however, phytoplankton are key indicators of habitat function, quality and productivity (notably for lentic waters such as Lake Albert) and help provide an understanding of aquatic habitats and their sensitivity to impacts.
Supporting water quality and physicochemical parameters	Provides an understanding of factors influencing various aquatic species and habitats.

All aquatic surveys were undertaken concurrently during two distinct seasonal survey windows:

- Dry season – 02/12/16 – 10/12/16; and
- Wet season – 30/04/17 – 08/05/17.

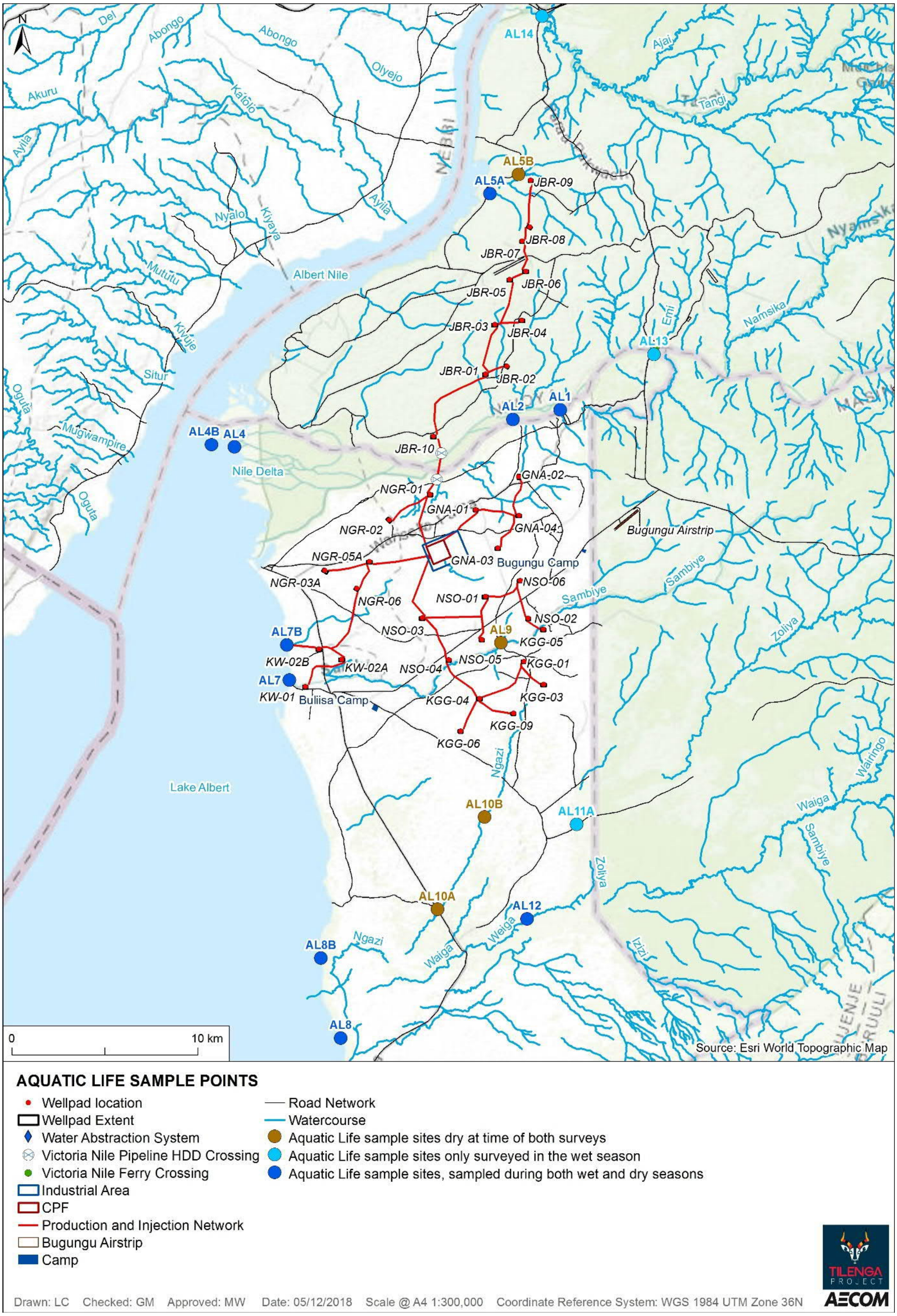


Figure 15-2: Aquatic Life Sampling Points

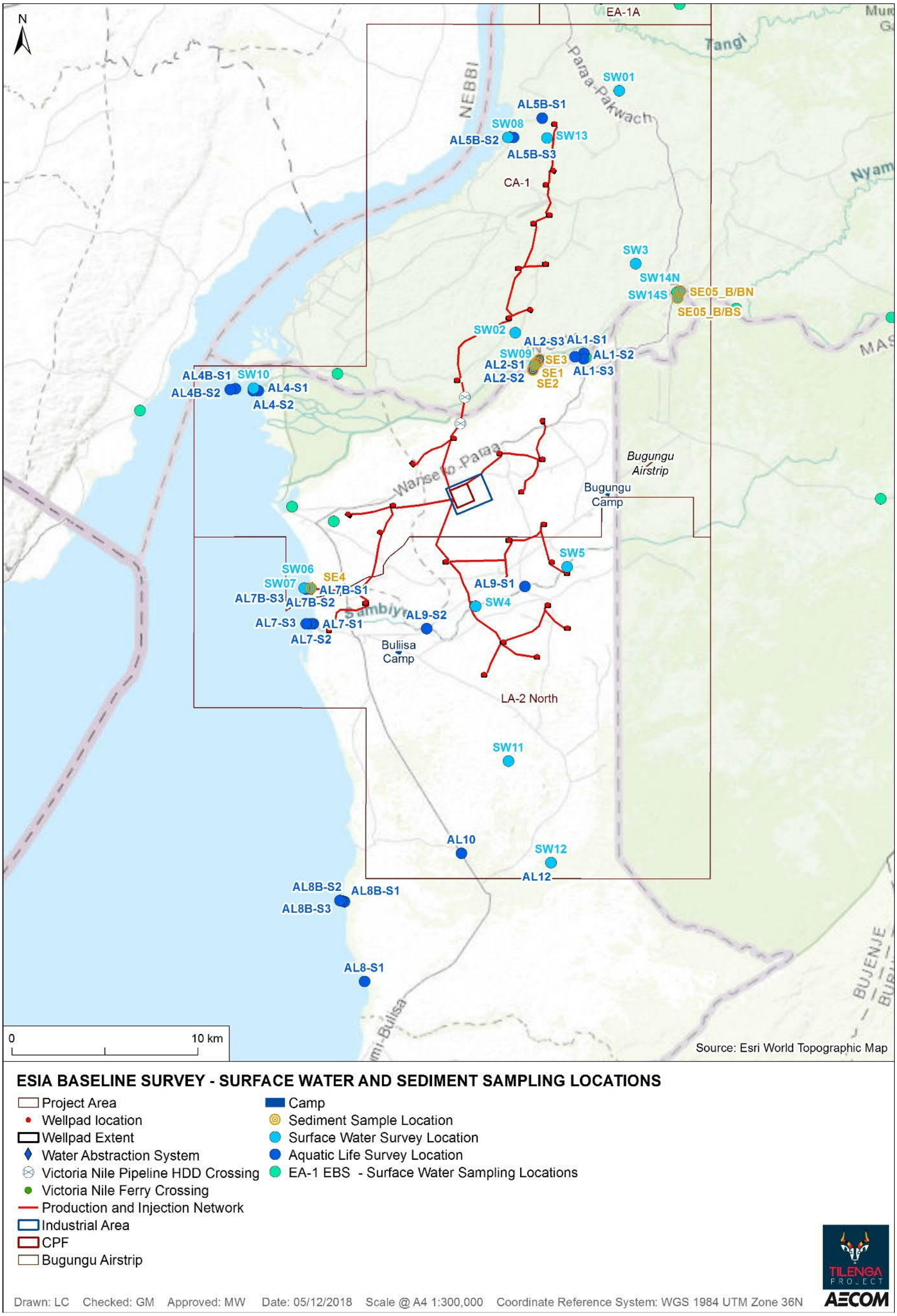


Figure 15-3: Surface Water Survey Locations

The surveys covered waterbodies identified in the Primary and Secondary Areas likely to be influenced by the Project. The sample locations associated with each of the waterbodies are described in Table 15-6, below. These included watercourses bisecting areas containing the identified oil well pads to be developed, pipeline crossings and upgraded roads; as well as critical fish breeding and nursery habitats likely to be directly or indirectly impacted by oil development activities.

All sites were surveyed from a boat, except those on the River Waiga, River Tangi, River Zoliya and the unnamed watercourse, which were surveyed by wading in marginal and/or shallow channel areas.

Table 15-6: Sample site locations for the Primary Baseline Surveys

Waterbody	Survey sites	Associated project activity/ justification	Further Comment
Victoria Nile river	AL1	Upstream of proposed pipeline crossing point	Surveyed during both wet and dry seasons
	AL2	Upstream of proposed pipeline crossing point	Surveyed during both wet and dry seasons
	AL13	Victoria Nile Ferry crossing location	Only surveyed in the wet season
Victoria Nile river Delta	AL4	Downstream of proposed pipeline crossing point and various well pads, highly sensitive habitat for fisheries.	Surveyed during both wet and dry seasons
	AL4B	Downstream of proposed pipeline crossing point and various well pads, highly sensitive habitat for fisheries.	Surveyed during both wet and dry seasons
Lake Albert	AL7	Proposed alternative water abstraction point	Surveyed during both wet and dry seasons
	AL7B	Proposed water abstraction point	Surveyed during both wet and dry seasons
Waiga-Waisoke Delta/Lake Albert	AL8	Downstream of proposed well pads, highly sensitive habitat for fisheries.	Surveyed during both wet and dry seasons
	AL8B	Downstream of proposed well pads, highly sensitive habitat for fisheries.	Surveyed during both wet and dry seasons
River Waiga	AL12	Downstream of proposed well pads	Surveyed during both wet and dry seasons
River Zoliya	AL11A	Downstream of proposed well pads	Only surveyed in the wet season (due to access)
River Sambiye	AL9	Downstream of proposed well pads	Dry during both wet and dry seasons
River Ngazi	AL10A	Downstream of proposed well pads	Dry during both wet and dry seasons
	AL10B	Downstream of proposed well pads	Dry during both wet and dry seasons
Unnamed Watercourse	AL5A	Downstream of proposed well pads	Surveyed during both wet and dry seasons
	AL5B	Downstream of proposed well pads	Dry during both wet and dry seasons
River Tangi	AL14	Potential works to Tangi bridge	Only surveyed in the wet season

The number of samples (or sub-samples) for the different aquatic life specialist surveys (fish, macroinvertebrate etc.) at each site varied according to survey methods and site constraints. The survey methods and number of samples (or subsamples) are discussed in detail in the baseline survey report provided in Appendix P, and summarised in section 15.7.3 below.

15.5.3.3 Primary Data - Survey Methodology

15.5.3.3.1 Fish

Samples were collected using a combination of methods at each of the survey sites, with the exception of those that were dry or were not surveyed for other reasons (access etc.), as set out in Table 15-6. In addition, sites AL5A and AL5B on the unnamed watercourse were too dry to sample for fish using any of the methods available, although any fish recorded during the macroinvertebrate kick-sampling were recorded.

Those sites that were located in close proximity to each other (i.e. AL7 and AL7B; AL8 and AL8B) could not be sampled as distinct survey points because fish surveys occur over a large area, thereby encroaching upon nearby sites, and due to the mobility of fish across large areas minimising how distinct nearby sites can be from one another. For each sampling point, the survey methods covered a range of different sub-samples and locations within the same reach, including shallow, marginal and central (deep water) locations where present (notably at sites on the Lake Albert and the Victoria Nile).

During the dry season, fish sampling was completed principally using experimental gillnets at each of the sites, although basket and minnow traps were used at some sites to augment the data collected. Additional data were also obtained from checking the catches of fish in local fishing communities (where present) operating in the survey areas. This was relevant at sites on Lake Albert (AL7) and the Waiga-Waisoke Delta/Lake Albert (AL8).

Due to limited catches using the methods above, which were undertaken in the dry season (notably at sites on the Albert Nile), the survey method was modified for the subsequent survey undertaken during the wet season. During the wet season, sampling comprised a combination of electric fishing (see Figure 15-7), multifilament nylon gillnets of mesh size 1 – 2.5 inches; metallic fish traps and fyke-nets.

Figure 15-4: Electric fishing on the Zoliya

Electric fishing equipment was used along the shores of the Victoria Nile from a boat (AL1, AL2, AL13, AL4, AL4B), and covered mostly shallow water areas (< 1 m depth zones) and in River Waiga (AL12), River Zoliya (AL11A) and River Tangi (AL14). Electric fishing was also carried out among submerged aquatic vegetation cover at the shores of Lake Albert (AL7). During the wet season, gillnets were used mainly in the open waters of Lake Albert and Nile Delta/Lake Albert (AL7, AL8B, AL4B) that were deeper (> 2 m in depth), as well as on the Rivers Waiga (AL12) and Tangi (AL14).

The fishing gears were set using a boat with outboard motor, stable enough for gill net fishing operations, yet easily manoeuvrable for the inshore fishing operations (electric fishing and basket/minor trap fishing). At Kabolwa Landing Site of Lake Albert (AL8B) commercial fish catches were also examined for the species landed. Fishing in open waters of the lake was not undertaken.

Where necessary, fish were preserved and taken to the laboratory for subsequent identification and analysis (e.g. measurements of gonads for assessment of fecundity etc.).

15.5.3.3.2 Macroinvertebrates

Samples were collected using a combination of methods at each of the sample sites, with the exception of those that were dry or were not surveyed for other reasons (access etc.), as set out in Table 15-7.

The survey comprised collection of aquatic macroinvertebrates at three (or occasionally two) sub-samples at each location described in Table 15-7, in order to maximise the different habitats covered, and any associated differences in faunal diversity. For samples collected on the Victoria Nile, the sub-samples included central (deep water > 1 m) and marginal (generally shallow) locations. Three sub-samples were collected at each sample location on Lake Albert, which were along transects, from shallow areas adjacent to the shore, to deeper areas, with each sample located approximately 100 m apart along the transect. For samples on the smaller watercourses (River Tangi, River Waiga, River Zoliya and the unnamed watercourse), subsamples covered any different mesohabitats present (i.e. riffle and glide sections, marginal backwaters, etc.).

In terms of sampling equipment and methods used, in deeper waters (> 1 m) a Ponar grab was used to sample from the survey boat. For each sub-sample collected using this method, the samples were collected in a triplicate and pooled together. These included all sites on the Victoria Nile and Nile Delta (AL13, AL1, AL2, AL4, AL4B), Lake Albert (AL7 and AL7B) and the Waiga-Waisoke Delta/Lake Albert (AL8/AL8B).

A standard Freshwater Biological Association (FBA) kick-net was used to collect three minute ‘timed’ samples for each of the shallow water sites. This method was used to collect samples from River Waiga (AL12), River Zoliya (AL11A), River Tangi and the unnamed watercourse (AL5B).

All macroinvertebrates samples were preserved on site using 70% ethanol and subsequently transported to laboratory for sorting, identification and quantification. The samples were processed in the National Fisheries Resources Research Institute Laboratory (NFIRRI), at appropriate magnification under a stereomicroscope and using appropriate identification keys.

15.5.3.3.3 Zooplankton and Phytoplankton

In parallel with the macroinvertebrate surveys, each survey site comprised the collection of two to three sub-samples of zooplankton and phytoplankton at each survey location. The samples collected on the Victoria Nile included sub-samples in central and marginal locations. Samples collected from Lake Albert were taken at various locations up to approximately 300 m from the shore at each site.

Samples were collected at each of the sample sites, with the exception of those that were dry or were not surveyed for other reasons (access etc.), as set out in Table 15-7, as well as sites AL5A and AL5B that were too shallow to sample.

Vertical zooplankton hauls were taken from 0.5 m above the bottom sediments to the surface using a conical net at each of the sites. Three hauls were taken to make a composite sample, which was preserved with formalin solution. The samples were processed in the laboratory, at appropriate magnification under an inverted microscope and using appropriate identification keys.

For phytoplankton, at each sampling site, 20 ml of water was drawn at approximately 0.5 m depth, fixed with Lugol´s solution, and stored away from light. The samples were processed in the laboratory. The sedimentation method was used to count the phytoplankton under an inverted microscope.

15.5.3.3.4 Water Quality

Detailed information on the water quality assessments undertaken are provided in ***Chapter 10: Surface Water*** of this ESIA. In addition to these surveys, water quality analyses, covering key chemical and physico-chemical parameters of particular relevance to aquatic fauna and flora, were undertaken during the aquatic life surveys, the details of which are provided in the full survey reports (Appendix P).

Water samples assessed for baseline quality were collected at 50 cm under surface using a 5 Litre van dorn sampler. Dissolved oxygen, temperature, pH and water conductivity were measured *in situ* at 0.5 m below water surface using Multiprobe (Hach HQ40d). Samples for determining water quality in the laboratory were transported in a cool-box on ice. Ammonia-nitrogen and nitrate-nitrogen were determined using Jenway 6505 UV/Vis Spectrophotometer.

15.5.4 Primary Data - Survey Results

This section provides a summary of the primary baseline data collected, with a focus on communities or species of conservation or ecological value, and the overall ecological functioning of the different communities and aquatic systems. Full details for each of the specialised surveys are provided in the survey technical report (Appendix P), including full data sets.

15.5.4.1 Habitat Descriptions

A summary of the different habitats surveyed during the baseline surveys, along with the CHQS expected to be found based on habitat type and availability at each site, but not identified within primary surveys, are given in Table 15-7 below. A PHI sediment size scale is given in Table 15-8 which can be used to indicate precise sediment types found in the habitat descriptions. Photographs of the different surveys sites are provided in Table 15-9.

Table 15-7: Aquatic habitat descriptions

Waterbody	Survey sites	Habitat description	CHQS expected to be present
Victoria Nile river	AL13	Large, moderately fast flowing watercourse. Approximately 350 m wide and 1 - 4 m deep in areas sampled. Substrate dominated by hard sandy clay. Left (south) bank: Extensive low lying floodplain, with adjacent areas covered in papyrus mats, emergent swamp trees and bushes, scattered grasses (*Vossia cuspidata*), fringed by mats of the non-native invasive giant salvinia (*Salvinia molesta*), water hyacinth (*Eichhornia crassipes*) and blue water lilly (*Nymphaea caerulea*). Right (north) bank: Raised shoreline under thick woodland. Shore fringe by occasional sedge (*Cyperus* sp.).	-*Citharinus citharus* -*Citharinus latus* -*Marcusenius victoriae* -*Thoracochromis wingatii* -*Synodontis victoriae*
	AL1	Large, moderately fast flowing watercourse. Approximately 600 m wide and 2 - 4 m deep in sampled areas. Substrate dominated by hard clay and sand. Left (south) bank: extensive swampy low lying land; dominant vegetation cover of sedge (*Cyperus* sp.) and papyrus sedge (*Cyperus papyrus*). Right (north) bank: low-lying front of tufts of heavily grazed grasses (notably (*Vossia cuspidata*) and wetland shrubbery	-*Citharinus citharus* -*Citharinus latus* -*Marcusenius victoriae* -*Thoracochromis wingatii* -*Synodontis victoriae*
	AL2	Large, moderately fast flowing watercourse. Approximately 650 m wide and 1.5 – 6.5 m deep in areas sampled. Substrate dominated by hard sandy clay (see Table 15-8). Left (south) bank: Fringe of grasses (*Vossia cuspidata*) with stands of reeds (*Phragmites* sp); non-native invasive giant salvinia in sheltered nooks; gentle current shallow water. .Right (north) bank: High forested bank fringed with sparsely scattered clumps of Vossia cuspidata. – opens into extensive low lying wetland heavily grazed expanse. Water depth less than 1m.	-*Citharinus citharus* -*Citharinus latus* -*Marcusenius victoriae* -*Thoracochromis wingatii* -*Synodontis victoriae*
Victoria Nile river Delta/Lake Albert	AL4/AL4B	Vast delta expanse, with the Victoria Nile split into several channels on approach to Lake Albert, limited by islands of vegetation. Approximately 2 - 4 m deep. Water depth range at sampled sites 1.5 to 1.6 m. Vegetation: various including submerged species e.g. pondweed (*Potamogeton* sp); floating species e.g. the non-native invasive giant salvinia, water hyacinth, Nile cabbage (*Pistia stratiotes*), water spinach (*Ipomoea aquatica*); and .emergent flora e.g. grasses (*Vossia cuspidata*) fringing extensive expanses of papyrus sedge.	-*Citharinus citharus* -*Citharinus latus* -*Marcusenius victoriae* -*Haplochromis loati* -*Thoracochromis wingatii*

Waterbody	Survey sites	Habitat description	CHQS expected to be present
			-Synodontis victoriae
Lake Albert	AL7/AL7B	Lake Albert, standing open water. Open shore: Fishing community boat landing site. Lake with hard sandy and hard clay bottom from 0.9 m depth at the sampling site nearest to the shore and 4.3 m at 200 from the shore. Macrophyte community include submerged pondweed species (*Potamogeton* sp.), a water nymph (*Najas horrida*) and eelgrass (*Vallisneria* sp.).	*-Citharinus latus* *-Mesobola bredoi* *-Marcusenius victoriae* *-Haplochromis spp.* *-Thoracochromis wingatii* *-Lates macrophthalmus* *-Oreochromis leucostictus* *-Synodontis victoriae* *-Bellamya rubicunda* *-Biomphalaria stanleyi* *-Ceratophallus bicarinatus* *-Ceratophallus faini* *-Gabbiella humerosa ssp. Alberti* *-Gabiella walleri*
Waiga/Waisoke Delta/	AL8/AL8B	Extensive merged fringing floodplain of River Waiga/River Waisoke merged delta along Lake Albert. There was rich flora on the edge of Lake Albert, including Papyrus mats, stands of reeds (*Phragmites* sp,) grasses (*Vossia cuspidata*); swamp forest trees; plus floating & rooted submerged water plants. Water depth generally shallow far offshore: 0.8 to 1.2 m; hard bottom fine sand at Waiga River mouth & dark muddy sand at Waisoke river mouth.	*-Citharinus citharus* *-Citharinus latus* *-Marcusenius victoriae* *-Haplochromis loati* *-Thoracochromis wingatii* *-Synodontis victoriae*
River Waiga	AL12	Shallow, relatively fast flowing river running through a narrow ravine, with different stream morphological features, including riffles and glide section (samples covered both areas).	*-Citharinus citharus*

Waterbody	Survey sites	Habitat description	CHQS expected to be present
		Wetted width approx. 4 m, depth >0.5 m. Brisk current; hard bottom with coarse sandy gravel, plus pebbles some smooth stones. Potential areas for refuge and spawning for potamodramous fish species. The channel was largely shaded by bankside trees and other vegetation thus no instream macrophytes were recorded.	-*Citharinus latus* -*Marcusenius victoriae* -*Thoracochromis wingatii* -*Synodontis victoriae*
Zoliya	AL11B	Recently re-inundated flood plain and channel during wet season survey, with extensive wetland covered in shrubs and grasses (e.g. floating (hippo) grass (*Vossia cuspidata*).	-*Citharinus citharus* -*Citharinus latus* -*Marcusenius victoriae* -*Haplochromis loati* -*Thoracochromis wingatii* -*Synodontis victoriae*
Sambiye	AL9	Dry channel, during both wet and dry season, with no evidence of being recently wet.	n/a
Ngazi	AL10A, 10B	Dry channel, during both wet and dry season, with no evidence of being recently wet. Local community leader indicated the Ngazi had not had water for any length of time since the 1960s.	n/a
Unnamed Watercourse	AL5A, AL5B	Seasonal tributary with perennial water in delta zone highly abundant with aquatic macrophytes dominated by the non-native invasive giant salvinia and water hyacinth. The watercourse drains vast Savannah grassland section of MFNP but holds water for very short periods during the wet season.	-*Citharinus citharus* -*Citharinus latus* -*Marcusenius victoriae* -*Haplochromis loati* -*Thoracochromis wingatii* -*Synodontis victoriae*
River Tangi	AL14	Site upstream of the Tangi Bridge. Heavily turbid water, silty substrate, with water levels less than 1m and slow flows during the wet season. River Tangi flows through extensive floodplain delta, which starts near to the sampling site.	-*Marcusenius victoriae* -*Oreochromis leucostictus*

Table 15-8: PHI sediment size scale

PHI scale	Size range (metric)	Size range (approx. inches)	Aggregate name (Wentworth class)
<−8	>256 mm	>10.1 in	Boulder
−6 to −8	64–256 mm	2.5–10.1 in	Cobble
−5 to −6	32–64 mm	1.26–2.5 in	Very coarse gravel
−4 to −5	16–32 mm	0.63–1.26 in	Coarse gravel
−3 to −4	8–16 mm	0.31–0.63 in	Medium gravel
−2 to −3	4–8 mm	0.157–0.31 in	Fine gravel
−1 to −2	2–4 mm	0.079–0.157 in	Very fine gravel
0 to −1	1–2 mm	0.039–0.079 in	Very coarse sand
1 to 0	0.5–1 mm	0.020–0.039 in	Coarse sand
2 to 1	0.25–0.5 mm	0.010–0.020 in	Medium sand
3 to 2	125–250 µm	0.0049–0.010 in	Fine sand
4 to 3	62.5–125 µm	0.0025–0.0049 in	Very fine sand
8 to 4	3.9–62.5 µm	0.00015–0.0025 in	Silt
10 to 8	0.98–3.9 µm	3.8×10^{-5}–0.00015 in	Clay
20 to 10	0.95–977 nm	3.8×10^{-8}–3.8×10^{-5} in	Colloid

Table 15-9: Site photographs

AL1 - Victoria Nile river
Surveyed in December 2016 and May 2017

AL2 - Victoria Nile river
Surveyed in December 2016 and May 2017

AL4 – Victoria Nile river Delta
Surveyed in December 2016 and May 2017

AL4B – Victoria Nile river Delta/Lake Albert
Surveyed in December 2016 and May 2017

AL5A - Unnamed Watercourse within MFNP
Surveyed in December 2016 and May 2017 (dry on both occasions)

AL5B – Unnamed Watercourse
Surveyed in December 2016 and May 2017

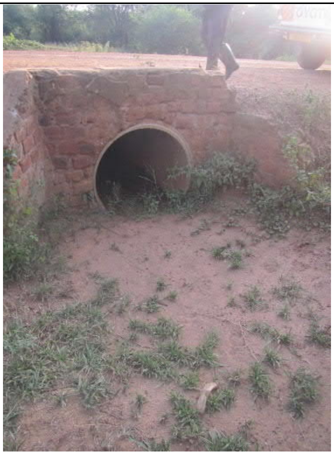
AL7 - Lake Albert
Surveyed in December 2016 and May 2017

AL7B- Lake Albert
Surveyed in December 2016 and May 2017

AL8 - Waiga-Waisoke Delta/Lake Albert.
Surveyed in December 2016 and May 2017

AL8B Waiga-Waisoke Delta/Lake Albert
Surveyed in December 2016 and May 2017

A9 – Sambiye Channel (at road bridge)
Surveyed in December 2016 and May 2017 (dry on both occasions)



AL10A, AL10B – Ngazi dry channel
Surveyed in December 2016 and May 2017 (dry on both occasions)

AL11B – River Zoliya - Surveyed in May 2017

AL12 – River Waiga
Surveyed in December 2016 and May 2017

AL13 – Victoria Nile river
Surveyed only in May 2017

AL14 – River Tangi
Surveyed only in May 2017

15.5.4.2 Physical Elements

15.5.4.2.1 Water Quality

Raw data and results for water quality are presented in the baseline survey report provided in Appendix P. Additional water quality parameters were compared against the USEPA Aquatic Life Criteria (2000) where relevant and are discussed in ***Chapter 10: Surface Water***.

Measurements of the physical and chemical parameters, notably dissolved oxygen, pH, temperature and conductivity recorded during both surveys were within acceptable levels for Ugandan Potable Water Standards. Dissolved oxygen levels were uniformly distributed at all sites sampled and suitable for both drinking water and water for a balanced biodiversity that supports high fish production (Ref. 15-33) (ranging from 4.4 - 8.9 mg L^{-1} during the wet season and 3.5 - 8.8 mg L^{-1} during the dry season). Temperature remained within the optimal range of 20-30^{o}C for fish production and 20-25^{o}C for the national standard for discharge into the natural system. PH measurements showed a balanced alkaline condition of 7.7-9.3 during the wet season and 6.8-9.0 during the dry season and pH levels were also mostly within the optimal range for fish (Ref 15-34).

There were marked differences in phosphorous levels (total and soluble active forms) between the different samples. Overall, higher total phosphorous levels were recorded in the smaller watercourses, notably the River Tangi, Waiga, and the unnamed watercourse compared with sites on the Victoria Nile and Lake Albert. In addition, phosphorous was generally higher (47 - 802 µgL-1) during the wet season compared to samples collected during the dry season (27 - 272 µgL-1). This variation can be explained by the nutrient wash-in from animal waste, which would have been higher during the wet season and also in smaller watercourses (River Tangi, River Waiga etc.), which due to lesser dilution are more easily impacted by such discharges. The phosphorus supply to the water column and primary producers (algae), from soluble reactive phosphorous supply was sufficient, but because of high current and/or turbidity in many of the sites, the conditions were not highly favourable for high algal productivity.

Chlorophyll a, an indicator of primary production for aquatic ecosystems, was relatively low throughout the different sites, but at levels that would provide sufficient food supply for consumers (such as fish) without leading to visible algal blooms that can cause reduced levels of dissolved oxygen by algal shading and eventual decay. The chlorophyll levels would qualify Lake Albert and the waterbodies in its catchment (including the Victoria Nile) as oligotrophic (low productivity) (0 - 8.5 µg L^{-1} according to OECD (Ref. 15-35). Similarly, algal levels do not indicate that the lake is productive, which is likely to reflect the high total suspended solids recorded, notably during the wet season, depriving algae of light to flourish. However, the concentrations of phosphorus recorded suggest that the lake is eutrophic. The silica levels recorded were variable but can explain the higher biovolume of diatoms in the river system samples (see below). The presence of Soluble Reactive Silica (SRSi) relays a good energy source through diatoms to support a healthy fish population.

Other parameters, notably nitrogen, ammonia and nitrate/levels were recorded at levels that would sustain a functioning aquatic ecosystem, and not at levels that would cause impacts to fish, algae, invertebrates or other aquatic fauna or flora. Hence the aquatic system within the Study Area during these two study periods appeared to remain healthy and sustain biogeochemical processes (e.g. nitrification, conversion of harmful ammonia into nitrate) that can support aquatic biodiversity. Ammonia levels remained at concentrations that would be acceptable based on Ugandan Potable Water Standards and other available standards. All water quality data is shown in Table 15-10 below.

Table 15-10: Water quality characteristics in surface waters of Exploration Areas CA-1, EA-1A and LA-2, May 2017

Transect		TD	SD	DO	Temp	pH	EC	Tot N	Tot P	PO_4-P	NH_4-N	NO_2-N	NO_3-N	SRSi	TSS	Chl-a
		m	m	mg/L	°C		µS/cm	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
AL1	S1	2.0	0.22	7.77	27.09	7.72	100	2816.16	115.84	3.43	29.72	1.20	98.61	780.76	25.0	2.96
AL1	S2	4.4	0.23	8.23	27.2	7.72	101	1802.47	308.61	7.35	7.50	119.31	269.74	216.46	160.0	2.96
AL1	S3	1.6	0.21	7.25	27.07	7.76	102	3747.67	216.24	5.39	20.46	6.99	152.09	1376.56	19.0	2.96
AL2	S1	2.3	0.21	8.11	27.27	7.72	101	1076.44	296.57	23.04	38.98	1.20	120.01	990.73	136.0	0.00
AL2	S2	1.3	0.3	6.67	27.14	7.8	102	1802.47	147.97	162.25	103.80	8.44	152.09	623.28	22.0	2.96
AL2	S3	1.9	0.19	7.8	27.4	7.88	101	1186.03	236.33	9.31	1.94	88.15	301.82	200.71	95.6	0.00
AL4	S1	0.7	0.51	6.26	27.72	7.73	106	1870.96	127.89	5.39	44.54	1.20	103.96	221.71	20.0	4.44
AL4	S2	1.4	0.62	7.64	27.54	7.78	106	1035.34	79.70	79.90	383.43	9.17	173.48	253.20	19.0	2.96
AL4B	S1	1.8	0.68	7.13	27.64	7.84	106	2268.22	123.88	7.35	11.20	7.72	152.09	1358.19	19.5	5.92
AL4B	S2	1.2	0.59	6.91	27.69	7.75	106	898.36	123.88	5.39	33.43	20.04	114.66	893.62	34.7	1.98
AL5	S1	.	.	4.39	31.71	8.97	265	3158.63	802.59	11.27	33.43	15.69	136.05	807.01	462.0	5.92
AL7	S1	0.7	0.39	8.89	27.97	9.19	120	1843.56	151.99	17.16	433.43	14.96	157.44	1489.42	31.6	1.48
AL7	S2	1.9	0.98	6.87	28.08	9.14	140	1816.16	91.75	164.22	38.98	6.99	29.10	1717.77	11.3	2.96
AL7	S3	2.9	1.01	6.69	28.16	9.07	148	953.15	135.92	5.39	38.98	20.04	178.83	646.90	15.5	2.96
AL7B	S1	0.7	0.7	7.24	27.23	9.08	160	1747.67	63.63	5.39	72.31	1.92	71.88	205.96	7.7	1.48
AL7B	S2	2.1	1.47	7.33	27.95	9.14	147	706.58	59.62	5.39	22.31	19.31	103.96	226.96	27.0	2.96
AL7B	S3	3.1	1.49	6.82	28.28	9.16	143	2994.25	103.80	1.47	24.17	1.20	103.96	649.53	2.7	1.48
AL8	S1	0.4	0.4	7.14	27.65	9.18	94	1473.70	75.68	7.35	0.09	7.72	130.70	1541.92	15.0	0.00
AL8B	S2	0.7	0.7	7.18	27.78	9.22	94	2857.26	47.57	9.31	50.09	8.44	141.40	224.33	12.7	0.00
AL8B	S3	0.8	0.8	7.16	27.96	9.28	98	5898.36	55.60	3.43	38.98	19.31	173.48	234.83	32.3	0.00
AL11 A		0.8	0.47	0.43	28.84	7.64	64	925.75	541.55	5.39	66.76	1.20	98.61	1720.39	5.6	2.96
AL12	(US)	.	0.3	2.81	23.63	7.9	66	1281.92	360.82	11.27	1.94	15.69	50.49	200.71	15.2	3.95
AL12	(DS)	0.6	0.61	2.93	23.68	8.19	78	1692.88	376.89	177.94	38.98	1.92	82.57	219.08	23.7	1.48
AL13	S1	1.4	0.65	8.44	28.6	8.43	65	2323.01	127.89	136.76	29.72	2.64	23.75	911.99	21.3	3.95

Transect		TD	SD	DO	Temp	pH	EC	Tot N	Tot P	PO_4-P	NH_4-N	NO_2-N	NO_3-N	SRSi	TSS	Chl-a
		m	m	mg/L	^oC		µS/cm	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
AL13	S2	5.0	0.52	8.89	28.4	8.27	74	1528.49	91.75	7.35	27.87	1.92	29.10	911.99	17.0	5.92
AL13	S3	5.0	0.51	8.91	28.85	8.73	93	2007.95	83.71	7.35	46.39	14.24	141.40	216.46	18.5	2.96
AL14		0.8	0.05	4.62	25.84	8.67	39	6501.10	1561.63	17.16	31.57	1.20	162.79	232.20	1250.0	0.00
National Standards potable water				**NS**	**20-35***	**6.5-8.5**	**2500**	**10000***	**10000***	**500***	**3000**	**1000**	**45000**	**NS**	**0**	NS

NB: TD = Total depth; SD = Secchi depth; DO = Dissolved oxygen; Temp = Temperature; Tot-N = Total nitrogen; Tot-P = Total phosphorus; PO4-P = Reactive phosphorus; NO_2-N = Nitrite nitrogen; NO_3-N = Nitrate nitrogen; SRSi = Soluble reactive silicon; US = Upstream and DS = Downstream; NS = Not Specified; * = Effluent discharge standard

15.5.4.3 Biological Elements

15.5.4.3.1 Zooplankton

Raw zooplankton data and results tables are provided in the survey report provided in Appendix P.

The zooplankton samples at each of the sites were dominated by Copepoda, Cladocera and Rotifera. There were considerable differences in species diversity between the different sites.

The Victoria Nile sites (AL1, AL2, AL4 and AL13) were characterised with very few species compared to other riverine sites on the River Waiga (AL 12), River Zoliya (AL11A), the unnamed watercourse (AL5 and AL5B) and River Tangi (AL14). Species diversity recorded at Lake Albert and Waiga-Waisoke Delta/Lake Albert sites (AL7, AL7B, AL8 and AL8B) were generally highest compared to other sites, but there was marked variation between the wet season (which was less diverse), compared to samples collected during the dry season. This could be explained by the more fragile species being influenced by an increase in turbidity. As such, the data suggest that zooplankton species composition in Lake Albert does not differ significantly from that of associated surface waters bodies within CA-1, EA-1A and LA-2. The absence of calanoids in Lake Albert and associated rivers sampled, while common in Lakes Victoria, Kyoga and upper Victoria Nile (Ref. 15-36 & 15-37), may be due to the high conductivity of Lake Albert (> 600 µs cm^{-1}).

Zooplankton density estimates exhibited wide variations within the three broad categories and among the sampled sites, the Victoria Nile had a low abundance compared to other sampled rivers AL11A (River Zoliya), AL12 (River Waiga) and AL14 (River Tangi). The possible reasons for low abundance and species richness in sampled sites of Victoria Nile compared to previous studies on the upper Victoria Nile (Mwebaza-Ndawula *et al*., 2005) are likely to be related to several factors. For example the high turbidity of floating plant materials (resulting from the infestation of the non-native invasive giant salvinia) and the fast and uninterrupted flow in this section of the river (a characteristic of many lotic systems) are not conducive to high densities of zooplankton.

Densities of zooplankton within Lake Albert were also relatively high compared to other sites surveyed. The wet season abundances were far lower than those sampled during the dry season in Lake Albert, River Waiga (AL12) and at Site 4B on the Nile Delta, but this was not the case for the other site on the Nile Delta. The general decrease in abundance for sites within Lake Albert, River Waiga (AL12) and Site 4B on the Nile Delta can be explained by the observed reduction in the water depth of approximately 1 m and with very transparent water down to the bed. Dual Vertical Migration (DVM) is another reason that can be considered for this variation, due to fluctuation in zooplankton depth according daily and seasonal life-history patterns. The distributions of these organisms are sometimes affected by reduction in water depth as it impacts on habitable area and thus decreased abundance.

Earlier studies recorded higher species diversity in Lake Albert (e.g. 21 species of Cladocera (Ref. 15-38), than those recorded with the surveys described in this report (a maximum of 9 species were recorded). This could be due to a discrepancy in sampling methods as well as inadequate taxonomic resolution. It may also reflect changes in the fish community structure, especially the current decreased numbers of piscivorous fishes such as the Nile perch from 13.3 MT in 2007/8 to 8.6MT by 2012 in Lake Albert (Ref. 15-39). Whilst the population of Nile perch has decreased in Lake Albert the small planktivores have increased to the point where they support a major fishery, which is likely to have had some impacts on zooplankton communities. This could explain the reduction in cladoceran diversity, as Cladocera are considered to be a preferred prey due to their sluggish movement.

A limited number of zooplankton species are designated IUCN Red List species and none are cited on the Ugandan Red List. None of the species recorded were designated as IUCN Red List Species, however, the availability of zooplankton constitutes an important part of the ecosystem and food chain for higher organisms (fish, macroinvertebrates). Their presence provides a crucial role in the transfer or energy and nutrients in lentic and lotic ecosystems, and for this reason are of importance and are considered within this chapter.

15.5.4.3.2 Phytoplankton

Raw data and results tables for phytoplankton are set out in the survey report provided in Appendix P.

A total of 72 phytoplankton taxa were recorded in surface waters of the Study Area during the wet season, compared with 84 in the dry season. However, the bio-volume was generally low in the wet season compared to the dry season. In the wet season bio-volume ranged from 0.95 to 10.60 mm^3 L-1 compared to 0.94 to 14.53 mm^3 L-1 during the dry season, when bio-volume was generally higher.

'Blue-green algae' (cyanobacteria) and diatoms were dominant (in terms of bio-volume), followed by green-algae, while dinoflagellates were recorded in much lower levels. Blue-green algae were present at all sampled sites and contributed 26 and 28 taxa during dry and wet seasons respectively. Like the blue-green algae, diatoms were also present in most of the sites and contributed 19 and 12 taxa during dry and wet seasons respectively. Although the green algae were recorded at a lower bio-volume, this group included relatively high number of taxa (32 and 25 taxa during dry and wet seasons respectively).

Generally the biovolume of blue green and green algae decreased during the wet season sampling (May 2017) while that of diatoms increased. During the wet season, more silt is deposited into the lake by the affluent rivers, hence increasing the concentration of soluble reactive silica. Silica is readily absorbed by the diatoms leading to rapid increase in biovolume. This is, however, at the expense of green algae that are shaded by the turbid environment; same with blue green algae despite increased nutrient load.

The overall low biovolume recorded could be due to the fast flowing waters present in rivers, providing turbulent conditions, which favours increased productivity and abundance of some species such as the diatoms (Ref. 15-40) whereas impeding proliferation of other groups. Additionally, the high turbidity and high suspended solids are likely to cause Significant shading, with the effect of hindering light penetration and thus algal proliferation.

None of the species of phytoplankton recorded are designated or have other species level protection. However, like zooplankton, they provide a key ecological role as primary producers in the food chain and thus have a key role in aquatic ecosystems, and for these reasons are of importance in terms of aquatic biodiversity.

15.5.4.3.3 Fish

Raw fish data and results tables are provided in the survey report provided in Appendix P and included as Table 15-20. None of the species identified are of high conservation value according to the IUCN criteria, however, 2 species (*Haplochromis avium and Thoracochromis wingatii*) are considered endemic to Lake Albert.

Most of the species were LC according to IUCN. There are, however, several fish species that are NE or DD, as set out in Table 15-11. It is worth noting that despite the species identified not being of high IUCN conservation value, they may be of CHA priority and so must not be discounted on this basis.

A total of 36 fish identified to species level and three other fish were recorded at genus during the two surveys over the different survey sites.

During the wet season data collection (May 2017), a total of 32 fish species, 12 families and 24 genera were recorded compared to 25 species from 10 families and 22 genera recovered during the dry season (December 2016). The observed differences in the fish species recovery could be due to the migratory guilds and patterns, and the sampling efficiency of the electric fishing equipment used only during the wet season. *Neobola bredoi* (LC) was the most abundant species in the wet season samples, contributing over 56% followed by, Haplochromines (13%) and Senegal bichir *Polypterus senegalus* (5%); compared to dry season samples where Haplochromines contributed over 60% of the catch.

Fish were recorded at most of the sample sites, except those that were dry at the time of the surveys, i.e. the Ngazi (AL10A, AL10B), the Sambiye (AL9) and the unnamed watercourse (AL5B), which was mostly dry, but could be sampled for other parameters, due to very shallow water during the dry season). In addition, no fish were recorded in the Zoliya (AL11A), despite the fact that the channel and much of the adjacent flood plain were wet at the time of the wet season survey. This may reflect that the water present was due to recent rainfall, and the site may have been recently dry and had not been re-colonised at the time of survey.

As expected, there were considerable differences between species richness (numbers of different fish species recorded) and total abundances (weight and numbers of fish) between the wet and dry seasons. On the whole, a greater abundance and richness was recorded throughout most of the sites during the wet season, notably at sites on the Victoria Nile (AL1, AL2) and the Nile Delta (AL4, AL4B). However, this is likely to reflect improved sampling quality during the wet season, notably the use of electric fishing, which was much more efficient in recording fish, particularly in waters such as the River Nile, where gillnets were not effective.

In contrast, samples taken on smaller watercourses, such as the River Waiga (AL12) and Waiga/Waisoke Delta (AL8) recorded similar or higher species richness and abundances in the dry season, reflecting difference in sampling efficiency due to sampling techniques between the two waterbody types.

Most of the large fish species caught from this wet season survey were mature and breeding while the small sized fish were immature except for *Neobola bredoi* and Haplochromines. Growth assessments (isometric and allometric growth and the relative fish condition) showed that the fish were in good condition.

In general, there was an increase in species recovery between the dry and wet seasons around inshore waters of Victoria Nile, northern Lake Albert and its tributaries.

The native fishery of the region is dependent on Nile perch *Lates niloticus* (LC), Nurse tetra (LC), Elonate tigerfish *Hydrocynus forskhalii* (NE), Pebbly fish *Alestes baremoze* (LC) and *Neobola bredoi* (NE). All of these species were recovered around inshore waters of Victoria Nile and northern Lake Albert. Most of the potamodramous fish species (those that migrate into freshwaters) such as the African sharptooth catfish *Clarias gariepinus* (LC) were retrieved from the River Waiga (AL12) as expected together with the typical riverine fish such as *Labeo* sp. and *Barbus* sp.

These findings highlight the ecological importance of the ephemeral rivers to Lake Albert fisheries. The data clearly show that the fish species are in good condition, which is indicative of adequate food supply notably insects and smaller fishes for the top predators. This is despite the presence of poachers who frequent Victoria Nile towards the Delta (AL4B), who use illegal and destructive fishing methods mainly targeting the breeding fish species moving upstream to spawn (Pers. Comm. Dr Timothy Twongo, expert in Ugandan and East African fisheries).

A summary of the fish recorded is presented in Table 15-11, below. It should be noted that AL10 A & B were dry and no fish were found at AL11A, therefore, these sites have been omitted from the table. Where the species has no IUCN classification n/a (not applicable) is used in the relevant column.

Table 15-11: Fish species recorded during baseline surveys during the wet (W) and dry (D) seasons

Families	Species	AL1	AL2	AL4	AL4B	AL7B	AL8	AL12	AL13	AL14	IUCN status
Polypteridae	*Polypterus senegalis*	W	W	W		W/D		W/D	W	W	n/a
Mormyridae	*Hyperopisus bebe*	W									LC
	Mormyrus kannume	W	D								LC
	Marcusenius petherici	W									n/a
	M. nigricans			W							n/a
	Mormyrops anguilloides	W			W						LC
	Petrocephalus catastoma						D				NE
	Marcusenius victoriae						D				LC
	M. graham		P								LC
Characidae	*Hydrocynus forskhalii*			W/D	W/D		W/D				n/a
	Alestes baremose				W		W				LC
	Brycinus macrolepidotus	W				D	p				LC
	B. nurse	W	W	W		W					LC
Cyprinidae	*Labeo horie*							W			n/a
	Garra dembeensis	W	W								LC
	Neobola bredoi	W	W	W			W		W		n/a
	Barbus jacksonii				W/D		D	D	W		LC
	B. prince	W		W/D				W			LC
	Barbus sp.	W	W	W	W				W	W	n/a
	Leptocypris niloticus					D	D				NE
	Labeo coubie							D			LC
	Barbus altianalis			D							LC
Bagridae	*Bagrus bayad*			W		W/D					LC
	Auchenoglanis occidentalis			D		W		D			LC
Schilbeidae	*Schilbe intermedius*				W						LC
Clariidae	*Clarias gariepinus*							W			LC
Mochokidae	*Synodontis schall*				W		D	D			LC
	S. frontosus	W/D	D				D				LC

Families	Species	AL1	AL2	AL4	AL4B	AL7B	AL8	AL12	AL13	AL14	IUCN status
	S. nigrita							D			LC
Cyprinodontidae	*Aplocheilichthys* sp.	W	W	W					W		n/a
Centropomidae	*Lates niloticus*	W		W/D		W/D	W/D				LC
Cichlidae	*Tilapia zillii*			D		W/D	W/D				LC
	Oreochromis niloticus			W		W	D	W	W	W	n/a
	O. leucostictus						D			W	LC
	Sarotherodon galilaeus					W	D				n/a
	Haplochromis avium					W	W				n/a
	Thoracochromis wingatii					W					DD
	Haplochromis sp.	W	W	W	W	W/D	D		W		n/a
Mastacembelidae	*Mastecembalus frenatus*			W							LC

15.5.5 Priority Species Descriptions

Table 15-12 summarises priority species recorded during the Primary Data collection surveys, which are included as CHQS within the CHA. While none of the other CHQS were recorded, it is possible that they may be present in the Study Area, and were not recorded as they were in low numbers or present at different times of year. These species therefore need to be considered in the IA.

15.5.5.1 Survey Limitations

Haplochromis sp. was recorded to the genus level; further identification to species level was not possible. *Haplochromis* is a diverse genus, containing more than 200 species, most of which are present in East Africa and several are endemic to Lake Albert and its catchment. Three other species of this genus (*Haplochromis albertiae, Haplochromis loati, Haplochromis mahagiensis*) were identified as CHQS, within Criterion 2 (endemic/restricted range species) of IFC P6 within the WCS & eCountability reports described above. *Haplochromis* sp. was recorded at each of the sites on the Victoria Nile (AL1, AL2, and AL13), the Nile Delta (AL4, AL4B) and also on Lake Albert. Given the large number of species within this genus, there can be no certainty that any of these three endemic species were present within the samples collected (or indeed other locations within the Study Area), but it is a possibility, given the records of the species from previous studies near to the Study Area.

Table 15-12: Priority Fish Species Recorded during Primary Surveys

Scientific name	Common name	Status/ designation	Distribution and Habitat	Likely distribution in Study Area	Records during primary data collection
Marcusenius victoriae	Victoria stonebasher	IUCN Global Red List (LC), Uganda Red List (NE), CH qualifying species (1ab and 2b Tier 1)	Endemic to Lake Victoria basin, with records from Victoria Nile and minor lakes in the catchment. Broad habitat distribution, including open waters of lakes and rivers. (FishBase team RMCA & Geelhand, 2016)	Victoria Nile, Lake Albert and its tributaries.	AL8
Haplochromis avium	n/a	IUCN Global Red List (NE), Uganda Red List (EN), CH qualifying species (2A Tier 1)	Endemic to Lake Albert (Fishbase website). Limited information available on habitat.	Lake Albert and wetlands.	7B AL8
Thoracochromis wingatii	n/a	IUCN Global Red List (DD), Uganda Red List (EN), CH qualifying species (2A Tier 1)	This is a benthopelagic species. Records indicate the species is present through the length Nile Basin. Records upper White Nile, Sudan (Ref 15-12)	Lake Albert and tributaries.	Lake Albert 7B
Oreochromis leucostictus	n/a	IUCN Global Red List (LC), CH qualifying species (2a Tier 2)	Records from Lake Albert, Lake Victoria and Nile Basin. Species prefers shallow waters. Its preferred depth range is 0-10 m, mainly in lagoons and near the papyrus fringe, in shallow muddy bays and inlets of lakes (Ref 15-12).	Lake Albert	AL8
Leptocypris niloticus	Nile minnow	IUCN Global Red List (LC), Possible CHQS	Records indicate wide range throughout Africa. Limited information on distribution in Uganda. Potamodromous species found in running waters especially on sandy shores and in irrigation canals (Ref 15-12)	Possible presence in Victoria Tributaries of Lake Albert.	AL7 AL8

15.5.5.2 Macroinvertebrates

Macroinvertebrates belonging to 14 orders, 29 families and 35 genera were recorded through the two sample seasons. However, only 13 taxa were recorded to species level, with all other taxa identified to genus, family or higher level. This is due to the difficulty identifying macroinvertebrates (e.g. because of immature specimens with insufficient features to speciate, or absence of reliable keys and lack of reference data). A summary of the taxa recorded is set out in Table 15-13. Overall, in terms of numbers of individuals/m^3 the most represented group was bivalves (molluscs), followed by gastropods (snails), Diptera (true flies) and Oligochaeta worms. Other groups present included Ephemeroptera (mayflies), Odonata (dragonflies and damselflies), Decapoda (crustaceans), Coleoptera (beetles), Trichoptera (caddis larvae), Hirundea (leeches) and Heteroptera (true bugs). During both surveys, Ephemoptera (seven families) were most diverse, while bivalves (four families), gastropods (four families) and Trichoptera (four families) were also relatively diverse.

The highest taxa richness (total number of taxa/sample) was recorded at Lake Albert site AL7 (17 taxa), which was slightly higher than at the nearby site AL7B. In addition, relatively high taxa richness were recorded at the Nile Delta site AL4B, River Waiga site AL12 and Victoria Nile sites AL1 and AL2. The lowest total taxa richness (two to five) were recorded at Lake Albert sampling sites AL8, AL8B. There were also considerable differences between the taxa richness recorded between the wet and dry seasons and total taxa richness from wet season samples were generally much lower than those of the dry season.

In terms of biological water quality, the Ephemeroptera, Plecoptera and Trichoptera (EPT) indices[2], ranged from zero to five during the dry seasons, the highest (five) was recorded at River Waiga (AL12). The tolerance scale ranges from zero (intolerant of organic pollutants) to 10 (very tolerant of organic pollutants). The relatively high EPT for this site is likely to reflect habitat type, as this was a shallow, permanent and fast flowing ‘riffle’ habitat, which tend to favour Ephemoptera and Trichoptera, compared with perennial watercourses (AL11), deep rivers such as the Victoria Nile (AL1, AL2, AL13), delta sections such as the Nile Delta (AL4, AL4B), slower rivers such as the Tangi (AL14) and lake habitats (AL7, AL8). EPT indices for the wet season were lower, ranging from zero to two only.

The reasons for the apparent seasonal differences in taxa richness and EPT are not clear. Potentially the long dry spell which affected Uganda from January 2017 until late April 2017 could have significantly reduced the food resources and habitats that support macroinvertebrates. Subsequent recent rainfall had not significantly recharged the waterbodies. In a related study (Beauchard *et al*., 2003), the duration of rains was found to account for temporal persistence of suitable habitats that support more macroinvertebrates in water bodies and drying summer period was associated with conditions that reduce taxa richness. Sampling variation could also have influenced the diversity of macroinvertebrates recorded. Apart from this seasonal effect, the present lotic and lentic environments of study could still be considered free from any serious pollution, as reported for the dry season survey of December 2016.

The findings on the occurrences of gastropod and bivalve taxa at the sample sites within northern Lake Albert and River Nile delta areas, are in line with one of the historical findings reported (Mandahl-Berth, 1954) regarding the composition and distribution of freshwater molluscs in water bodies of Uganda.

In terms of nature conservation value or designations, the gastropod snail *Bellamya rubicunda* was recorded in the Lake Albert at Site AL7, AL7B and Waiga-Waisoke Delta/Lake Albert Site AL8B. This species is IUCN designated as NT. *Gabbiella humerosa ssp. Alberti,* recorded in Lake Albert at Sites AL7 and AL7B, is designated on the IUCN Global Red List as CR. Several other species are NE, as described in Table 15-13. The remaining species recorded are not of high conservation value according to the IUCN criteria or endemic species lists. However, as many of the species could not be identified to a species level (genus or higher level only), it is not possible to assess species conservation value of many of the taxa (approximately 46%).

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[2] The EPT Index is named for three orders of aquatic insects that are common in the benthic macroinvertebrate community: Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). The EPT Index therefore uses three orders of aquatic insects that are easily sorted and identified and is commonly used as an indicator of water quality.

Table 15-13: Macro-invertebrate densities (mean no./m2), composition and distribution in the Study Area – Dry, D (December 2017) and Wet, W (May 2017)

Taxa		AL1		AL2		AL4		AL4B		AL7		AL7B		AL8		AL8B		AL11A	AL12		AL13		IUCN
Order	Species	D	W	D	W	D	W	D	W	D	W	D	W	D	W	D	W	W	D	W	W	W	
Unionoida	*Caelatura bakeri*	0	0	5	0	0	0	0	0	0	0	8	0	0	0	0	9	0	0	0	0	0	NE
Unionoida	*C. acuminate*	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	LC
Unionoida	*Mutela*	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Unionoida	*Etheria elliptica*	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	LC
Veneroida	*Corbicula africana*	0	0	0	0	0	0	28	0	14	9	0	0	0	0	0	0	0	0	0	0	0	LC
Veneroida	*Sphaerium victoriae*	14	0	5	0	77	0	1653	133	0	0	84	56	126	0	103	163	0	0	0	0	0	LC
Veneroida	*Byssanodonta parasitica*	0	0	0	0	0	0	14	0	5	0	0	0	0	0	0	0	0	0	0	0	0	NE
Ctenobrachiata	*Bellamya unicolor rubecunda*	0	0	0	0	0	0	0	0	9	5	18	0	0	0	0	5	0	0	0	0	0	NT
Ctenobrachiata	*Gabbia humerosa alberti*	0	0	0	0	0	0	0	0	19	5	275	0	0	0	0	0	0	0	0	0	0	EN
Ctenobrachiata	*Gabbia tilhoi*	0	0	0	0	0	0	0	0	5	0	7	0	0	0	0	0	0	0	0	0	0	NE
Ctenobrachiata	*Cleopatra pirothi*	0	0	0	0	0	0	0	7	33	19	5	0	0	0	0	0	0	0	0	0	0	LC
Ctenobrachiata	*Melanoides tubertulata*	0	0	0	0	105	0	42	7	56	9	28	33	0	0	37	42	0	0	0	0	0	LC
Plumonata	*Biomphalaria* sp.	0	0	0	0	0	0	0	0	14	9	7	0	0	0	0	0	0	0	0	0	0	n/a
Plumonata	*Anisus natalesis*	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	LC
Ephemeroptera	*Caenis* sp.	0	0	5	0	0	0	0	0	0	0	5	0	0	0	0	5	0	135	0	0	0	n/a
Ephemeroptera	*Povilla adusta*	0	0	0	0	0	7	0	0	5	0	19	9	0	0	0	0	0	0	0	0	0	LC
Ephemeroptera	*Baetis* sp.	0	0	0	0	0	0	14	0	9	0	0	0	0	0	0	0	0	73	0	0	0	n/a
Ephemeroptera	*Cloeon* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	n/a
Ephemeroptera	*Ophelmatostoma* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	n/a
Ephemeroptera	*Acanthiops* sp.	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Ephemeroptera	*Tricorythus* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	n/a
Ephemeroptera	*Ellasoneuria* sp.	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Ephemeroptera	*Tricorythus* sp.	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	n/a

Taxa		AL1		AL2		AL4		AL4B		AL7		AL7B		AL8		AL8B		AL11A	AL12		AL13		IUCN
Ephemeroptera	*Heptagenia* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	n/a
Odonata	*Neurogomphus* sp.	0	0	5	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Odonata	*Hagenius*	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Odonata	Protoneuridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	n/a
Odonata	*Phyllomacromia*	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Diptera	Chironomidae	5	0	42	14	343	7	21	14	65	0	5	0	0	0	23	28	14	11	13	0	14	n/a
Diptera	*Palpomyia* sp.	9	0	0	0	0	0	0	0	14	0	0	0	0	0	0	5	0	1	0	0	0	n/a
Diptera	*Simulium* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	n/a
Trichoptera	Leptoceridae	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	n/a
Trichoptera	*Cheumatopsyche* sp.	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Trichoptera	*Aethaloptera* sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	n/a
Trichoptera	*Polycentropus* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Trichoptera	*Dipseudopsis* sp.	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Decapoda	*Caridina* sp.	0	0	0	0	0	0	0	0	33	0	5	0	0	0	5	0	0	0	0	0	0	n/a
Hemiptera	*Aphelocheirus* sp	5	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	n/a
Coleoptera	*Neoelmis* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	n/a
Coleoptera	*Orectogyrus* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	n/a
Ostracoda	Ostracoda	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Hirudinea	Hirudinea	0	0	0	0	0	0	0	0	145	0	0	0	0	0	0	0	0	0	0	0	0	n/a
Oligochaetes	Oligochaeta	0	0	5	0	105	0	28	0	65	0	0	0	156	0	135	9	0	0	0	0	238	n/a
EPT Index score		3	0	2	0	0	1	2	0	2	0	2	1	0	0	1	1	0	5	1	2	0	

15.5.5.3 Macroinvertebrates

The Secondary Baseline Data Collection indicated that several IUCN Red List macroinvertebrate species were potentially present in the Study Area. These included one species listed as EN, one CR and two NT. In addition, one NE and three DD species were identified. No macroinvertebrates are on the Ugandan Red List.

In total, 10 IFC PS6 CHQS were recorded, including the IUCN species listed below. The only examples of IUCN Red List, Critical Habitat or other species of significant nature conservation importance for which there was evidence of presence during the Primary baseline surveys were the snail *Bellamya rubicunda* and *Gabbia humerosa alberti*. *Bellamya rubicunda*, designated as NT on the IUCN global Red List, was recorded in the Lake Albert at Site AL7, AL7B and AL8B, while *Gabbia humerosa alberti*, designated as EN on the IUCN global Red List, was recorded in the Lake Albert at Site AL7, AL7B and thus both species appear to be locally common in Lake Albert. In addition, the species is identified as qualifying species for IFC P6 Critical Habitat.

A summary of the priority species found within the primary surveys and their likely distribution is summarised in Table 15-14, below.

Table 15-14: Summary of priority Macroinvertebrates species found within primary surveys of Conservation Value

	Species name		Status	Habitat and distribution	Records during primary data collection	Likely distribution in Study Area
Architaenioglossa	*Bellamya rubicunda*	Gastropod	IUCN Global Red List (NT), CH qualifying species (2a, Tier 1)	Recorded as occurring up to 18 m in depth in Lake Albert. Endemic to Lake Albert (Ref 15-12)	Lake Albert (AL7, AL7B and AL8B).	Lake Albert (confirmed)
Littorinimorpha	*Gabbiella humerosa ssp. Alberti*	Gastropod	IUCN Global Red List (EN), CH qualifying species (1ab & 2a, Tier 1)	Subspecies is endemic to Lake Albert. No further information on habitat available (Ref 15-12)	Lake Albert (AL7, AL7B)	Lake Albert (confirmed)

15.5.5.4 Zooplankton

Very few zooplankton species are considered as rare and few species are IUCN or otherwise designated. None of the species that were recorded in the survey are nationally or internationally designated. However, the availability of zooplankton forms an important part of the ecosystem and food chain for higher organisms (fish, macroinvertebrates). Mitigation measures seek to improve water quality and quantity, which in turn will promote the conservation of zooplankton species.

15.5.5.5 Phytoplankton

No phytoplankton species recorded are considered as rare and there is no national or other protection for this group. However, like zooplankton, they provide a key ecological role as primary producers in the food chain. Mitigation measures seek to improve water quality and quantity, which in turn will promote the conservation of phytoplankton species.

15.6 Baseline Characteristics

15.6.1 Overview

The objective of this section is to present concisely the most pertinent existing data and information in relation to aquatic life of biodiversity importance in the Study Area. This is based on the secondary data studies listed above with reference to primary data sources and relies on review of information on designations, mapping studies and species lists derived from previous studies, published sources and known databases.

This exercise is necessary in order to ensure that there is an appropriate baseline for the assessment of impacts on aquatic wildlife. Specifically, this means identifying the potential receptors and importantly, their status and distribution, which may be affected by the proposed Project and defining their ecological sensitivity. Having identified the potential receptors, including individual species and the habitats with which they are likely to be associated, this data (supplemented by field surveys as necessary) has been used to identify the sensitive receptors and their status, which then informs the impact assessment through the identification of potential impacts on Significant receptors, the development of appropriate mitigation measures and the determination of residual impacts of the Project.

Therefore, for this assessment each identified receptor is assigned an indication of its sensitivity, which is based on a number of factors as set out below. Once the sensitivity of the receptor is known, it can be considered in the context of the likely magnitude (used interchangeably with the word character in this chapter) of the impact on the receptor and the significance of the potential impact can therefore be determined.

In considering the actual impact on the receptor, the impact that is most relevant is the **residual impact**, i.e. the impact after additional mitigation has been taken into account.

There is also another level of mitigation which relates to indirect impacts and achieving the objectives of no net loss / net gain which are part of the Net Gain Strategy (that some may refer to as “Offset Strategy”) for direct and indirect impacts. These are referred to as mitigation concept strategies or biodiversity conservation initiatives.

Identifying and evaluating the sensitivity of receptors and defining impacts on them in this systematic way provides a robust assessment and framework for understanding what receptors are likely to be most affected by the Project. This therefore allows the identification and prioritisation of management measures for these receptors, with clearly defined mitigation actions, that will be required during appropriate stages of the Project’s life.

15.6.2 Areas of Conservation Interest

The proposed Project is located at the northern end of Lake Albert and includes both the Victoria Nile inlet and the Albert Nile outlet, which together represent the primary surface water resources within the Study Area. The Albert Nile is also fed from the east by several short, seasonally inundated riverine floodplains.

Lake Albert is Africa's seventh largest lake and the most prominent surface water feature on the border between Uganda and the Democratic Republic of Congo. It receives inflow from two major rivers: the Victoria Nile, originating from Lake Victoria and entering Lake Albert at its northern tip, and the Semliki River, which originates from Lake Edward and joins the southern part of the Lake Albert.

Other rivers that drain into Lake Albert from the east include the Muzizi, Kafu, Wambabya, Waki, Sonso, Waisoke, Waiga and the Sambiye. The Albert Nile outflows from the northern end of Lake Albert. The Tangi River, with three main tributaries, flows westwards and drains most of the eastern catchment of the Albert Nile within the North Nile area.

The hydrology of the Study Area is covered in detail in ***Chapter 10: Surface Water*** of this ESIA. A summary of the hydrology for the purpose of providing context to the waterbodies and receptors considered in terms of aquatic life are set out in the following section.

The Study Area can be separated into several different major hydrological catchments, namely the Albert Nile (which has several major tributaries, including the River Tangi and an unnamed watercourse), the Victoria Nile and Lake Albert (which has several tributaries and sub-catchments that fall within the Study Area, notably the River Waiga/Waisoke, River Sambiye and Ngazi). These rivers are shown in Figure 15-1, together with the hydrological features and major catchment boundaries within the Study Area. These catchments are all freshwater and comprise several broad aquatic habitat types, as described below:

- Lentic habitats (still waters), i.e. Lake Albert;
- Lotic habitats (riverine), i.e. the Victoria Nile, Albert Nile and River Waiga;
- River Deltas, i.e. the Nile Delta and Waiga/Waisoke Delta; and
- Temporary habitats, i.e. Rivers Sambiye, Zoliya and Ngazi.

Lake Albert is of particular importance as an aquatic habitat and receptor, it is considered to be an IFC PS6 Critical Habitat. It forms an essential part of Landscape Context C (Lake Albert and fringing wetlands). This Landscape Context also covers the Waisoke/Waiga Delta and the River Waiga and several of its tributaries. Several CHQS identified within the Primary and Secondary data analysis are present (and indeed endemic to the Lake Albert and its tributaries, see Table 15-15).

Table 15-15: CHQS Endemic to Lake Albert and its Tributaries

Fish
Citharinus citharus
Haplochromis albertianus
Haplochromis avium
Haplochromis loati
Haplochromis mahagiensis
Thoracochromis wingatii
Lates macrophthalmus
Mesobola bredoi
Mollusc
Bellamya rubicunda
Coelatura bakeri
Ceratophallus faini
Gabbiella candida
Gabbiella humerosa ssp. Alberti
Gabiella walleri
Shrimp
Limnocaridella alberti

The Nile Delta is considered as being a habitat particularly sensitive to pressures such as over-fishing, drought and accelerated soil erosion due to change in land uses such as agriculture. It has been identified as an IFC PS6 Critical Habitat and forms a key part of Landscape Context C (see Table 15-7 below) and a Ramsar Site (Murchison Falls-Albert Delta Wetland System).

The Albert Nile is also designated as part of the MFNP and considered to be of high importance as an aquatic habitat.

Protected Areas that form part of the AoI for the Project are reviewed in detail in ***Chapter 13: Terrestrial Flora*** and ***Chapter 14: Terrestrial Fauna*** of this ESIA. However, those designated sites of particular importance for aquatic biodiversity are also described below.

As shown in Figure 15-1 and Figure 15-5 the Study Area includes the MFNP and the whole Murchison Falls-Albert Delta Wetland System Ramsar Site. Details of these sites are set out in Table 15-16 below.

Table 15-16: Summary of Areas of Conservation Interest Influenced by the Project with relevance to Aquatic Life

Name of site	Designations	Description
Lake Albert, rivers and fringing wetlands.	Forms part of the Ramsar and National Park and International Union for the Conservation of Nature (IUCN) Category II Protected Area	Lake Albert and fringing wetlands, including the Murchison Falls-Albert Delta Wetland System Ramsar Site and Waiga/Waisoke River floodplain, as well as many other smaller rivers and swamps: Contains a concentration of species of conservation concern in the Murchison Falls-Albert Delta Wetlands System Ramsar Site
Murchison Falls National Park	National Park and International Union for the Conservation of Nature (IUCN) Category II Protected Area	Largest National Park in Uganda (nearly 3,480 km^2). Bisected by the Victoria Nile for 80 km flowing in an east to west direction. The MFNP supports rich and varied habitat types including wetlands that provide varied ecosystems that in turn support a high diversity of both flora and fauna. The MFNP is of ecological importance for a number of globally and regionally endangered species including plants, reptiles, mammals and birds. The park is particularly notable for its large population of mammals. The park has a rich level of biodiversity for which information on mammals and birds is fairly well known, although data for other species groups such as amphibians, reptiles, fish and invertebrates in terms of total species present are incomplete.
Murchison Falls-Albert Delta Wetland System	Ramsar Site	Site covers an area of 17,293 ha, stretching from the top of Murchison Falls to the Albert Delta. It lies predominantly within the MFNP, although a small area along the southern edge is outside the park. The site was designated as it supports rare (uncommon), vulnerable (classified as facing a threat such as hunting) and endangered (in severe decline) species of birds. It also supports the largest known population of the Nile crocodile in Uganda, and a number of indigenous fish species and is a spawning ground on which fish stocks depend (Byaruhanga and Kigoolo, 2005). The river contains several sandbanks and Papyrus islands.

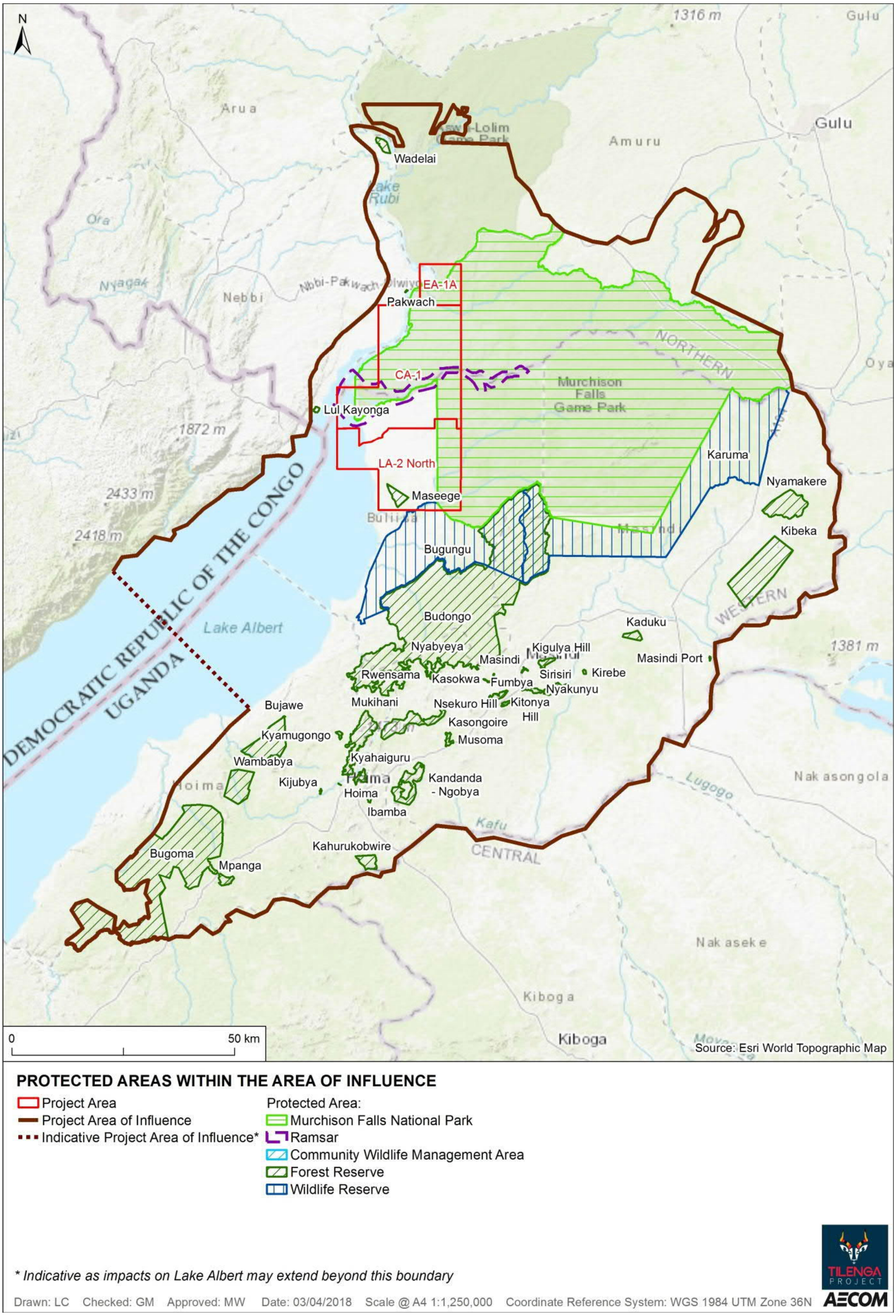

Figure 15-5: Protected Areas

15.6.3 Landscape Contexts

As presented in ***Chapter 14: Terrestrial Wildlife***, the Critical Habitat Assessment (CHA) identifies Landscape Context Areas. Landscape Context A covers MFPA, which includes the Victoria Nile and therefore, has been included in the aquatic life chapter. Landscape Context C covers Lake Albert, rivers and wetlands. A summary of both Landscape Contexts included in the aquatic life assessment are summarised in below and shown in Figure 15-6. Landscape contexts B & D-F are not defined here as they are not relevant to the aquatic life assessment, but are described in ***Chapter 14: Terrestrial Wildlife***.

Table 15-17: CHA Landscape Contexts and Project Interactions

Context	Name	Description	Interaction with Project Footprint
A	**MFPA**	The Victoria Nile flows through MFPA from east to west, and discharges into Lake Albert, forming Landscape Context C (Lake Albert, rivers and wetlands). A concentration of Vulnerable and endemic species exist here.	Flow lines and roads to CA-1 north of the Nile, HDD under the Victoria Nile Crossing and Ferry crossing, in addition to land use changes within the riparian area.
C	**Lake Albert, rivers and wetlands**	Lake Albert and fringing wetlands, including the Murchison Falls-Albert Delta Wetland System Ramsar Site and Waiga/Waisoke River floodplain, as well as many other smaller rivers and swamps: Contains a concentration of Vulnerable species in the Murchison Falls-Albert Delta Wetlands System Ramsar Site.	Victoria Nile Ferry Crossing beneath the river bed, facilities for Victoria Nile ferry crossing, Lake Albert shore and abstraction point, pipeline and road crossings of smaller waterbodies such as the River Tangi.

Other aquatic habitats do not form part of these designated areas, and for those waterbodies that were dry, are likely to be of limited importance for aquatic biodiversity. However, they may serve as refuges for potamodromous fish (species that migrate within fresh water only) during very wet seasons, and desiccation tolerant fauna, including specialist macroinvertebrates.

A summary of the different habitats surveyed during the baseline surveys present in the Project AoI and the CHQS expected to be found, based on habitat type and availability at each site, is provided in Table 15-18 below.

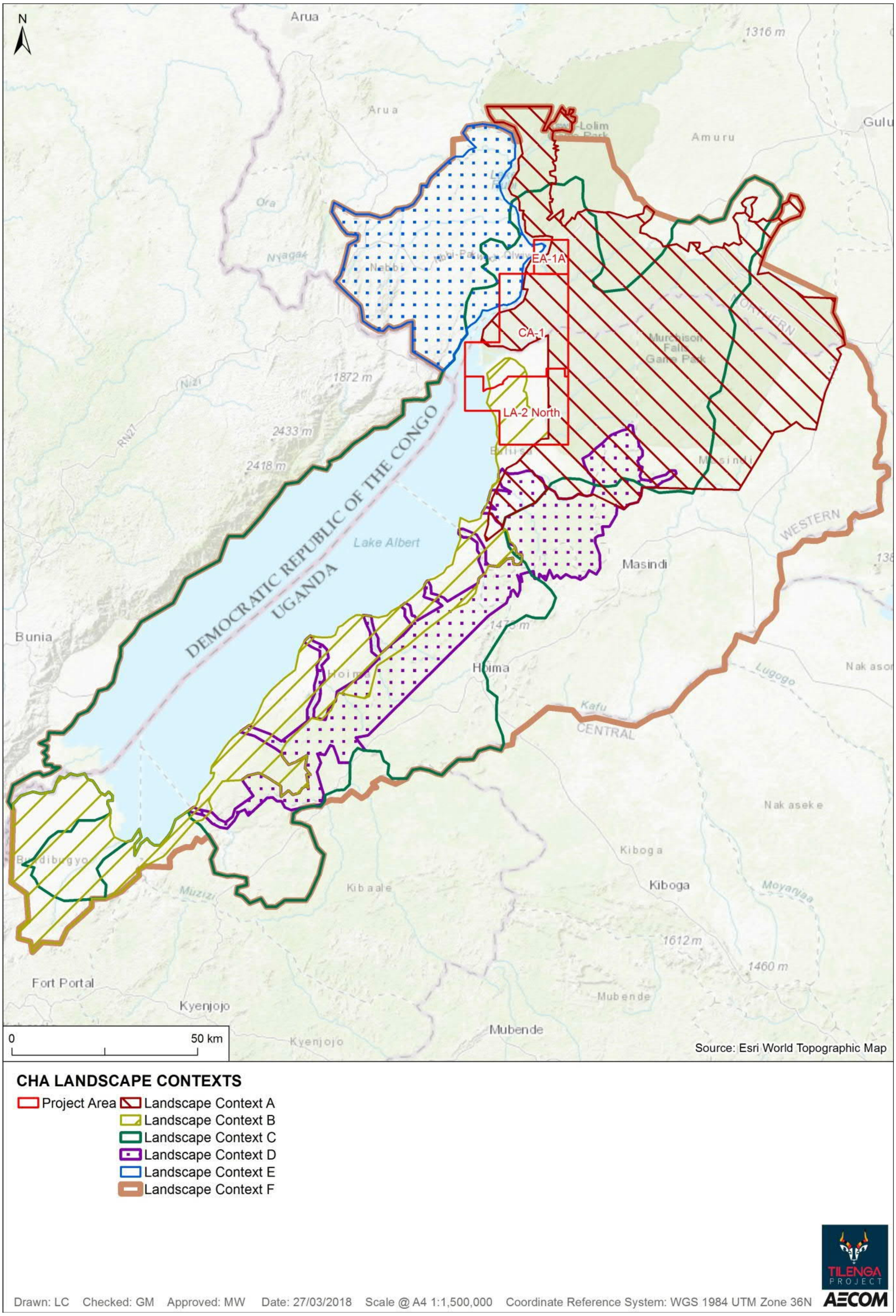

Figure 15-6: Landscape Contexts

Table 15-18: Freshwater Ecosystems and their Expected CHQS Species

Waterbody	Habitat description	CHQS expected to be present
Victoria Nile river	Large, moderately fast flowing watercourse. Approximately 350 m -650m wide and 1 – 6.5 m deep in areas sampled. Areas of slack water with a depth of less than 1m also exist in some locations. Substrate dominated by hard sandy clay and sand. Riparian areas include low lying floodplain and swamp, areas covered in papyrus mats, emergent swamp trees and bushes and grasses and woodland. In areas, this river is fringed by mats of the non-native invasive giant salvinia (*Salvinia molesta*), water hyacinth (*Eichhornia crassipes*) and blue water lilly (*Nymphaea caerulea*).	*-Citharinus citharus* *-Citharinus latus* *-Marcusenius victoriae* *-Thoracochromis wingatii* *-Synodontis victoriae*
Victoria Nile river Delta/Lake Albert	Vast delta expanse, with the Victoria Nile split into several channels on approach to Lake Albert, limited by islands of vegetation. Approximately 2 - 4 m deep. Water depth range at sampled sites 1.5 to 1.6 m. Vegetation: various including submerged species e.g. pondweed (*Potamogeton* sp); floating species e.g. the non-native invasive giant salvinia, water hyacinth, Nile cabbage (*Pistia stratiotes*), water spinach (*Ipomoea aquatica*); and .emergent flora e.g. grasses (*Vossia cuspidata*) fringing extensive expanses of papyrus sedge.	
Lake Albert	Lake Albert, standing open water. Open shore: Fishing community boat landing site. Lake with hard sandy and hard clay bottom from 0.9 m depth at the sampling site nearest to the shore and 4.3 m at 200 from the shore. However, online information, suggests that maximum water depth can reach up to 60m. Macrophyte community includes submerged pondweed species (*Potamogeton* sp.), a water nymph (*Najas horrida*), eelgrass (*Vallisneria* sp.)and water hyacinth (*Eichhornia crassipes)*	*-Citharinus latus* *-Mesobola bredoi* *-Marcusenius victoriae* *-Haplochromis spp.* *-Thoracochromis wingatii* *-Lates macrophthalmus* *-Oreochromis leucostictus* *-Synodontis victoriae* *-Bellamya rubicunda* *-Biomphalaria stanleyi* *-Ceratophallus bicarinatus* *-Ceratophallus faini* *-Gabbiella humerosa ssp. Alberti* *-Gabiella walleri*
Waiga/Waisoke Delta/	Extensive merged fringing floodplain of River Waiga/River Waisoke merged delta along Lake Albert. There was rich flora on the edge of Lake Albert, including Papyrus mats, stands of reeds (*Phragmites* sp,) grasses (*Vossia cuspidata*); swamp forest trees; plus floating & rooted submerged water plants. Water depth generally shallow far offshore: 0.8 to 1.2 m; hard bottom fine sand at Waiga	*-Citharinus citharus* *-Citharinus latus* *-Marcusenius victoriae*

Waterbody	Habitat description	CHQS expected to be present
	River mouth & dark muddy sand at Waisoke river mouth.	-*Haplochromis loati* -*Thoracochromis wingatii* -*Synodontis victoriae*
River Waiga	Shallow, relatively fast flowing river running through a narrow ravine, with different stream morphological features, including riffles and glide section (samples covered both areas). Wetted width approx. 4 m, depth >0.5 m. Brisk current; hard bottom with coarse sandy gravel, plus pebbles some smooth stones. Potential areas for refuge and spawning for potamodramous fish species. The channel was largely shaded by bankside trees and other vegetation thus no instream macrophytes were recorded.	
Zoliya	Floodplain and channel during wet season survey, with extensive wetland covered in shrubs and grasses (e.g. floating (hippo) grass (*Vossia cuspidata*).	
Sambiye	Dry channel, during both wet and dry season, with no evidence of being recently wet.	n/a
Ngazi	Dry channel, during both wet and dry season, with no evidence of being recently wet. Local community leader indicated the Ngazi had not had water for any length of time since the 1960s.	
Unnamed Watercourse	Seasonal tributary with perennial water in delta zone highly abundant with aquatic macrophytes dominated by the non-native invasive giant salvinia and water hyacinth. The watercourse drains vast Savannah grassland section of MFNP but holds water for very short periods during the wet season.	-*Citharinus citharus* -*Citharinus latus* -*Marcusenius victoriae* -*Haplochromis loati* -*Thoracochromis wingatii* -*Synodontis victoriae*
River Tangi	Site upstream of the Tangi Bridge. Heavily turbid water, silty substrate, with water levels less than 1m and slow flows during the wet season. River Tangi flows through extensive floodplain delta, which starts near to the sampling site.	-*Marcusenius victoriae* -*Oreochromis leucostictus*

15.6.4 Status and Distribution of Key Receptors

15.6.4.1 Critical Habitat Assessment and Interpretation

TBC and FFI completed an interpretation and results report (Ref 15.29), which follows on from the Critical Habitat screening exercise, and summarises and interprets the technical findings of the Critical Habitat Assessment (CHA). Seven threatened ecosystems in the project landscape qualify as Critical Habitat including Lake Albert, which is Critical Habitat not only for its threatened and range-restricted species, but because it supports key evolutionary processes. The findings of the Critical Habitat Assessment and Interpretation are summarised in Appendix O.2.

Landscape Context C (see Figure 15-6) comprises Lake Albert and fringing wetlands, including the Murchison Falls-Albert Delta Wetland System Ramsar Site and Waiga/Waisoke River floodplain, as well as many other smaller rivers and swamps. This area qualifies as Tier 1 Critical Habitat for many highly threatened and narrowly endemic fish and invertebrates (e.g. *A*lbert lates and *Gabiella walleri*). Please refer to Appendix O.2 for more information.

The desktop summary recognised a number of gaps in the known data with regards to distribution, habitat preferences and population numbers of many fish and macroinvertebrate due to data deficiency. Therefore, the status of CH-trigger fish species remains very poorly known; there are no recent records of a number of species; several may now be very rare, and locally or even globally extinct. It was determined that the priority is to establish a baseline that determines presence/absence and relative abundance of aquatic species. It was also considered to be valuable to establish individual species' ecological preferences, however, this was considered to be unfeasible as they are so scarce.

The CHQS identified in this report were used to inform the sensitivity and magnitude (interchangeable with the word character in this assessment) of impact within the Impact Assessment. Where no additional information was found in the Primary Surveys, a precautionary approach was taken to the impact assessment, as absence of records does not imply the feature is necessarily absent.

15.6.4.2 Fish

The Albertine Rift is a significant centre of endemism for aquatic biodiversity, and the Project landscape holds many species with restricted global ranges. However, details on population numbers/trends, habitat preferences and locations are rare, especially if the species is not important commercially.

Biodiversity studies completed by WCS (Ref. 15-27 & 15-28) aimed to generate and map baseline ecological data within the northern and southern areas of EA2 (focusing on Buliisa and Kaiso Tonya, respectively). This study covered all land use types as well as lake-fringe and wetland areas and focused on eight taxa, of which fish are relevant here.

Most of the fish encountered during the experimental fishing outlined in this study were juveniles suggesting that these habitats are important for recruitment, although the lack of adult fish may also be a result of overfishing pressures. The highest levels of relative species richness and diversity were recorded at the lake/river interfaces, which is expected due to the diversity of habitat types (e.g. still and fast flowing waters, shallow and deep areas etc.).

Seven species from the study were identified as endemic to Lake Albert and have been identified as priority species. These species are summarised in Table 15-19 below.

Table 15-19: Priority fish species recorded in this study

Species	Common Name	Global Status
Leptocypris niloticus	Nile minnow	LC
Haplochromis avium	n/a	NE
Haplochromis loati	n/a	DD
Haplochromis mahagiensis	n/a	NE
Thoracochromis wingatii	n/a	DD
Lates macrophthalmus	n/a	EN
Marcusenius victoriae	Victoria Stonebasher	LC

* NE (Not evaluated), DD (Data Deficient), LC (Least Concern), NT (Neat Threatened), VU (Vulnerable), EN (Endangered)

The report notes it is likely that the study did not recover all of the species present, due the spatial scope and extent of the survey. A number of species of conservation concern were therefore not encountered in this survey. Table 15-20 gives a complete list of the priority fish species known or considered likely to be present, and that are assessed as receptors in this chapter.

15.6.4.2.1 Ramsar Fisheries Studies

As part of the biodiversity baseline surveys prior to oil and gas activities by TEP Uganda, the National Fisheries Resources Research Institute (NaFIRRI) was commissioned to undertake a study of the fish populations in the Ramsar site area of MFNP. The study was carried out between April 2013 and March 2014 and focused on seven primary data collection sites within the exploration area of the Ramsar site. Commercial fisheries data was collected over the same period from two selected secondary data collection sites (Abok and Wanseko) close to the experimental sites.

Out of the 48 fish species encountered in the Study Area for the study period April 2013 to March, 2014 a total of 35 (73%) are categorized as LC (IUCN 2017). One fish species (*A*lbert lates) of the family Centropomidae and another (Victoria stonebasher) of family Mochokidea are categorised as EN and LC respectively and are two of the species already identified as CHQS.

Baseline studies suggest that the Victoria Nile area of the Ramsar site of the MFNP is a very important component of fish species and ecosystem biodiversity. The area supports a high diversity of fish species from which the local riparian populace derive their livelihoods. This study also suggested that avoidance features (24 breeding/nursery sites; Figure 15-2, see Ref 15.32) and avoidance periods with respect to survival of fish populations (six month spawning period between June and November) for keynote species in order to eliminate or mitigate any likely potential adverse impacts on fish, fish habitats and the local riparian populace.

This information has been used to inform appropriate mitigation measures within the Impact Assessment. Such measures include protecting the fish breeding sites from oil & gas activities as well as synchronizing these activities with periods that do not coincide with the breeding seasons for keynote fish species (see Figure 15-7).

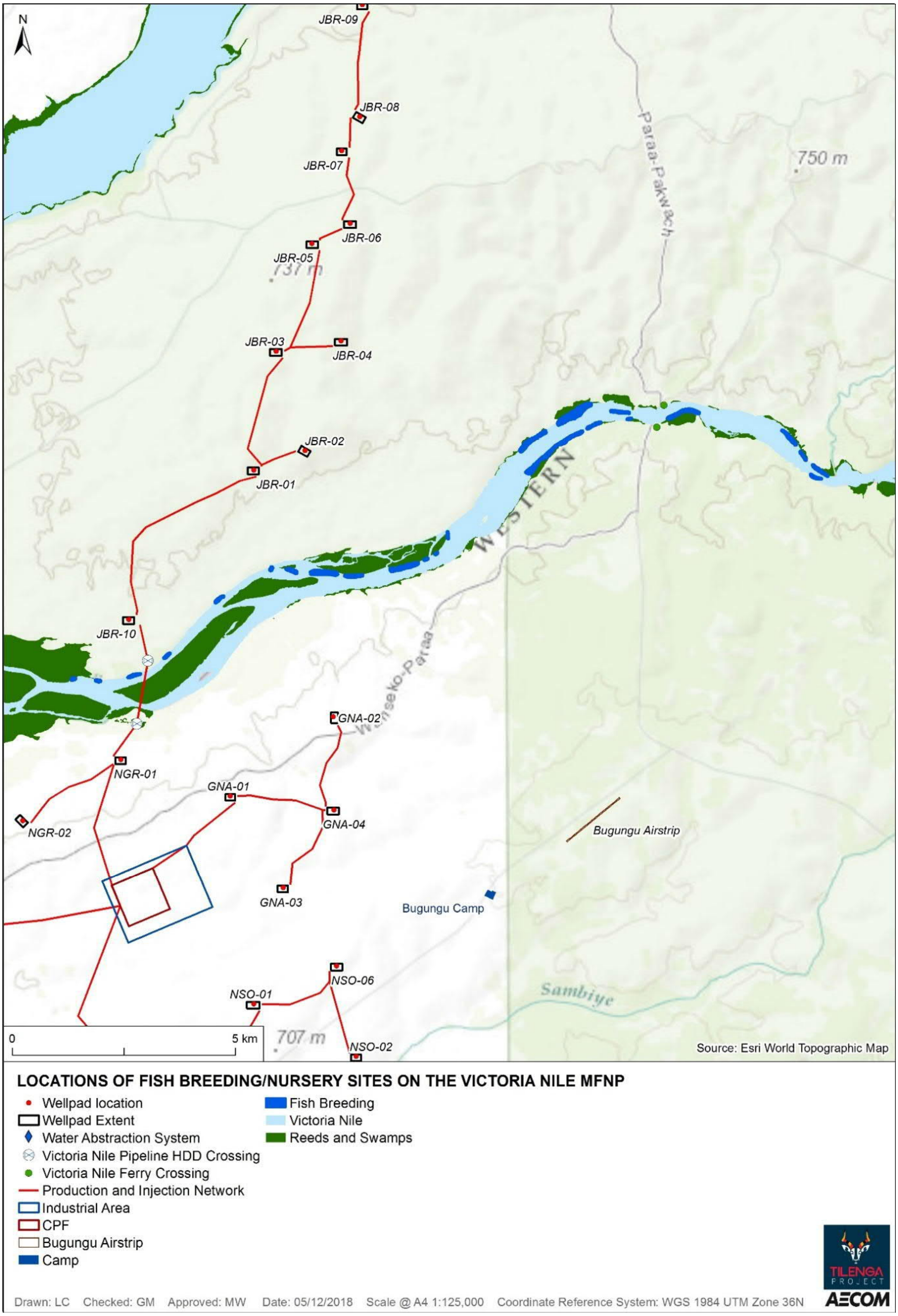

Figure 15-7: Locations of fish breeding/nursery sites on the Victoria Nile MFNP

In addition, two fish (*Haplochromis loati* and *Thoracochromis wingatii*) of the Cichlid family were identified, but available data is not sufficient to understand species conservation status, and therefore they are classified as data deficient (DD). The other nine fish species have not yet been evaluated (NE) for Red List classification, which is also assumed to be due to a lack of data. Four species found (*Albert lates*, *Neobola bredoi*, *Thoracochromis wingatii* and *Haplochromis loati*) are endemic to Lake Albert (Ref 15.12).

All species of fish considered to be endemic or with global status found within this study have been included as priority species within the Impact Assessment. Where species have not been evaluated and/or are data deficient a precautionary approach will be taken in the assessment.

This study focused on fish and did not record macro-invertebrate species, therefore, it has not informed the assessment for macroinvertebrates.

15.6.4.2.2 Quarterly report for Baseline Biodiversity Surveys of the Ramsar Delta Area (2017)

TEP Uganda contracted Biodiversity Solutions Limited to undertake a baseline study of the Delta Area of the Ramsar site. The one-year project with monthly surveys targets fishes, birds, crocodiles and other herptiles, and opportunistic records of mammals using the Ramsar site. Before this study, there has been no detailed study of the fish populations and invertebrate communities of the Delta area of Murchison Falls-Albert Ramsar site in Uganda. A total of 16 fish species, belonging to seven families were encountered in December 2017 compared to 21 species belonging to nine families encountered during the November 2017 survey. In October 2017, the period when the exploration survey was undertaken, a total of 11 fish species belonging to nine families were recorded.

The species encountered in December were dominated by *Enteromius prince* (14), the Wahrindi *Synodontis schall* (12), Armoured catfish *Auchenoglanis occidentalis* (10) and Nurse tetra *Brycinus nurse* (10). The two families Alestidae and Cyprinidae each represented by four species dominated the December survey while Family Polypteridae had the least. Overall, a total of 24 cumulative fish species have so far been recorded at all the ten transects since October 2017, with 11 species recorded in October, 21 in November and 16 December. During the December survey, two new additional species Assuan labeo *Labeo horie* and *Oreochromis leucostictus* were encountered compared to the ten recorded in November. As in the November survey, the Wahrindi was the most frequent species recorded at half of the study sites.

The 24 fish species recorded in the study area represent exactly 50% of the total number of species encountered in Upper Murchison Delta during the April 2013 to March 2014 fisheries baseline surveys Conducted by the National Fisheries Resources Research Institute (NaFIRRI, 2014). Most fish species so far encountered in the Delta, Murchison Fall-Albert Ramsar site are typical of Lake Albert fish (Greenwood, 1966, Worthington, 1929) and belong to three categories (LC = Least Concern, DD = Data Deficient and NE = Not Evaluated) of the IUCN Red List.

A total of 21 macro-invertebrates' taxa belonging to 23 families were recorded in December 2017, compared to the 24 taxa belonging to 16 families recorded in November 2017 and the 21 species of nine families recorded in October, 2017. Four taxa (*Oligochaeta, Byssanodonta parasitica, Sphaerium* spp., and *Chironomidae*) were the most dominant recorded at half of the ten sampled sites.

Generally, the macro invertebrate species recorded fall into the three broad categories of sensitive (*Heptageniidae, Polymitarcidae*, and *Gomphidea*), moderately sensitive (*Caenidae, Baetidae, Oligoneuridae, Tricorythidae, Dipseudopsidae, Econpmidae,* and *Hydropsychidae*), and the tolerant/non sensitive (*Unionidae, Mutelidae, Ceratopogonidae, Chironomidae*, and *Oligochaeta*). The results of macro-invertebrates' presence and abundance provide a quick indication of the status of the water quality as well as indicator species for future monitoring habitat alterations that may arise from the oil and gas development activities.

15.6.4.2.3 Migration and Conservation in the Lake Albert Ecosystem, International Institute for Sustainable Development (2015)

This report has identified that induced migration is playing a significant role in the deterioration of the Lake Albert ecosystem in Buliisa District. Migrants, mainly coming from neighbouring provinces in the DRC, are pulled to the region by the economic opportunities presented by the fishery. Expanding access to new markets, made possible by infrastructure investments linked to oil and gas exploration, have similarly increased demand for fish from buyers as far away as Kampala.

Evidence suggests that these two forces—increasing demand for fish and increasing supply of labour—have resulted in a fishery dangerously close to collapse: larger species of fish are increasingly rare, while the fish caught are of increasingly smaller size across species.

The structures and institutions governing the Lake Albert fishery in Buliisa District are key to addressing the impacts of migration on the ecosystem. The Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) is responsible for the formulation, review and implementation of national policies, plans, strategies and regulations pertaining to fisheries. More specifically, fisheries in Uganda are under the Department of Fisheries Resources (DFR), which has a mandate to promote, support and guide the fisheries sector, while also setting and enforcing the relevant standards and regulations. At the local level, DFR strategies and regulations are implemented in partnership with local co-management institutions. However, given the limited budget and manpower available at the district level, the implementation of DFR’s mandate in Buliisa District remains problematic.

In fisheries and in conservation biology, catch per unit effort (CPUE) is an indirect measure of abundance of target species. In the Lake Albert fisheries, the overall CPUE is believed to have been steadily declining, in particular for the larger and most commercially valuable species such as Nile perch and tilapia. However, while declines in CPUE have been reported in a variety of secondary sources, no quantitative data on CPUE trends over the past decade are available (Ref 15-13).

Fisheries co-management was first introduced to Uganda in the late 1990s. Beach Management Units (BMUs) were established to act as community fisheries management institutions registered with the DFR. However, evidence suggests that this initiative has been unsuccessful and unenforced.

Lessons can be learnt from the BMU initiative to help promote and enforce sustainable fisheries within Lake Albert and new initiatives should be enforced to ensure that Lake Albert remains a viable fishery. Evidence from this report suggests that overfishing poses the greatest risk to the Lake Albert aquatic ecosystem. Wide-spread poverty, rapidly growing populations and the lack of viable alternative livelihood strategies drive the unsustainable exploitation of the lake’s aquatic resources.

Evidence also suggests there are major data gaps and a lack of knowledge surrounding fish population numbers, distribution and habitat preferences. Therefore, a precautionary approach was applied to the Impact Assessment within this report.

This report helped inform the sensitivity of species within the Impact Assessment and also provided information on mitigation measures required for a sustainable fishery that have already been unsuccessful and need improving. Furthermore, it provides substantial evidence that induced impacts could pose a significant threat to sustainable fisheries in Lake Albert and connected waterbodies.

Fish species identified within the studies discussed above and outlined in Table 15-20 represent receptors likely to be affected by the Project, both directly and indirectly and therefore have been considered within the Impact Assessment as Priority Species.

Table 15-20: Priority fish species likely to be affected by the Project.

Fish	IUCN	PS6 Criterion	Landscape Context(s)		Reason for designation as a priority species
Lates macrophthalmus	EN	1ab, 2a	C		CHQS
Citharinus citharus	NE	1e	C		CHQS
Citharinus latus	LC	1e	C	A	CHQS
Synodontis victoriae	LC	1e, 2b	C	A	CHQS
Haplochromis albertiae	NE	2a	C		CHQS
Haplochromis loati	DD	2a	C		CHQS

Haplochromis mahagiensis	NE	2a	C		CHQS
Haplochromis avium	NE	2a	C		CHQS
Marcusenius victoriae	LC	1ab, 2a	C	A	CHQS
Thoracochromis wingatii	DD	2a	C		CHQS
Oreochromis leucostictus	LC	2b	C		CHQS
Synodontis afrofischeri	LC	2b	C	A	CHQS
Mesobola bredoi	NE	1e, 2a	C		CHQS
Barbus huloti	VU	-	C	A	VU according to IUCN Red List and Endemic to Lake Albert ecosystem

15.6.4.3 Aquatic Macroinvertebrates

A Nile Crossing Geotechnical Survey (Ref. 15-31), which studied the benthic (bottom sediment) macroinvertebrates was conducted in order to examine their baseline composition, abundance and distribution of species and communities. A composite sample comprising three samples of bottom sediment was collected at each of eight sampling points (labelled points 1 to 8) using a Ponar grab. At each point, water depth measured with a portable depth sounder and nature of sediment collected was recorded.

Nine (9) aquatic macroinvertebrate taxa were recovered from all of the eight sampling points. However, these were generally not identified to species level. Table 15-21, below, lists the taxa identified, none of which are designated on the IUCN, Ugandan Red List or highlighted of particular interest (i.e. they have not been found in the area before, or their conservation status is under review).

Table 15-21: Aquatic Macroinvertebrates recorded during Nile Crossing Geotechnical Survey ESIA

Taxa	Species (where identified)
Gastropoda	*Melanoides tuberculate*
Bivalvia	*Byssanodonta parasitica*
Ephemeroptera	*Baetis* sp.
Ephemeroptera	*Caenis* sp.
Ephemeroptera	*Tricorythodes* sp.
Odonata	*Gompoides williamsoni*
Trichoptera	*Psychomia* sp.
Diptera	Chironomidae
Diptera	Ceratopogonidae
Collembola	*Isotomerus palusitris*
Coleoptera	Elmidae
Oligocheata	*Nais* sp.

Additional data from the IUCN website has identified two species of mollusc recorded in Lake Albert (*Chambardia trapezia* and *Coelatura bakeri*) and a shrimp (Decapoda), *Limnocaridella alberti* categorised as Not Evaluated on the IUCN global Red List and/or the Uganda Red List when the report was produced.

A summary of the status of these macroinvertebrates is given in Table 15-22, below.

Table 15-22: Additional aquatic macroinvertebrate species identified from IUCN Website

Phylum	Common name	Scientific name	IUCN
Mollusca	n/a	*Chambardia trapezia*	DD
Mollusca	n/a	*Coelatura bakeri*	NT
Arthropoda	n/a	*Limnocaridella alberti*	DD

Priority Macroinvertebrate species identified (molluscs and freshwater shrimps) within the studies discussed and within the CHA and considered within the impact assessment are shown in Table 15-23.

Table 15-23: Priority Macroinvertebrate species likely to be affected by the Project

Mollusc	IUCN	PS6 Criterion	Landscape Context(s)		Reason for designation as a priority species
Chambardia trapezia	DD	-	C		Endemic to Lake Albert, but also found in Lake Victoria and Kyoga
Gabbiella candida	CR	Tier 1 (1a, b & 2a)	C		CHQS
Gabbiella humerosa ssp. *alberti*	NE	Tier 1 (1a, b & 2a)	C		CHQS
Bellamya rubicunda	NT	Tier 1 (2a)	C		CHQS
Biomphalaria stanleyi	NT	Tier 2 (2b)	C		CHQS
Ceratophallus bicarinatus	LC	Tier 2 (2b)	C		CHQS
Ceratophallus faini	DD	Tier 1 (2a)	C		CHQS
Gabiella walleri	NE	Tier 1 (2a)	C		CHQS
Coelatura bakeri	NT	Tier 2 (2b)	C	A	CHQS
Shrimp	**IUCN**	**PS6 Criterion**	**Landscape Context(s)**		**Reason for designation as a priority species**
Limnocaridella alberti	DD	Insufficient information to determine	C		Endemic to Lake Albert and possible CHQS

15.7 Impact Assessment and Mitigation

The following sections present the impact assessment relating to aquatic life. The assessment has been undertaken for the four distinct stages of the project as follows:

- Site Preparation and Enabling Works;
- Construction and Pre-Commissioning;
- Commissioning and Operations; and
- Decommissioning.

For each stage of the project the assessment sets out:

- The potential impacts on each of the defined receptors (this takes into account the embedded mitigation described above);
- The additional mitigation measures; and
- The residual impacts of the project, taking all mitigation measures (embedded and additional) into account. The assessment considers the direct and indirect impacts of each stage of the project.

For most stages of the project activities are often the same and therefore the impacts will be quite similar. In order to minimise repetition of text, the assessment has largely been undertaken in tabular form with additional commentary where necessary, to highlight differences of potential impacts, mitigation and residual impacts between phases, where these differences can be defined.

The tables included in the assessment provide a summary of the impact assessment. However, the reader is asked to refer to the detailed assessment for each identified species of conservation concern, which is included in the tables in Appendix P.

These extended tables include information on individual receptor ecology and sensitivities and provide a discussion of potential and residual impacts for each species

Based on the assessment of residual impacts further mitigation may be required in line with the overall commitment for this project to comply with the requirements of IFC PS6, to ensure no net loss of natural habitat and net gain of critical habitat that is lost or compromised by the project, even after all additional mitigation is taken into account.

15.7.1 General Approach

This section describes how the impact assessment has been undertaken for aquatic life based on the standard methodology outlined in ***Chapter 3: ESIA Methodology*** which has been modified for biodiversity specifics.

In order to undertake the assessment it is necessary to understand the likely effects of the Project and the receptors that may be affected by it. The assessment concentrates on aquatic life species and habitats of greatest conservation concern.

15.7.2 Receptor Sensitivity

Based on the information collected from literature, data collection and field surveys, the ESIA has assigned a sensitivity value (very high / high / medium / low / negligible) to each identified species, protected area or Landscape Context present, or likely to be present within the Project's AoI.

These are very largely based on their conservation status in terms of whether they are considered to be or contain species or habitats of conservation concern.

The sensitivity of receptors has been defined based on a combination of vulnerability (e.g. level of extinction risk) and irreplaceability (e.g. relating to issues of species considered to have a restricted range). Extinction risk has been defined based on the IUCN Red List of Threatened Species (Ref. 15-12) and the Uganda Red List (2016) (Ref. 15-9).

In combination with information about the character of the impact, the significance of the impact(s) on the identified receptor can be determined.

For this assessment the main categories of receptor sensitivity/importance have been based on those identified as part of the CHA process. Receptor value categories have therefore been defined as follows in Table 15-24.

Table 15-24: Receptor Sensitivity

Receptor Sensitivity	Selection Criteria
Very High	• Legally protected and internationally recognised areas (Class I and II), such as Ramsar sites, Important Bird and Biodiversity Areas (IBA), the MFNP, wildlife reserves, or areas of high biodiversity value (including some Forest Reserves (FR)) that meet the criteria for such designation, irrespective of whether or not they have yet been designated. • Critically Endangered (CR) and Endangered (EN) species (PS6 Criterion 1: Tier 1). • Endemic/ Restricted Range Species (PS6 Criterion 2: Tier 1). • Migratory/Congregatory Species (PS6 Criterion 3: Tier 1).
High	• Legally protected and nationally recognised areas, such as wildlife reserves, or areas of high biodiversity value (including some FR) that meet the criteria for such designation, irrespective of whether or not they have yet been designated. • Critically Endangered (CR) and Endangered (EN) species (PS6 Criterion 1: Tier 2). • Endemic/ Restricted Range Species (PS6 Criterion 2: Tier 2). • Migratory/Congregatory Species (PS6 Criterion 3: Tier 2). • Highly Threatened and/or Unique Ecosystems (PS6 Criterion 4). • Key Evolutionary Processes (PS6 Criterion 5).
Moderate	• Sites that are of regional importance such as Community Wildlife Management Areas. Regionally important areas that may meet the published ecological selection criteria for designation, but are not designated as such. • Species not meeting the criteria for 'high', but are assessed by IUCN and/or are listed on the Ugandan Red as Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD), whichever is the higher category. • A regularly occurring, locally significant number of a regionally important species. Or species which is legally protected. • Features functioning as wildlife corridors or migration routes but which may not be designated or protected.
Low	• Areas of habitat considered to appreciably enrich the habitat resource within the context of the area, e.g. species-rich grassland, less usual ecological features, but with no protected status of designation. • A significant population of a locally important species. Sites/features that are scarce within the locality or which appreciably enrich the local area's habitat resource. • Species that do not meeting the criteria for 'high' or 'medium' but are notable for other reasons (e.g. of socio-economic importance).
Negligible	• Areas of low ecological value such as modified or disturbed habitat with low species diversity or concentrations with no priority species known to be present. • Species that are common and widespread.

15.7.3 Impact Magnitude

Once the sensitivity of a particular receptor has been identified it is then necessary to determine the changes/activities and potential impacts on the receptor. To determine the magnitude of impacts the following four parameters have been considered:

- Extent;

- Severity;
- Duration; and
- Permanence.

These parameters are defined below.

Extent: relates to the location and proportion of the feature's area or population in the landscape that is expected to be impacted by the Project.

Severity: is a measure (or estimation) of how severe the impact could be on that proportion of the population or location defined by the scope. Such parameters would include extent of habitat degradation, loss of integrity of protected areas (including connectivity) and changes ranging from disturbance to measurable demographic extent on species populations.

Duration: is defined by whether the impact is short term, temporary or long term.

Permanence: defines the expected capacity for the species to recover once the cause of the impact has been removed. This includes the time it might take for population or status to recover and also what proportion of that impact will also be reversible.

This assessment has therefore been undertaken with reference to Table 15-25, where the character of each impact is defined based on consideration of the various parameters (scope, severity, duration, permanence).

Table 15-25: Impact Magnitude assessment criteria

Magnitude	Assessment Criteria
High Adverse	**Scope:** 20% or more of the feature's population and/or distribution within the Project AoI will be affected by the impact. **Severity:** Complete loss or severe degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Change may result in a reduction in conservation status (as defined by IUCN) of the species or habitat. **Duration:** The impact will be long term (10 to 20 years) or permanent. **Permanence:** The impact cannot be reversed within 10 years of its cause ceasing and/or where less than 30% of the population / areas lost / habitat quality will be fully recovered / restored.
Medium Adverse	**Scope:** between 10 to 20% of the feature's population and/or distribution within the AoI will be affected by the impact. **Severity:** Moderate degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Change likely to result in change in conservation status of the species or habitat. **Duration:** The impact will be temporary and medium term (between 5 and 10 years). **Permanence:** The impact can be reversed to baseline levels within 5 years of the activity causing the impact having ceased and/or less than 60% of the population / areas lost / habitat quality will be fully recovered / restored.
Low Adverse	**Scope:** Up to 10% of the feature's population and/or distribution within the AoI will be affected by the impact. **Severity:** Insignificant degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. Change will not be enough to result in change in conservation status of the species or habitat. **Duration:** The impact will be temporary and short term (between 1 and 5 years). **Permanence:** The impact can be reversed to baseline levels within 2 years of the activity causing the impact having ceased and/or less than 90% of the population / areas lost / habitat quality will be will be fully recovered / restored.

Magnitude	Assessment Criteria
Negligible	**Scope:** Less than1% of the feature's population and/or distribution within the AoI will be affected by the impact. **Severity:** No discernible degradation or disturbance of ecological function, species population, habitat coverage or functionality, or protected site integrity, including connectivity, will occur. **Duration:** The impact will be temporary and short term (less than 1 year). **Permanence:** The impact can be reversed to baseline levels within 2 years of the activity causing the impact having ceased and will be fully reversed and restored.

15.7.4 Assessment of Impacts

Impacts of the Tilenga Project on aquatic life have been determined by comparing the sensitivity of the receptor against the character of the impact. This comparison is done using a modified ESIA assessment method comprising a cross-referencing matrix, as shown in Table 15-26 below. Due to the nature of the environment where the Project is located, it has been necessary to extend the standard impact significance matrix to allow for an extra category in determining the receptor sensitivity, thus the impact significance matrix deviates slightly from the standard approach presented in ***Chapter 3: ESIA Methodology***.

Table 15-26: Impact Assessment Matrix

	Impact Magnitude			
Receptor Sensitivity	**Negligible**	**Low Adverse**	**Medium Adverse**	**High Adverse**
Negligible	INSIGNIFICANT	INSIGNIFICANT	INSIGNIFICANT	LOW
Low	INSIGNIFICANT	INSIGNIFICANT	LOW	MODERATE
Medium	INSIGNIFICANT	LOW	MODERATE	MODERATE
High	LOW	MODERATE	MODERATE	HIGH
Very High	LOW	MODERATE	HIGH	CRITICAL

As discussed above, the significance of impacts has been determined based on a combination of the sensitivity of the receptor and the predicted character of the potential effect. Based on this approach an impact of moderate, high or critical indicated on the assessment matrix is regarded as a potentially **Significant** impact.

In following this framework the assessment of significance has also been informed by the most recent Chartered Institute for Ecology and Environmental Management, 2016, Guidelines of Ecological Impact Assessment (CIEEM) (Ref. 15-41). These use the principle of valuing an ecological resource at a defined geographic scale, but advocating that impacts are evaluated simply as Significant or not Significant for the geographic level at which the ecological resource is valued.

15.7.4.1 Data gaps and limitations

As with any impact assessment there will inevitably be data gaps and other uncertainties that cannot be filled prior to submission of the assessment. This is particularly the case with a complex and large-scale project such as this, which is likely to have direct and/or indirect impacts on a wide range of receptors and priority species.

Therefore assessment approach undertaken is to try to be pragmatic about the information that is available and to employ the **precautionary principle** in all cases. For example, if there are records of a particular priority species being present in an area or habitat type, but our surveys have not found it, the assessment does not disregard this species, but assume that the fact it was not found, does not mean it is not there.

Therefore as noted we have used the precautionary principle in defining the sensitivity of priority species and their habitats, as well as the likely magnitude of impact that may occur as result of the direct and indirect effects of the project.

Determining the level of potential impact consequently indicates the level and focus of mitigation that will be required in order to manage residual impacts; the level of residual impacts will determine what further monitoring and surveys will be required in order to manage the impacts on these receptors and this will be identified in the ESMP, which is discussed separately in this ESIA ***Chapter 23: Environmental and Social Management Plan***.

15.7.4.2 Receptors and their Sensitivity

This section summarises the receptors that will be considered in the assessment section of this chapter. It is necessary to identify these explicitly because the assessment needs to define what the likely impacts of the Project will be on specific receptors, so that where necessary specific mitigation can be developed.

As part of the mitigation activities this will involve planning and long term management for some of the receptors and therefore it is important to understand as clearly as possible and in specific terms what needs to be managed, what the priorities for management are and what the practicalities will be. This is particularly important where long term management of impacts on particularly receptors will be required in order to mitigate residual impacts of the project that remain after other mitigation activities have been considered.

This section is structured to reflect the requirements and receptor types (criteria) defined by PS6 and draws heavily on the findings of CHA. In addition, other receptors have been included if found in the baseline surveys and are of conservation concern (IUCN Red list or endemic), which although not strictly an IFC requirement should be considered in terms of general biodiversity value within the AoI. Impacts on Natural Habitat have also been assessed, as this is a PS6 requirement.

Receptors are summarised in a series of tables with their level of sensitivity defined, based on the criteria discussed above.

The assessment considers impacts at a variety of levels which are interlinked and therefore these receptors have not been considered in ecological isolation, but considered in the context of habitats and biodiversity generally. Nevertheless, our aim is to try to present the assessment as simply as possible so that it is clear what receptors are being affected most significantly by the project. This is necessary because it will help to define what management of direct and indirect impacts and on which receptors will be required in order to mitigate those impacts during Site Preparation and Enabling Works, Construction and Pre-commissioning and Commissioning and Operations, as well as during the Decommissioning phase (and possibly beyond).

Table 15-27, Table 15-28 and Table 15-29 summarise the species that have been defined as receptors for the purposes of this assessment. The table gives the IUCN status of each species, its PS6 criterion and the landscape context with which it is generally associated. Based on these parameters and with reference to Table 15-26 above, the sensitivity of each receptor is then defined.

Table 15-27: Fish Receptor Species

Fish	IUCN	PS6 Criterion	Landscape Context(s)		Location	Receptor Sensitivity
Globally-threatened Criterion 1, Tier 1 Critically Endangered and Endangered Species						
Lates macrophthalmus	EN	1ab, 2a	C		Records indicate it is endemic to Lake Albert, and restricted to the single lake ecosystem (Lake Albert) where it is confined to waters deeper than 18 m	VERY HIGH
Criterion 1, Tier 2, Critical Habitat-Qualifying Species thought likely to occur in/near project footprint						
Citharinus citharus	NE	1e	C		Restricted to Lake Albert	HIGH
Citharinus latus	LC	1e	C	A	Lake Albert and affluent rivers	HIGH
Synodontis victoriae	LC	1e, 2b	C	A	Victoria Nile, possible Lake Albert and tributaries.	HIGH
Criterion 2, Tier 1 & 2, Endemic/Restricted range species Restricted range species for which there are species point location records in the study area.						
Haplochromis albertiae	NE	2a	C		Restricted to Lake Albert	VERY HIGH
Haplochromis loati	DD	2a	C		Records indicate very limited distribution, with records in Uganda limited to Lake Albert	HIGH
Haplochromis mahagiensis	NE	2a	C		Endemic to Lake Albert	VERY HIGH
Haplochromis avium	NE	2a	C		Endemic to Lake Albert	VERY HIGH
Marcusenius victoriae	LC	1ab, 2a	C	A	Victoria Nile, Lake Albert and its tributaries	HIGH
Thoracochromis wingatii	DD	2a	C		Lake Albert and tributaries.	VERY HIGH
Oreochromis leucostictus	LC	2b	C		Records from Lake Albert and Nile Basin.	HIGH
Criterion 2, Tier 1 & 2, Endemic/Restricted range species Restricted range species for which there are no species point location records in the study area.						
Synodontis afrofischeri	LC	2b	C	A	Known from Victoria Nile	HIGH
Mesobola bredoi	NE	1e, 2a	C		Lake Albert, rivers and wetlands	HIGH
Other priority species						
Barbus huloti	VU	-	C	A	Records indicate limited distribution in East Africa, endemic to Lake Albert and affluent rivers. Limited habitat and ecological information	MEDIUM

Table 15-28: Mollusc Receptor Species

Mollusc	IUCN	PS6 Criterion	Landscape Context(s)	Location	Receptor Sensitivity
Criterion 1, Tier 1 & 2 Critical Habitat Qualifying					
Gabbiella candida	CR	Tier 1 (1a, b & 2a)	C	Lake Albert	VERY HIGH
Gabbiella humerosa ssp. *alberti*	NE	Tier 1 (1a, b & 2a)	C	Endemic to Lake Albert	VERY HIGH
Criterion 2, Tier 1 & 2, Endemic/Restricted range species Restricted range species for which there are species point location records in the study area.					
Bellamya rubicunda	NT	Tier 1 (2a)	C	Recorded as occurring up to 18 m in depth in Lake Albert. Endemic to Lake Albert.	VERY HIGH
Biomphalaria stanleyi	NT	Tier 2 (2b)	C	Endemic to Lake Albert, found with vegetation in shallow parts	HIGH
Coelatura bakeri	NT	Tier 2 (2b)	C A	This species said to be restricted to Lake Albert. Most records are found in the north and found in shallow waters above 10-15 m depth. However, records of this species were found in the Victoria Nile during the Primary survey	HIGH
Criterion 2, Tier 1 & 2, Endemic/Restricted range species Restricted range species for which there are no species point location records in the study area.					
Ceratophallus bicarinatus	LC	Tier 2 (2b)	C	Recorded up to 18 m deep in Lake Albert	HIGH
Ceratophallus faini	DD	Tier 1 (2a)	C	Endemic to Lake Albert	VERY HIGH
Gabiella walleri	NE	Tier 1 (2a)	C	Endemic to Lake Albert found between 8 - 40 m deep	VERY HIGH
Other priority species					
Chambardia trapezia	DD	-	C	Endemic to Lake Albert	HIGH

Table 15-29: Shrimp Receptor Species

Shrimp	IUCN	PS6 Criterion	Landscape Context(s)	Location	Receptor Sensitivity
Other priority species					
Limnocaridella alberti	DD	Insufficient information to determine	C	Endemic to Lake Albert	HIGH

It is a PS6 requirement for protected habitats to be included within the impact assessment. Murchison Falls-Albert Delta Wetland System has been considered in this chapter as it is a Ramsar site. This habitat includes the Victoria Nile, part of Lake Albert and associated streams and fringing wetlands. MFNP is considered within ***Chapter 13: Terrestrial Vegetation***. Lake Albert has also been assessed as it is considered to be Critical Habitat based on its threatened and endemic species and also because it supports key evolutionary processes. Table 15-30 summarises Murchison Falls-Albert Delta Wetland System Ramsar and Lake Albert as habitat receptors.

Table 15-30: Natural Habitat Receptors

Natural Habitat	Designations	Description	Sensitivity
Murchison Falls-Albert Delta Wetland System	Ramsar Site	Site covers an area of 17,293 ha, stretching from the top of Murchison Falls to the Albert Delta. It lies predominantly within the MFNP, although a small area along the southern edge is outside the park. The site was designated as it supports rare (uncommon), vulnerable (classified as facing a threat such as hunting) and endangered (in severe decline) species of birds. It also supports the largest known population of the Nile crocodile in Uganda, and a number of indigenous fish species and is a spawning ground on which fish stocks depend (Byaruhanga and Kigoolo, 2005). The river contains several sandbanks and Papyrus islands.	VERY HIGH
Lake Albert	Forms part of MFNP	Lake Albert is one of Africa's Great Lakes and is located in the centre of the continent on the border between Uganda and the Democratic Republic of the Congo. The lake is approximately 160km long and 30km wide. Lake Albert is Critical Habitat not only for its threatened and endemic species, but because it supports key evolutionary processes. Water is a crucial ecological feature in this landscape, driving ecological process and patterns and essential for ecological function	VERY HIGH

15.7.4.3 Project Activities

Having defined the receptors it is necessary to understand how the Project activities and components will be likely to interact with them. The Tilenga Project is a complex project that includes a number of inter-linking elements. Project components will be constructed over a number of years and operated for even longer, with ultimately decommission and restoration.

Many of the project's component sites are similar and there is considerable repetition of processes and structures. However, the overall combined impact of those components also needs to be taken into account, particularly where such components are located near each other in similar habitat. In such situations the combined effects of project infrastructure can have broader effects over the project's various landscapes and the populations of species that inhabit them.

Furthermore, there may be indirect impacts on identified receptors caused or induced by the project, or by facilities or processes associated with the project. Such impacts may occur away from the actual footprint of the Project and may not be easy to identity or separate out from other impact-causing activities in the environment, which may not be directly associated with the Project.

An overview of the design of the Project is provided in ***Chapter 4: Project Description and Alternatives***. However, it is necessary to isolate and describe those elements of the project that are likely to interact with (and therefore impact on) the ecological receptors that have been identified in this chapter. The Project will have four phases comprising:

- *Site Preparation and Enabling Works*, which is expected to take approximately 2 to 3 years;
- *Construction and Pre-Commissioning*, which is expected to take 7 years, between Years 2 and 8;
- *Commissioning and Operations*, which is expected to commence around end of year 3. The lifetime of the Project is 25 years; and
- *Decommissioning*, which is planned for the end of the 25 year operation.

The Project activities that are likely to occur during each of the Project's four phases, derived from the Project Description, are summarised in Table 15-31 below.

Table 15-31: Project Activities which may lead to potential impacts

Phase	*Activity*
Site Preparation and Enabling Works	Mobilisation of plant and construction vehicles to the Project Site
	Site clearance and land preparation across the Project Area, including for the Industrial Area, wellpads, lake abstraction facility, Victoria Nile Ferry crossing, and new roads and tracks
	Earth works and civil works at well pads, Industrial Area, Water Abstraction system (WAS)
	Transportation of construction personnel to and from the Project Site, physical presence of construction personnel
	Waste generation, storage and disposal (hazardous and non-hazardous)
	Disposal of treated waste water (grey and black)
	Lighting emissions
	Installation of facilities at Victoria Nile Ferry Crossing (i.e. containers)
	Construction of Victoria Nile Crossing Facility, including piling for the jetties
	Discharge of surface runoff from roads
	Physical movement of vehicles and plant (WAS and Victoria Nile Ferry Crossing Facilities)
	Deliveries of materials and supplies (including fuel and other hazardous substances) to the Project Site
	Refuelling of plant and machinery within Project Site
	Storage of fuel and hazardous materials
	Use of water to suppress dust generation
	Construction of new access roads (W3, C1, C3, N1, N2, inter field access roads south of the Victoria Nile) and upgrade works of existing roads (A1, A2, A3, A4, B1 and B2) including the installation of drainage
	Water borehole drilling and water abstraction
Construction and Pre-Commissioning	Site clearance for the Production and Injection Network
	Construction of Production and Injection Network and WAS pipeline RoW including trenching, assembling of the pipeline, welding, pressure testing, storage of material, backfilling etc.
	HDD activities at the Victoria Nile Crossing (on a 24/7 basis)

Phase	*Activity*
	Pre-commissioning activities (e.g. hydrotest) including use and disposal of treated water and associated chemicals
	Restoration of Projection and Injection Network RoW, WAS pipeline RoW and HDD Construction Area
	Mobilisation of plant and construction vehicles to the Project Site
	Transportation of construction personnel to and from the Project Site, physical presence of construction personnel
	Deliveries of materials and supplies (including fuel and other hazardous substances) to the Project Site
	Increased vehicle movements on the local and national road network
	Abstraction of water (ground and surface) for use at well pads, camps and Masindi Vehicle Check Point for drilling, construction, domestic, washing and dust suppression purposes
	Operation and discharge from temporary SuDS drainage system (including use of storm water facility)
	Discharge of treated waste water from Waste Water Treatment plant
	Waste generation, storage and disposal (hazardous and non-hazardous)
	Refuelling of plant and machinery within Project Site
	Storage of fuel and hazardous materials
	Drilling at the well pads (on a 24/7 basis)
	Construction activities at the Industrial Area and WAS
	Movement of construction vehicles for Production and Injection Network RoW, WAS pipeline RoW and HDD Construction Area
	Physical movement of construction vehicles and plant within the Project Site
	Transportation of materials and supplies including hazardous substances (i.e. drill cuttings) within the Project Site
Commissioning and Operations	Transportation of operational personnel to and from the Project Site
	Delivery of materials and supplies (including fuel and other hazardous substances) to the Project Site
	Physical movement of vehicles and plant within the Project Site
	Abstraction of water from boreholes for domestic, washing and dust suppression purposes

Phase	*Activity*
	Abstraction of water via the WAS for re-injection purposes
	Waste generation, storage and disposal (hazardous and non-hazardous)
	Discharge of treated waste water from Waste Water Treatment plant
	Storage of fuel and hazardous materials
	Refuelling of plant and machinery within Project Site
	Lighting emissions from Industrial Area, well pads (during work over activities only)
	Operation and maintenance of WAS
	Operation and maintenance of the Victoria Nile Ferry
	Discharge of surface runoff from all permanent facilities via drainage system (SuDS)
	Waste generation, storage and disposal (hazardous and non-hazardous)
Decommissioning	Dependent upon Decommissioning strategy - but expected to be of a similar nature to those for Construction and Pre-Commissioning.

15.7.4.4 Overview of Potential Direct and Indirect Impacts

As can be seen from Table 15-31, the routine and unplanned activities may impact on aquatic life in a variety of ways. However, these can be condensed into four main types that are listed and summarised in general terms in Table 15-32 below.

Note that there is a certain amount of overlap between impact types, for example where loss, degradation or fragmentation of habitats will have an effect on species populations, but the aim was to try to separate out further the causes of impacts for the assessment. In addition, in a technical sense barrier effects could be regarded as ‘disturbance’. However, because the Project comprises linear or interconnected infrastructure elements, for the purposes of this assessment barrier effects has been included as a separate category of impact.

Table 15-32: Potential Direct Impacts on Aquatic Life

Potential Direct Impacts on Aquatic Life (Covers All Phases)
<u>Loss, degradation or fragmentation of species habitat</u>
1. Direct loss of habitat from establishment of well pads, roads and other components such as Victoria Nile Ferry infrastructure and water abstraction pipeline 2. Soil erosion at adjacent habitats from site drainage or flooding 3. Smothering of adjacent habitats from dust, concrete or other material 4. Changes to seasonal wetlands or other habitats due to surface and groundwater changes 5. Introduction of alien or invasive plant species 6. Contamination of surface waters with oils, chemicals or other hazardous substances 7. Wastewater management issues
<u>Population Changes</u>
1. Species mortality due to a reduction in water quality and/or quantity and impingement and entrainment at lake Albert water abstraction facility 2. Species mortality as a result of ingesting contaminants/pollutants washed/drained from land into water bodies 3. Loss of breeding areas and/or disruption of breeding behaviours 4. Reductions in prey or loss of feeding areas 5. Destruction or disturbance of spawning and nursery areas
<u>Disturbance</u>
Disturbance can be created by following activities: 1. Visible human presence 2. Lighting and night-time working 3. Vehicle movements 4. Noise and vibration from Victoria Nile pipeline, abstraction point and Victoria Nile Ferry crossing 5. Pollution of water resource 6. Barrier Effects (see below)
<u>Barrier Effects</u>
1. Road construction (culverts and bridges) and traffic levels creating a barrier for smaller streams and rivers 2. Pipelines creating a barrier to fish migration 3. Positioning of physical project components 4. Fragmentation of smaller waterbodies and seasonal wetlands due to the construction of access tracks and development of well pads

In addition to potential direct impacts of construction and operation of the Project, there are likely to be indirect or induced impacts. These will relate mainly to increased pressures on natural resources due to the influx of workers, their economic dependents and others to the area. Such an influx will also attract people providing ancillary goods and services to those workers, and with improved access to the region, for example if there are road improvements, this will exacerbate those pressures. These are highlighted in Table 15-33.

Table 15-33: Potential Indirect Impacts on Aquatic Life

Potential Indirect Impacts on Aquatic Life (Covers All Phases)
Loss, degradation or fragmentation of species habitat
1. Wastewater management issues leading to poor water quality 2. Increased pressures on natural resources such as water may reduce water/habitat availability 3. Land use changes, resulting in loss of vegetation and therefore, increase in surface water run-off and degradation of habitats 4. Induced activities such as unsustainable fishing practices and land clearance degrading habitat and water quality. 5. Increase in pollution entering surface waters such as general waste/plastic
Population Changes
1. Species mortality from unsustainable fishing practices using gillnets and trawling techniques. Not only as a direct result of fishing, but also an increase in discarded nets unintentionally killing aquatic species.
Disturbance
1. Species mortality from unsustainable fishing practices using gillnets, trawling and dredging techniques 2. Disturbance from dredging shoreline areas for mollusc shells 3. Increases in noise and light pollution from fishing activities 4. Increase in fishermen boat/human traffic on the lake/wetlands
Barrier Effects
None known

15.7.4.5 Embedded Design Mitigation

A list of relevant embedded mitigation measures already built into the design of the Project are outlined within ***Chapter 4: Project Description and Alternatives***. These measures have been taken into account when predicting the significance of the potential impact. A summary of those embedded mitigation measures particularly relevant to Aquatic Life is provided within Table 15-34 below.

Table 15-34: Embedded Mitigation Measures for Aquatic Life

Embedded Mitigation Measures for Aquatic Life
All fuels and hazardous materials will be stored with appropriate containment including impermeable areas, kerbing, bunding and drip trays.
Chemicals and hazardous liquids will be supplied in dedicated tote tanks made of sufficiently robust construction to prevent leaks/spills. Dedicated procedures will be developed for fuel and hazardous material transfers and personnel will be trained to respond. Spill kits will be available at all storage locations
Main refuelling facilities will be located within the Industrial Area, the camps and the Masindi Vehicle Check Point. Facilities will be located within bunded areas with appropriate capacity (110% tank containment). The refuelling pumps will be equipped with automatic shut off and there will be dedicated procedures and spill kits available. Bunds will be designed to minimise ingress of surface water, facilities roofed where practicable and any contaminated water collected will be trucked off site for disposal
With the exception of the CPF which has a bespoke drainage arrangement, drainage arrangements for the permanent facilities will be as follows: • Potentially contaminated areas (i.e. fuel and chemical storage areas) will be provided with local effluent collection (sumps, kerbing and bunding) whereby the potentially contaminated water will be collected and

Embedded Mitigation Measures for Aquatic Life
removed by road tanker to a licenced waste disposal facility; and • Uncontaminated areas which will drain naturally to the environment via Sustainable Drainage System (SuDS) comprising filter drains and soakaways. The SuDS design is subject to further detailed design. Sampling points will be established for all potentially contaminated areas to enable samples to be collected for analysis
Lighting will be reduced to the minimum and its design consider need to limit associated nuisances (e.g. light directed inwards, of warm/neutral colour) without impacting safety and security
Each well pad will include an emergency pit with capacity for up to 50 cubic metres (m3) for use should there be an unplanned event i.e. blowout. The pit will be lined and covered to prevent rainwater ingress
The pipelines will comprise carbon steel with adequate corrosion allowance built into material specifications (wall thickness) to prevent leaks
An anticorrosion coating will be applied for external protection and a corrosion inhibitor will be injected for internal protection
The Production and Injection Network outside the Industrial Area will be buried at least 0.8m below the ground surface; markers will be used to denote the location (including the water abstraction pipeline in Lake Albert)
The drainage arrangement of the CPF will be designed to segregate clean and potentially contaminated effluent streams
Once operational, there will be restricted access either side of the intake pipeline location in Lake Albert
Drainage channels will be installed along the edges of the upgraded roads to prevent excessive runoff and cross drainage culverts will be installed, as required. All drainage infrastructure will be designed taking into account the Uganda Ministry of Works and Transport - Road and Bridge Works Design Manual for Drainage (January 2010) (Ref 4.2)
All site clearance activities will be undertaken in line with the Site Clearance Plan which will be developed by the Contractor(s) prior to commencing the Site Preparation and Enabling Works Phase to limit extent of vegetation clearance
Surface water will be managed via temporary sustainable drainage systems (SuDS) to manage flood and contamination risk. The requirements for construction SuDS will be adapted depending on the nature of the activities utilising the principles as outlined in Chapter 23: Environmental and Social Management Plan
During site clearance, vegetation stripping will be undertaken using a phased approach to minimise sediment pollution from runoff
Buffer zones will be established to protect watercourses and habitats
Contaminated run off will be minimised by ensuring adequate storage facilities are in place for materials stockpiles, waste, fuels/chemicals/hazardous materials, vehicles/washing areas, parking facilities
Clean surface water will be diverted away from exposed soils with use of diversion drains and bunds
All dewatering from excavations or isolated work areas will be provided with appropriate level of treatment prior to discharge
Implementation of a Dust Control Plan, which will include: o Measures to include the application of dust suppressants (including water), on potentially dust generating sources, including on site and off site roads used by Project vehicles and material stockpiles; o Water will be sprayed onto the roads and work sites to supress dust generation, where necessary. Water

Embedded Mitigation Measures for Aquatic Life
will be provided at the work sites and mobile water bowsers will be available to control dust generation; o Activities likely to generate dust (e.g. drilling powders use and transfer) will be enclosed and dust catchers in place when practicable; o Trucks carrying potentially dusty material will be covered, to reduce fugitive dust emissions from the materials being transported; o Roads used by Project vehicles will be maintained, to the extent that this is possible, to reduce fugitive dust emissions associated with surface dust being disturbed by the passing of traffic; and o Concrete batching materials to be stored in sealed silos with the batching area regularly watered down to supress dust emissions.
The topsoils will be removed to a required depth; material will be temporarily stored areas within designated areas
It is planned to reuse removed soil onsite or for borrow pits restoration. Through detailed design, the Project will ensure the generation of excess material is minimised
All drill cuttings from borehole drilling activities will be collected and disposed of appropriately. Disposal methods will be pre-agreed with NEMA prior to commencement of activities
Flow meters will be installed on all boreholes to measure flow, water level and quality
The Project Proponents are aware of the need to employ water efficiency measures throughout the lifetime of the Project; they will consider water reduction measures.
The installation of boreholes across the Project Area is subject to the outcome of the Water Abstraction Feasibility Study currently being undertaken by the Project Proponents
Pre-commissioning water (used for pipeline cleaning and hydrostatic tests) will be reused. The base case for management of hydrostatic test water is for the treated water to be left in situ until start up. Final disposal will be determined and selected depending on water quality and available discharge options. The base case for ESIA is that water left in the pipeline from hydrotesting will be disposed of via the Produced Water Treatment Train and transferred back via the Production and Injection Network to the well pads for re-injection, subject to further technical assessment
Synthetic Based Muds will be transferred from the Liquid Mud Plant to the well pads via truck in dedicated sealed containers to reduce the risk of spillage during storage, handling and transportation operations
Spent muds will be temporary stored in containers prior to removal by a vacuum truck, waste cuttings will collected via augers to the Roll-on Roll-off (Ro-Ro) skips (or equivalent) and transferred off the well pad for treatment and disposal
Disposal of drill cuttings will be in accordance with Ugandan Legislation and IFC Environmental Health and Safety (EHS)
Ditch plugs will be installed on all trenches to prevent the pooling of water in the trenches
Prior to starting HDD activities a risk assessment will be undertaken to identify the necessary design of the HDD tunnels including appropriate tunnelling and slurry management practice to control groundwater ingress and minimise slurry loss from the tunnel into surrounding aquifers/surface waters
The temporary land required for the HDD Construction Areas will be restored following construction in line with the Site Restoration Plan as developed by the Contractor
Any residues and wastes generated from pre-commissioning activities will be managed in accordance with the site Waste Management Plan
For any chemical usage [with respect to pre-commissioning], a thorough Chemical Risk Assessment will be

Embedded Mitigation Measures for Aquatic Life
undertaken and lowest toxicity chemicals will be used wherever possible
[Decommissioning of Masindi] All wastes will be removed and disposed of at dedicated waste treatment facilities in accordance with the Waste Management Plan. A detailed Decommissioning Plan will be developed for the works during the Site Preparation and Enabling Works Phase of the Project
Commissioning tests will be undertaken using feedstock oil, natural gas, methanol and chemicals. All commissioning fluids will be managed either at CPF or transferred off site for disposal
A dedicated Pipeline Integrity Management System will be implemented during the Commissioning and Operations Phase. This will include regular preventative maintenance including operational pigging, intelligent pigging and inspection campaigns to monitor the status of pipelines
The chemicals used for polymer injection will be subject to detailed environmental risk assessment prior to use taking into account all chemical /biological properties and the specific requirements for early oil recovery use
The ferry will operate for 8 hours a day and will be dedicated to Project use only. There will be no ferry movements during night time hours except in exceptional circumstances and with internal derogation
A review of relevant studies, if necessary, will be undertaken during the Commissioning and Operations Phase to confirm that the planned decommissioning activities utilise good industry practices and are the most appropriate to the prevailing circumstances and future land use
The Project Proponents will obtain all relevant approvals and authorisations for all decommissioning activities from the GoU departments responsible at the time
In general, the following principles will be adopted where practicable and will be subject to detailed assessment prior to decommissioning: • Above ground infrastructure will be removed to 0.5 m below ground level and backfilled and vegetated; • Access roads may be left in place depending upon the subsequent use of the land; • Shallow foundations for infrastructure may be excavated, demolished and disposed of; • Where piled foundations exist, these may be excavated to a depth of 1 m below the existing ground level and removed; • Excavations resulting from the removal of foundations will be backfilled; • It is expected that pipelines will be cleaned, capped and let in situ, to prevent disturbing the reinstated habitats; and • Where the environment assessment identifies it is acceptable, in some locations pipeline sections may be cleaned, reclaimed and re-used.
During the Decommissioning Phase the following assumptions are applicable regarding supporting facilities: • Water will be supplied from dedicated abstraction boreholes; • Localised effluent collection facilities will be provided for chemical storage, hazardous materials storage, liquid waste storage, tanks, and fuelling facilities. Such containment will include impermeable areas, kerbing, bunding and drip trays; • Drainage systems will remain until sites are free of contamination. SuDS will also manage flood risk during this phase of work; • No discharge of water used for decommissioning activities will be discharged to the environment; • Sewage will be treated by existing wastewater treatment plants (WWTPs) and discharged in accordance with wastewater treatment standards as presented in Chapter 10: Surface Water or collected and transferred to suitably licensed treatment facilities for processing and disposal; • Lighting will be reduced to the minimum and its design consider need to limit associated nuisances (e.g. light directed inwards, of warm/neutral colour) without impacting safety and security; • A Construction Support Base will be constructed within the Industrial Area for use during the Decommissioning Phase; • For power generation, a centralised diesel generator package including back up facilities will be located at the Construction Support Base to service the decommissioning activities within the Industrial Area. Dedicated generator packages of varying sizes will also be mobilised to provide the power at discrete locations

Embedded Mitigation Measures for Aquatic Life
including the Lake Water Abstraction System, well pads and pipeline decommissioning sites; and • Waste will be segregated and managed in accordance with a Waste Management Plan.
Depending on the final land use agreed with the Ugandan authorities, all or part of the site may need to be rehabilitated. In such circumstances, the Project Proponents will also develop a monitoring programme for completion criteria to verify that the sites are being returned to the agreed representative state.
A Waste Management Plan will be developed and maintained to cover the duration of the Project; and will address the anticipated waste streams, likely quantities and any special handling requirements. The Project Proponent's will implement a waste tracking system to ensure traceability of all wastes removed off site.
Prior to transfer offsite to a licensed waste treatment facility, waste materials will be segregated and stored in appropriate containers to prevent: • Accidental spillage or leakage; • Contamination of soils and groundwater; • Corrosion or wear of containers; • Loss of integrity from accidental collisions or weathering; • Theft; and • Odour and scavenging by animals.
The existing camps have operating Waste Water Treatment Plants (WWTPs). Sewage produced from the camps will be treated at the WWTPs in compliance with regulatory requirements (refer to Chapter 10: Surface Water). Sewage from other Project Areas (e.g. road work sites) will be collected and transferred to WWTPs and/or suitably licensed treatment facilities for processing and disposal. All sewage sludge will be removed periodically from WWTPs and transferred off site for disposal
A flow meter will be integrated at the discharge point of the WWTPs to record to all discharges and a sample point will be established to collect spot samples for analysis
For the Masindi Vehicle Check Point, waste will be collected and transferred to an approved waste treatment facility for recycling, treatment, recovery and/or disposal
Sewage produced from the camps and other Project Areas will be treated at the WWTPs located at the camps in compliance with regulatory requirements (refer to Chapter 10: Surface Water). Wastewater from the well pads will be collected and transferred by tanker to the nearest WWTPs
For the Masindi Vehicle Check Point, sewage will either be treated by a wastewater treatment plant on site and discharged in accordance with the wastewater treatment standards presented in Chapter 10: Surface Water or transferred to the Masindi sewage treatment plant for processing (depending on capacity and approval)
During the Commissioning and Operations Phase waste will be stored and processed at the Integrated Waste Management Area located south of Victoria Nile. There will be no waste management facility located north of the Victoria Nile within the MFNP
For the well pads, Victoria Nile Ferry Crossing Facility and the Lake Water Abstraction System, sewage will be collected and transferred to suitably licensed treatment facilities for processing and disposal
Avoidance of sensitive features to minimise the footprint when siting options for key facilities, taking into account both environmental and social sensitivities. The Project Proponents initiated their own avoidance protocol which was used by the FEED Engineers in the development of the Project's design.

15.7.4.6 Additional Mitigation

The agreed embedded mitigation will be implemented as part of the project to the sequence of the mitigation hierarchy as set out in IFC PS6. However, it is likely that further additional mitigation will be identified through the assessment process, and, where relevant, this is discussed through the assessment sections below.

It should be clear that the 'additional mitigation' measures are not meant to be just recommendations for mitigation but are commitments made as an integral part of the Project.

Taking both the embedded and the additional mitigation into account will define the residual environmental impacts of the Tilenga Project.

Where required, further detail on mitigation measures will need to be developed in a series of topic-specific Management Plans drawing on the ESMP. In some cases, further work will be required to consider various mitigation options before selection and implementation of the most appropriate option.

Note that, except where explicitly stated, mitigation for closure and decommissioning of the Project is not considered in detail in this assessment, because the necessary measures will be developed during the operational life of the field development and are not known at the present time. However, impacts are likely to be similar to the Construction and Pre-Commissioning phase, with the end point being removal of project components and restoration of habitats.

It is intended that additional mitigation will be flexible and that feedback on the success of mitigation measures, such as offsetting, will be reviewed in order to ensure that the defined and agreed mitigation objectives are actually achieved. As indicated above, these will be reviewed during the detailed design phase to ensure their adequacy in mitigating the potential impacts.

Where it is determined though monitoring that overall the mitigation measures have not been successful or have fallen short of objectives, then remedial actions will be identified and undertaken as soon as the deficiency is identified.

15.7.5 Assessment of Impacts: Site Preparation and Enabling Works

15.7.5.1 Introduction

Fish and macroinvertebrates species are highly sensitive to changes in water quality and quantity, and also reliant on plant species for shelter and food. Therefore, potential impacts that directly influence water quality may influence these species.

Fish and macroinvertebrates may potentially be at risk from hydrological changes and increases in particulates or nutrients present in run-off from the Project Area and AoI. Fish species may be impacted due to potential loss of habitat, changes to the hydraulic regime, increases in sediment loading, and potentially increased human interaction and fishing. Similarly, macroinvertebrates may be impacted due to loss of habitat, changes to the hydraulic regime, increases in sediment loading, and potentially increased anthropogenic effects.

The Site Preparation and Enabling Works Phase is described in detail in ***Chapter 4: Project Description and Alternatives***. The main activities during this Phase of the Project with the potential for impacts on aquatic life are outlined in Table 15-31 above.

Potential direct impacts based on these activities have been divided into four main potential direct as outlined in and are described below.

15.7.5.2 Potential Impacts – Site Preparation and Enabling Works

15.7.5.2.1 Loss, degradation or fragmentation of species habitat

During the initial Site Preparation and Enabling Works phase there will be considerable clearance of vegetation and preparation for the subsequent phases of the project. Clearing of vegetation means there may be an increase in potential for sediment run-off into nearby waterbodies, as a smaller root system will increase sediment mobilisation.

Access tracks will be built including the construction of the piers for the Victoria Nile Ferry crossing and well-pad areas cleared, with soil and subsoil stockpiled for later use as required. Significant potential impacts may occur where new roads cross waterbodies and suitable drainage is not in place.

Similarly, a potential increase in suspended sediments may occur as plant moves across the Site mobilising sediment especially during the dry season where the influence of dust may be substantial. Works within or close to the Victoria Nile and associated Ramsar site may impact on various species through direct loss of their habitat, for example, migratory fish species that breed or visit these permanent wetland areas, especially in shallow water areas. Where water suppression techniques are used, there may be an increase potential of sediment laden water entering the surrounding surface waterbodies.

Site clearance may directly affect seasonal wetlands, shallow spawning and nursery grounds and other sensitive areas. Of particular concern is potential damage to seasonal wetlands where these may be crossed by access tracks, which could affect the hydrology of these wetland areas, as well as disturbing species which may inhabit these areas during construction activities. Additionally, tracks and pipelines may cause fragmentation of surface water bodies.

During the Site Preparation and Enabling Works phase there is also potential for habitat to be affected by construction activities outside of the immediate project footprint. Either as a result of works or plant straying beyond the defined footprint of the works, or through run-off or spreading of dust or pollution, species habitats are smothered, lost or otherwise degraded.

Storage and delivery of fuels and hazardous substances increases the potential for accidental spillage and for these substances to enter waterbodies. This could have a detrimental impact on aquatic life, such as loss of species (fish and macroinvertebrates) and/or habitat. Chemicals may pollute the surrounding waterbodies making them uninhabitable for aquatic species and increasing mortality.

15.7.5.2.2 Population changes

The introduction of intensive human activity within the MFNP may potentially impact on population levels of a number of species. Potential disturbance issues, such as noise from construction activities may influence population numbers of species occupying the shallow waters of Lake Albert, the Victoria Nile or smaller rivers and wetlands.

Increased numbers of humans into protected areas may also increase the spread of invasive species such as Giant salvinia, which could have a detrimental impact on habitat availability for fish and macroinvertebrates. Species could be fragmented and/or mortality could increase.

15.7.5.2.3 Disturbance

Disturbance during Site Preparation and Enabling Works, activities such as access road creation, installation of piers, well-pad clearance and other excavations has the potential to disturb fish and macroinvertebrate populations, particularly during the wet season when fish are occupying seasonal streams and wetlands.

Of particular concern is works near sensitive areas such as the Victoria Nile, which contains a large number of spawning and nursery areas for fish in shallow, marginal waters. The presence of humans and construction activities may increase disturbance via pollution or in case of illegal fishing, but also the installation of piers using piling techniques. There may indeed be an increased disturbance to aquatic species from the noise and vibration of the pier construction for the Victoria Nile Ferry crossing point.

15.7.5.2.4 Barrier Effects

Site clearance and construction of well pads, access roads and other infrastructure may create barriers to the natural connection of surface water bodies and therefore, there is the potential to fragment aquatic species populations.

15.7.5.2.5 Indirect Impacts

A number of species of conservation concern are not recorded in the direct project areas but are present in protected areas (PA) within the wider Project AoI, such as Lake Albert (Landscape Context C). Human population changes induced by the Project, where workers' economic dependents and others are attracted to the wider area may potentially impact on habitats and species populations. In addition, construction of 'critical oil roads' as associated infrastructure will enable easier access for people and vehicles.

These population changes would be likely to cause land use changes and degradation of habitats, illegal fishing, mollusc shell dredging, land clearance (increasing erosion) and the introduction of invasive species. New and upgraded roads and other access improvements in the region will enable people to enter more easily and potentially impact on rivers and wetlands during this phase.

If no additional mitigation is in place, negative effects on aquatic species may include a reduction of water quality through an increase in suspended solids or hazardous substances within the aquatic environment, smothering macroinvertebrates, fish gills, eggs, larvae and spawning/nursery areas for fish. Additionally, light penetration may be reduced, minimising visibility and the capability of fishes to feed. A reduction in light penetration could also have limiting effects on macrophyte growth, reducing habitat and food for fish as well as macroinvertebrates. These potential impacts may increase fish and macroinvertebrate mortality, ultimately reducing population numbers.

15.7.5.2.6 Overview of potential impacts

Table 15-35 summarises the potential direct and indirect significance of impacts of this phase of the works on CHQS and other priority species. Without additional mitigation there is the potential for Significant adverse impacts on most species.

Table 15-35: Significance of Potential Direct and Indirect Impacts (without additional mitigation) during Site Preparation and Enabling Works Phase

Fish	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Potential Impact Magnitude	Potential Impact Significance
CHQS					
Lates macrophthalmus	C	VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	NEGLIGIBLE	LOW ADVERSE
Citharinus citharus	C	HIGH		LOW	MODERATE ADVERSE
Citharinus latus	C A	HIGH		LOW	MODERATE ADVERSE
Haplochromis albertiae	C	VERY HIGH		LOW	MODERATE ADVERSE
Haplochromis avium	C	VERY HIGH		LOW	MODERATE ADVERSE
Haplochromis loati	C	HIGH		LOW	MODERATE
Haplochromis mahagiensis	C	VERY HIGH		LOW	MODERATE ADVERSE
Marcusenius victoriae	C A	HIGH		LOW	MODERATE ADVERSE
Mesobola bredoi	C	HIGH		LOW	MODERATE ADVERSE
Oreochromis leucostictus	C	HIGH		LOW	MODERATE ADVERSE
Synodontis afrofischeri	C A	HIGH		LOW	MODERATE ADVERSE
Synodontis victoriae	C A	HIGH		LOW	MODERATE ADVERSE
Thoracochromis wingatii	C	VERY HIGH		LOW	MODERATE ADVERSE
Other priority species					
Barbus huloti	C A	MEDIUM	As above	LOW	LOW ADVERSE
Mollusc	**Landscape Context**	**Sensitivity**	**Potential Direct and Indirect Impacts**	**Potential Impact Magnitude**	**Potential Impact Significance**
CHQS					
Bellamya rubicunda	C	VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	LOW	MODERATE ADVERSE
Biomphalaria stanleyi	C	HIGH		LOW	MODERATE ADVERSE
Coelatura bakeri	C A	HIGH		MEDIUM	MODERATE ADVERSE
Ceratophallus bicarinatus	C	HIGH		LOW	MODERATE ADVERSE
Ceratophallus faini	C	VERY HIGH		LOW	MODERATE ADVERSE
Gabbiella candida	C	VERY HIGH		LOW	MODERATE ADVERSE

Fish	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Potential Impact Magnitude	Potential Impact Significance
Gabbiella humerosa ssp. *alberti*	C	VERY HIGH		LOW	MODERATE ADVERSE
Gabiella walleri	C	VERY HIGH		LOW	MODERATE ADVERSE
Other priority species					
Chambardia trapezia	C	HIGH	As above	LOW	MODERATE ADVERSE
Shrimp	**Landscape Context**	**Sensitivity**	**Potential Direct and Indirect Impacts**	**Potential Impact Magnitude**	**Potential Impact Significance**
Other priority species					
Limnocaridella alberti	C	HIGH	As above	LOW	MODERATE ADVERSE
Natural Habitat	**Landscape Context**	**Sensitivity**	**Potential Direct and Indirect Impacts**	**Potential Impact Magnitude**	**Potential Impact Significance**
Murchison Falls–Albert Delta Wetland System Ramsar Site	n/a	VERY HIGH	See Protected Area Summary in Appendix P	MEDIUM	HIGH ADVERSE
Lake Albert	n/a	VERY HIGH	Reduction in water quality due to site clearance	LOW	MODERATE ADVERSE

The assessment of potential impacts, prior to additional mitigation, for the Site Preparation and Enabling Works indicates that there are potentially Significant impacts for a number of receptors within Landscape Contexts A (MFNP) and C (Lake Albert, rivers and wetlands) and also Murchison Falls–Albert Delta Wetland System Ramsar Site and Lake Albert natural habitats. This is a reflection of the sensitivity of the receptors located within the Project Area and AoI. This stage of the project includes most of the site clearance and earthworks, therefore, there is the potential for impacts associated with run-off and increase in suspended solids and/or spillages of hazardous substances. Similarly, direct disturbance and potential degradation of habitats and/species located in close proximity to the proposed piers, associated with the Victoria Nile Ferry crossing, is possible.

15.7.5.3 Additional Mitigation and Enhancement

15.7.5.3.1 Additional Mitigation and Enhancement: Direct Impacts

Potential Direct impacts on aquatic life will be further reduced using the measures presented in Table 15-36.

Each mitigation measure has been assigned a reference number for ease of reference throughout the ESIA. All mitigation measures are also outlined in the ESMP Mitigation Checklist contained with Appendix T. As indicated above, these will be reviewed during the detailed design phase to ensure their adequacy in mitigating the potential impacts

Table 15-36: Additional Mitigation Measures

No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
AL.1	A Biodiversity and Ecosystem Services Management Plan (BMP) will be developed, ensuring that impacts of site clearance on plant species of conservation concern will be minimised.	X	X	X	X
AL.2	The Site Clearance Plan will be developed to structure and schedule clearly site clearance activities, noting any constraints.	X	X		
AL.3	A Site Restoration Plan for the project will be developed and will be updated prior to commencement of every stage of the Project.	X	X	X	X
AL.4	Works and traffic/plant movement will maintain strict adherence to agreed footprint design including access roads and other infrastructure.	X	X	X	X
AL.5	Dust control measures will be implemented at each site and access road to prevent smothering of adjacent habitats (as outlined within the Air Quality and Climate chapter). Dust emissions will be strictly controlled via adhering to the operating procedures set out in the Dust Control Plan.	X	X	X	X
AL.6	Landforms, slopes and drainage from sites and access roads will be designed to prevent erosion of adjacent soils and impacts on habitats, as discussed in the Chapter 8: Geology and Soils.	X	X	X	X
AL.7	Land-based effluent / runoff will be controlled to prevent sedimentation and pollution as defined in Soils and Geology and Surface Water chapters.	X	X	X	X
AL.8	Temporary 'bogmats', riprap bridges and other measures to reduce compaction or erosion of soils and habitat degradation during wet conditions will be utilised.	X	X		X
AL.9	Spill Prevention and Oil Spill Contingency Plans will be developed and implemented; as defined under Chapter 4: project description and alternatives, Chapter 20: Unplanned events and Chapter 23: ESMP.	X	X	X	X
AL.10	Water abstraction and activities at other locations will ensure that they do not affect groundwater base flow to wetlands (including wallows and watering holes) and other habitats resulting in degradation of those habitats. Flow rates and residual recharge rates will be sufficient to sustain sensitive habitats. To achieve this, water abstraction points will be carefully selected, as defined in Chapter 9: Hydrogeology. In addition, all water abstraction activities will comply with the requirements of water abstraction permits.	X	X	X	X
AL.11	Construction techniques will allow unimpeded shallow groundwater and surface water flow where they have to cross seasonal watercourses (for example between JBR-01 & JBR-10; JBR-03 & JBR-04; around JBR-09; between JBR-08 and JBR-09), through use of culverts and permeable layers, avoiding compaction of soils.	X	X		
AL.12	Care will be taken not to cause compaction of ground near wetlands resulting in hydrological or hydrogeological changes that may affect those habitats.	X	X		X

No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
AL.13	Use of concrete or other impermeable surfacing material at sites will be minimised. These materials will be used only at those areas that absolutely require it.	X	X	X	
AL.14	Herbicide will not be used at any Project location. Control of 'weeds' will be undertaken by hand weeding or use of permeable matting or other standard weed control measures.	X	X	X	X
AL.15	A risk-based Alien/Invasive Species Management Plan will be developed and implemented	X	X	X	X
AL.16	Pipeline trenches will be designed to ensure that they do not become preferential flow paths for groundwater, particularly where they cross seasonal wetland areas or terrain, which comprises catchment for wallows or waterholes. This could comprise placement of impermeable backfill (clay or similar) at certain locations within the trench to prevent lateral movement of water within the pipeline alignment.	X	X		X
AL.17	For Project areas that cross seasonal wetlands/rivers, construction works will take place in the dry season as much as possible. This is to prevent disruption of surface water / shallow groundwater flow thus affecting habitats as well as disturbing the animals relying on those wetlands. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts	X	X		X
AL.18	The detailed Site Restoration Plan will be implemented and at each site this will be monitored for success of vegetation establishment (i.e. where plants do not take successfully), erosion issues and presence of invasive species to ensure that all sites are effectively restored. Where such problems are encountered, further planting, site reprofiling and other remedial measures will be taken to ensure that site restoration is completed satisfactorily to the agreed standard or coverage and plant composition, which should match reasonably the sounding vegetation by the end of the restoration process.	X	X		X
AL.19	For areas of the Project that cross seasonal wetlands/rivers decommissioning works will take place in the dry season as much as possible. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts				X
AL.20	When roads intercept key crossing points for certain species (e.g. amphibians near wetlands), design consideration should include need to maintain crossing path as much as practicable.	X	X		
AL.21	Piling and other activities generating noise and vibration will be 'ramped up' (slow started) to allow wildlife to move away in good time.	X	X		X
AL.22	For works taking place in or near the Ramsar site, a buffer will be established around identified sensitive features where no works will take place, as defined in the Avoidance Protocol. Should it not be possible, appropriate mitigation measure shall be developed to minimise adverse impacts	X	X		X
AL.23	An Environmental Monitoring Programme will be established. This will include comprehensive monitoring associated with water, noise, air quality, etc as defined in the respective chapters of the ESIA.	X	X	X	X

No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
AL.24	Ensure spill response equipment (including sampling and personal protective equipment) is readily available on site to contain and clean any spillages, and containment/clean up undertaken after the event.	X	X	X	X
AL.25	Procedures and protocols for operating water vessels (barges) and ferries will be formulated and implemented. Water vessels will travel at reduced speeds while travelling along watercourses to reduce risk of disturbance of wildlife and collisions.	X	X	X	X
AL.26	The footprint of the HDD will be minimised to avoid unnecessary loss of wetland/riparian habitat.		X		
AL.27	Further mitigation for the flowline across the seasonal river between JBR-09 and JBR-08 will be considered. This is a deep gully and bridging may be required.	X	X		
AL.28	Halt hydro-testing if leakage is detected and remediate any pollution of soil or water		X		
AL.29	As indicated in Chapter 8: Geology and Soils, Where required, settlement areas and silt traps will be provided downstream of the construction areas to remove or filter out sediment originating from access tracks or construction site drainage and protect water courses, wetlands, drainages. The most appropriate sedimentation and siltation control measures will be designed prior to excavation during the construction period, and will be dependent on site-specific characteristics. This will reduce any potential detrimental impacts on fish and macroinvertebrates.	X	X		X
AL.30	Workers will be prohibited from collecting shells, timber, firewood, fibres and other plant based resources.. Fishing by workers will not be permitted. Ensure control at the camps and work sites.	X	X	X	X
AL.31	Where feasible, activities scheduling for barge construction should consider avoiding disturbance during migratory fish season (October to March approximately)	X	X		
AL.32	A Chemical Management Plan will be developed that will describe the selection, transport, storage and usage processes as well as mitigation measures against releases or toxic effects and spill contingency measures in case of spills. The plan will be based on the results of Chemical Risk Assessment.	X	X	X	X
AL.33	Develop and implement a Spill Prevention Plan, incorporating appropriate containment for liquids contained on site	X	X	X	X
AL.34	Construction of facilities in a floodplain will be avoided. Where unavoidable, appropriate mitigation measure shall be developed to minimise adverse impacts.	X	X		
AL.35	Any work in watercourses and wetlands will be avoided in periods of heavy rainfall. Where unavoidable appropriate mitigation measure shall be developed to minimise adverse impacts.	X	X		X
AL.36	A Wetland Management Plan will be established to ensure no disruption to wetland areas. The main measures will comprise avoiding and minimising impacts on wetlands and restricted exclusion zones.	X	X	X	X

No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
AL.37	Pre-construction surveys will be perform to confirm the extent and state of identified wetlands.	X	X		
AL.38	Construction activities within 200 m for lake (Lake Albert) and 100 m for a river (River Nile) will be avoided. Should they be unavoidable, a permit for use of river banks and lake shores will be applied for activities within those zones (for Water Abstraction System, HDD crossing, Nile River Ferry Crossing)	X	X		X
AL.39	Activities scheduling will consider seasonal sensitivities of Priority Species as much as practicable. In any case, Project shall ensure that disturbance to sensitive discrete areas at any one time is minimised, and that wide areas, free of works, are maintained to allow animal movements and any other potential mitigations are investigated	X	X		
AL.40	Site layout (storage and refuelling area) will be planned considering location of nearest ground and surface water receptors	X	X	X	X
AL.41	Abstraction and discharge permits will be obtained.	X	X	X	X
AL.42	Ensuring compliance to the abstraction and discharge limits permitted	X	X	X	X
AL.43	Non-toxic paints will be used to treat the pipeline to minimise any impacts on the aquatic environment as much as practicable.		X	X	
AL.44	A screen with a mesh size of 2mm will be used to reduce/prevent entrainment of aquatic species at the abstraction point in Lake Albert.		X	X	
AL.45	Testing and Monitoring of the water intake will take place during pre-commissioning to ensure that intake velocities and activities at the Water Abstraction System (WAS) are not having a detrimental impact on fish. Any infringement or issues discovered will be addressed accordingly and appropriately prior to start-up of abstraction.		X		
AL.46	Based on UK guidance the intake velocity of the WAS should not exceed 75cms-1 for larger fish species and should be lower than this to reduce impingement of smaller fish (Ref 15.43). At present based on the proposed pipe size and abstraction rate, the estimated escape velocity is 49cms-1		X	X	
AL.47	In locations where tracks, roads and/or pipelines cross smaller surface water bodies such as the River Tangi, crossing options/methods (e.g. bridges, culverts etc.) will be assessed and the most appropriate implemented.	X	X		
AL.48	A pilot scheme for wetland restoration will be linked to the Restoration Plan - developed in partnership with WMD and DWRM.	X	X	X	X

No.	Additional Mitigation Measures	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
AL.49	Before decommissioning, a Decommissioning Management Plan will be prepared and agreed with NEMA and other relevant agencies prior to the commencement of any on-site works. It will include details on the methods and activities associated with the decommissioning of the infrastructure, including the transportation and final disposal or re-use strategy for Project components and wastes. Completion criteria will be detailed in the management plans.				X
AL.50	Biodiversity codes of conduct for workers will be developed, which can be disseminated to economic dependents and others that may be able to enter Protected Areas. This may require punitive measures if not complied with	X	X	X	X
Al.51	As defined in Chapter 7: Noise, For work activities located close to noise sensitive receptors, a range of specific noise mitigation measures shall be implemented to minimise impacts. Such measures shall be implemented on a case by case basis and may include the use of temporary abatement such as dampening and shielding techniques, noise barriers, and mufflers. Specific noise regulations and thresholds will be specified in the Noise and Vibration Management Plan	X	X	X	
AL.52	Decommissioning activities to be confined within the Project footprint				X

Additional mitigation measures also relevant to aquatic life can be found within ***Chapter 8: Geology and Soils***, ***Chapter 10: Surface Water*** and ***Chapter 14: Terrestrial Wildlife***.

15.7.5.3.2 Additional mitigation and Enhancement: Indirect Impacts

In addition to the mitigation measures for potential direct impacts listed above specific mitigation has been identified for potential indirect impacts. Mitigation is of two types:

1. *Mitigation measures that operate by addressing factors that are under the control of the Project* – for example recruitment strategies, access control on project roads, location of workers' camps and other infrastructure (amenities, etc.) that might attract in-migrants;
2. *Strategic mitigation measures for impact pathways outside the Project's sphere of control* and which therefore need to be implemented in partnership with other actors, including, communities, government, NGOs and the private sector as appropriate.

Additional mitigation measures for potential indirect effects are listed in Table 15-37. These measures apply to all project phases, however since many are preventive it is important they are in place prior to the Site Preparation and Enabling Works and Construction and Pre-commissioning phases. As indicated above, these will be reviewed during the detailed design phase to ensure their adequacy in mitigating the potential impacts.

Implementation of the proposed mitigation measures discussed above and below, including the following relative Management Plans: **Biodiversity Management Plan**; **Stakeholder Communication Plan**; **Environmental and Social Management Plan**; **Road Safety and Transport Management Plan**; **Resettlement Action Plan**; **Community Impact Management Strategy**; and **Influx Management Strategy** will mitigate the likely residual impacts.

Table 15-37: Additional Mitigation for Indirect Impacts

Ref No.	Additional Mitigation for Indirect Impacts	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
AL50	As detailed in Chapter 16: Social, the Project Proponents will provide support to the Ministry of Lands Housing and Urban Development and Buliisa District Government to develop a District Land Use Plan through financing of a study that can be used as basis of such planning. The study will consider existing land use and land tenure, trends in land use, and future land use requirements including for Project infrastructure and for any mitigations required to off-set Project impacts, e.g. relocation land and land for biodiversity offsetting. The study will also identify areas that will benefit from improved accessibility across Buliisa District	X	X	X	X
AL51	Ensure that the Resettlement Action Plan (RAP) does not increase pressure on natural or critical habitats by moving people into or closer to sensitive habitats or Protected Areas	X	X		
AL52	As detailed in Chapter 16: Social, a Community Environmental Conservation Plan will be developed which will contain educational/information programmes to highlight importance of protected areas, identify plant species of conservation concern (and why they are important), and to explain how pressure on those will be alleviated	X	X	X	X
AL53	As detailed in Chapter 16: Social, an Influx Management Strategy will be developed to mitigate in-migration impacts and maximise benefits for local communities. Implementation of the strategy will depend on joint coordination between the Project, government, other project developers, local communities and civil society. The Strategy will build on the recommendations provided in the In-Migration Risk Assessment (Ref. 16-11) and will set out the overarching approach and objectives for mitigating the negative impacts of influx and enhancing the benefits. The strategy will make reference to more detailed actions and procedures contained within other environmental and social management plans that are relevant to addressing influx. The strategy will also propose a specific monitoring & evaluation framework to measure project-induced in-migration trends, hotspots and key impacts	X	X	X	X
AL54	The Influx Management Strategy will also consider potential impacts of increased pressure on natural resources due to population growth including looking at ways to provide alternative sources of fuel, building materials, farming land and food (particularly protein)	X	X	X	X

Ref No.	Additional Mitigation for Indirect Impacts	Relevant Phase			
		Site Preparation and Enabling Works	Construction and Pre-Commissioning	Commissioning and Operations	Decommissioning
AL55	As detailed in Chapter 16: Social, the Community Content, Economic development and Livelihood Plan will consider measures aimed at mitigating impact of population growth such as increased pressure on fisheries resources	X	X	X	X
AL56	The Community Environmental Conservation Plan will consider (but not be limited to) community based programmes for extension of tree nurseries, promotion of alternative fuel use, fisheries management and monitoring programme that will entail engagement of communities through BMUs in fisheries management as defined in Chapter 16: Social	X	X	X	X
AL57	Resettlement Action Plans will include livelihood restoration and will also provide alternative livelihoods/ income diversification programmes to ease dependence on natural resources or protected areas as a source of livelihood as defined in Chapter 16: Social	X	X		
AL58	Project Recruitment Centres locations should be defined in consideration of potential impacts it may generate on protected areas and unprotected forest areas	X	X	X	X
AL59	Regular monitoring of the extent and impacts of in-migration, generally on natural resources, will be carried out as part of the Biodiversity Monitoring and Evaluation Plan, including regular acquisition and analysis of satellite imagery to assess landuse/landcover changes	X	X	X	X
AL60	Strategic collaboration platforms will be established with local and regional authorities, UWA, NFA development and conservation NGOs and other stakeholders as appropriate to regularly evaluate and review the extent of indirect effects, share understanding of causes and identify adapted or additional mitigation requirements	X	X	X	X
AL61	The in-migration risk assessment will be regularly updated based on monitoring data to assess which protected areas, species and habitats are most at risk of indirect impacts, both imminently and in the foreseeable future	X	X	X	X

15.7.5.4 Residual Impacts – Site preparation and Enabling Works

Residual impacts on aquatic life receptors considered likely to occur during the Site Preparation and Enabling Works phase are shown in Table 15-38 below. These impacts are termed residual impacts because they take into account the embedded mitigation and the additional mitigation discussed above, to be implemented during this phase.

Table 15-38: Significance of Residual Direct and Indirect Impacts (with additional mitigation) during Site Preparation and Enabling Works Phase

Fish	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
					Direct	Indirect
CHQS						
Lates macrophthalmus	C	VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Citharinus citharus	C	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Citharinus latus	C A	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Haplochromis albertiae	C	VERY HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Haplochromis avium	C	VERY HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Haplochromis loati	C	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Haplochromis mahagiensis	C	VERY HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Marcusenius victoriae	C A	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Mesobola bredoi	C	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Oreochromis leucostictus	C	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Synodontis afrofischeri	C A	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Synodontis victoriae	C A	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Thoracochromis wingatii	C	VERY HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Other priority species						
Barbus huloti	C A	MEDIUM	As above	LOW	LOW ADVERSE	LOW ADVERSE

Mollusc	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
					Direct	Indirect
CHQS						
Bellamya rubicunda	C	VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Biomphalaria stanleyi	C	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Ceratophallus bicarinatus	C	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Ceratophallus faini	C	VERY HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Coelatura bakeri	C A	HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Gabbiella candida	C	VERY HIGH		NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE

Gabbiella humerosa ssp. *alberti*	C	VERY HIGH	Disturbance	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Gabiella walleri	C	VERY HIGH	Barrier effects	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Other priority species						
Chambardia trapezia	C	HIGH	As above	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Shrimp	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
					Direct	Indirect
Other priority species						
Limnocaridella alberti	C	HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Natural Habitat	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
					Direct	Indirect
Murchison Falls–Albert Delta Wetland System Ramsar Site	n/a	VERY HIGH	See Protected Area Summary in Appendix P	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Lake Albert	n/a	VERY HIGH	Reduction in water quality due to site clearance	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives. It is considered that indirect impacts may be more Significant than the direct impacts and harder to mitigate. However, if the implementation of indirect mitigations strategies are successful, pressures on aquatic species and natural habitats are likely to be insignificant.

Assuming the embedded and additional mitigation measures are undertaken as proposed, all residual impacts will be **Low Adverse** Significance. There are therefore unlikely to be Significant direct and indirect residual impacts on most species present in Landscape Contexts A and C during this phase of works.

The residual impact within the aquatic environment of the Murchison Falls–Albert Delta Wetland System Ramsar Site and Lake Albert is considered to be **Low Adverse** Significance, mainly because of the localised construction of the piers and their limited impacts if mitigation is implemented and the limited extent of Lake Albert influenced by the Site Preparation and Enabling Works phase. If effective, implementation of the proposed strategic mitigation measures discussed above should minimise and mitigate any detrimental impacts. Additionally, these residual impacts are only relevant to this phase of works, which is short term, so impacts are considered to be reversible during this phase.

There will need to be constant monitoring of the success of mitigation to review their effectiveness. A summary of the potential and residual impacts throughout the Site Preparation and Enabling Works Phase is provided in Table 15-39.

Table 15-39: Summary of the potential and residual impacts throughout the Site Preparation and Enabling Works Phase

			POTENTIAL IMPACTS				RESIDUAL IMPACTS			
Fish	**Landscape Context**	**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species										
Lates macrophthalmus	C	VERY HIGH	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Citharinus citharus	C	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Citharinus latus	C A	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Haplochromis albertiae	C	VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Haplochromis avium	C	VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Haplochromis loati	C	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Haplochromis mahagiensis	C	VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Marcusenius victoriae	C A	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Mesobola bredoi	C	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Oreochromis leucostictus	C	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Synodontis afrofischeri	C A	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Synodontis victoriae	C A	HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Thoracochromis wingatii	C	VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE

Other Notable Species (not CHQS)											
Barbus huloti	C	A	MEDIUM	LOW	LOW	LOW	LOW ADVERSE	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Mollusc	**Landscape Context**		**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species											
Bellamya rubicunda	C		VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Biomphalaria stanleyi	C		HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Ceratophallus bicarinatus	C		HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Ceratophallus faini	C		VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Coelatura bakeri	C	A	HIGH	MEDIUM	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Gabbiella candida	C		VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Gabbiella humerosa ssp. *alberti*	C		VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Gabiella walleri	C		VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Other Notable Species (not CHQS)											
Chambardia trapezia	C		HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Shrimp	**Landscape Context**		**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
Other Notable Species (not CHQS)											
Limnocaridella alberti	C		HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE

Natural Habitat	Landscape Context	Sensitivity	Potential Direct impact Magnitude	Potential Direct Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
Murchison Falls–Albert Delta Wetland System Ramsar Site	C	VERY HIGH	MEDIUM	HIGH ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Lake Albert	C	VERY HIGH	LOW	MODERATE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE

15.7.6 Assessment of Impacts: Construction and Pre-Commissioning

15.7.6.1 Introduction

Fish and macroinvertebrates species are highly sensitive to changes in water quality and quantity, and also reliant on plant species for shelter and food. Therefore, potential impacts that directly influence water quality, may influence these species.

Fish and macroinvertebrates may potentially be at risk from hydrological changes and increases in particulates or nutrients present in run-off from the Project Area and AoI. Fish species may be impacted due to loss of habitat, changes to the hydraulic regime, increases in sediment loading, and potentially increased human interaction and fishing. Similarly, macroinvertebrates may be impacted due to loss of habitat, changes to the hydraulic regime, increases in sediment loading, and potentially increased anthropogenic effects.

The Site Preparation and Enabling Works Phase is described in detail in ***Chapter 4: Project Description and Alternatives***. The main activities during this Phase of the Project with the potential for detrimental impacts on aquatic life are outlined in Table 15-31 above.

Potential direct impacts based on these activities have been divided into four main potential direct as outlined in and are described below.

15.7.6.2 Potential Impacts – Construction and Pre-Commissioning

15.7.6.2.1 Loss, degradation or fragmentation of species habitat

During the initial Construction and Pre-Commissioning phase there will be some clearance of vegetation and preparation for the subsequent phases of the project. Clearing of vegetation means there may be an increase in potential for sediment run-off into nearby waterbodies, as a smaller root system will increase sediment mobilisation.

Access tracks will be built including the construction of the piers for the Victoria Nile Ferry crossing and well-pad areas cleared, with soil and subsoil stockpiled for later use as required. Significant potential impacts may occur where new roads cross waterbodies and suitable drainage is not in place. Similarly, a potential increase in suspended sediments may occur as plant moves across the Site mobilising sediment especially during the dry season where the influence of dust may be substantial. Works within or close to the Victoria Nile and associated Ramsar site may impact on various species through direct loss of their habitat, for example, migratory fish species that breed or visit these permanent wetland areas, especially in shallow water areas. Where water suppression techniques are used, there may be an increase potential of sediment laden water entering the surrounding surface waterbodies.

Site clearance may directly affect seasonal wetlands, shallow spawning and nursery grounds and other sensitive areas. Of particular concern is potential damage to seasonal wetlands where these may be crossed by access tracks, which could affect the hydrology of these wetland areas, as well as disturbing species which may inhabit these areas during construction activities. Additionally, tracks and pipelines may cause fragmentation of surface water bodies.

During the Construction and Pre-Commissioning phase there is also potential for habitat to be affected by construction activities outside of the immediate project footprint. Either as a result of works or plant straying beyond the defined footprint of the works, or through run-off or spreading of dust or pollution, species habitats are smothered, lost or otherwise degraded.

Storage and delivery of fuels and hazardous substances increases the potential for accidental spillage and for these substances to enter waterbodies. This could have a detrimental impact on aquatic life, such as loss of species (fish and macroinvertebrates) and/or habitat. Chemicals may pollute the surrounding waterbodies making them uninhabitable for aquatic species and increasing mortality.

15.7.6.2.2 Population changes

The introduction of intensive human activity within the MFNP may potentially impact on population levels of a number of species. Potential disturbance issues, such as noise from construction activities may influence population numbers of species occupying the shallow waters of Lake Albert, the Victoria Nile or smaller rivers and wetlands.

Increased numbers of humans into protected areas may also increase the spread of invasive species such as Giant salvinia, which could have a detrimental impact on habitat availability for fish and macroinvertebrates. Species could be fragmented and/or mortality could increase.

15.7.6.2.3 Disturbance

Disturbance during Construction and Pre-Commissioning, activities such as access road creation, installation of piers, well-pad clearance and other excavations has the potential to disturb fish and macroinvertebrate populations, particularly during the wet season when fish are occupying seasonal streams and wetlands.

Of particular concern is works near sensitive areas such as the Victoria Nile, which contains a large number of spawning and nursery areas for fish in shallow, marginal waters. The presence of humans and construction activities may increase disturbance via pollution or in case of illegal fishing, but also the installation of piers using piling techniques. There may indeed be an increased disturbance to aquatic species from the noise and vibration of the pier construction for the Victoria Nile Ferry crossing point.

15.7.6.2.4 Barrier Effects

Site clearance and construction of well pads, access roads and other infrastructure may create barriers to the natural connection of surface water bodies and therefore, there is the potential to fragment aquatic species populations.

15.7.6.2.5 Indirect Impacts

A number of species of conservation concern are not recorded in the direct project areas but are present in protected areas (PA) within the wider Project AoI, such as Lake Albert (Landscape Context C). Human population changes induced by the Project, where workers' economic dependents and others are attracted to the wider area may potentially impact on habitats and species populations. In addition, construction of 'critical oil roads' as associated infrastructure will enable easier access for people and vehicles.

These population changes would be likely to cause land use changes and degradation of habitats, illegal fishing, mollusc shell dredging, land clearance (increasing erosion) and the introduction of invasive species. New and upgraded roads and other access improvements in the region will enable people to enter more easily and potentially impact on rivers and wetlands during this phase.

If no additional mitigation is in place, negative effects on aquatic species may include a reduction of water quality through an increase in suspended solids or hazardous substances within the aquatic environment, smothering macroinvertebrates, fish gills, eggs, larvae and spawning/nursery areas for fish. Additionally, light penetration may be reduced, minimising visibility and the capability of fishes to feed. A reduction in light penetration could also have limiting effects on macrophyte growth, reducing habitat and food for fish as well as macroinvertebrates. These potential impacts may increase fish and macroinvertebrate mortality, ultimately reducing population numbers.

15.7.6.2.6 Overview of potential impacts

Table 15-35 summarises the potential direct and indirect significance of impacts of this phase of the works on CHQS and other priority species. Without additional mitigation there is the potential for Significant adverse impacts on most species.

Table 15-40: Significance of Potential Direct and Indirect Impacts (without additional mitigation) during Construction and Pre-Commissioning Phase

Fish	Landscape Context		Sensitivity	Potential Direct and Indirect Impacts	Potential Impact Magnitude	Potential Impact Significance
CHQS						
Lates macrophthalmus	C		VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	MEDIUM	HIGH ADVERSE
Citharinus citharus	C		HIGH		MEDIUM	MODERATE ADVERSE
Citharinus latus	C	A	HIGH		MEDIUM	MODERATE ADVERSE
Haplochromis albertiae	C		VERY HIGH		MEDIUM	HIGH ADVERSE
Haplochromis avium	C		VERY HIGH		MEDIUM	HIGH ADVERSE
Haplochromis loati	C		HIGH		MEDIUM	MODERATE ADVERSE
Haplochromis mahagiensis	C		VERY HIGH		MEDIUM	HIGH ADVERSE
Marcusenius victoriae	C	A	HIGH		MEDIUM	MODERATE ADVERSE
Mesobola bredoi	C		HIGH		MEDIUM	MODERATE ADVERSE
Oreochromis leucostictus	C		HIGH		MEDIUM	MODERATE ADVERSE
Synodontis afrofischeri	C	A	HIGH		MEDIUM	MODERATE ADVERSE
Synodontis victoriae	C	A	HIGH		MEDIUM	MODERATE
Thoracochromis wingatii	C		VERY HIGH		MEDIUM	HIGH ADVERSE
Other priority species						
Barbus huloti	C	A	MEDIUM	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	MEDIUM	MODERATE ADVERSE

Mollusc	Landscape Context		Sensitivity	Potential Direct and Indirect Impacts	Potential Impact Magnitude	Potential Impact Significance
CHQS						
Bellamya rubicunda	C		VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	MEDIUM	HIGH ADVERSE
Biomphalaria stanleyi	C		HIGH		MEDIUM	MODERATE ADVERSE
Ceratophallus bicarinatus	C		HIGH		MEDIUM	MODERATE ADVERSE
Ceratophallus faini	C		VERY HIGH		MEDIUM	HIGH ADVERSE
Coelatura bakeri	C	A	HIGH		MEDIUM	MODERATE ADVERSE

Gabbiella candida	C	VERY HIGH		MEDIUM	HIGH ADVERSE
Gabbiella humerosa ssp. *alberti*	C	VERY HIGH		MEDIUM	HIGH ADVERSE
Gabiella walleri	C	VERY HIGH		MEDIUM	HIGH ADVERSE
Other priority species					
Chambardia trapezia	C	HIGH	As above	MEDIUM	MODERATE ADVERSE
Shrimp	**Landscape Context**	**Sensitivity**	**Potential Direct and Indirect Impacts**	**Potential Impact Magnitude**	**Potential Impact Significance**
Other priority species					
Limnocaridella alberti	C	HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	MEDIUM	MODERATE ADVERSE
Natural Habitat	**Landscape Context**	**Sensitivity**	**Potential Direct and Indirect Impacts**	**Potential Impact Magnitude**	**Potential Impact Significance**
Murchison Falls–Albert Delta Wetland System Ramsar Site	n/a	VERY HIGH	See Protected Area Summary in Appendix P	MEDIUM	HIGH ADVERSE
Lake Albert	n/a	VERY HIGH	Reduction in water quality due to site works Loss of habitat and disturbance from laying of abstraction pipeline	LOW	MODERATE ADVERSE

The assessment of potential direct impacts, prior to additional mitigation, for the Construction and Pre-Commissioning phase are greater than the Site Preparation and Enabling Works phase. There are potentially Significant impacts for all aquatic receptor species within Landscape Contexts A (MFNP) and C (Lake Albert, rivers and wetlands). As mentioned previously, impacts on Murchison Falls–Albert Delta Wetland System Ramsar Site and Lake Albert have also been assessed. These natural habitats have elevated sensitivity and are therefore more vulnerable to pressures including population changes, likely changes in land use and pressure on natural habitats, causing degradation of habitats and increased mortality to some species. Potential impacts, before application of additional mitigation, on all species are considered to be **Significant** for this phase of the Project.

15.7.6.3 Additional Mitigation and Enhancement

Potential direct and indirect impacts on aquatic life will be further reduced using the measures presented in Table 15-36 and Table 15-37.

15.7.6.4 Residual Impacts – Construction and Pre-Commissioning

Residual impacts on aquatic life receptors are considered likely to occur during this phase and are shown in Table 15-41 below. These impacts are termed residual impacts because they take into account the embedded mitigation and the additional mitigation discussed above, to be implemented during this phase.

Table 15-41: Significance of Residual Direct and Indirect Impacts (with additional mitigation) during Construction and Pre-Commissioning

Fish	Landscape Context		Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
						Direct	Indirect
CHQS							
Lates macrophthalmus	C		VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Citharinus citharus	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Citharinus latus	C	A	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis albertiae	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis avium	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis loati	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis mahagiensis	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Marcusenius victoriae	C	A	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Mesobola bredoi	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Oreochromis leucostictus	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Synodontis afrofischeri	C	A	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Synodontis victoriae	C	A	HIGH		LOW	LOW ADVERSE	LOW ADVERSE
Thoracochromis wingatii	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Other priority species							
Barbus huloti	C	A	MEDIUM	As above	LOW	LOW ADVERSE	LOW ADVERSE
Mollusc	**Landscape Context**		**Sensitivity**	**Potential Direct and Indirect Impacts**	**Impact Magnitude**	**Residual Impact Significance**	
						Direct	**Indirect**
CHQS							
Bellamya rubicunda	C		VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance	LOW	LOW ADVERSE	MODERATE ADVERSE
Biomphalaria stanleyi	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Ceratophallus bicarinatus	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Ceratophallus faini	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Coelatura bakeri	C	A	HIGH		MEDIUM	LOW ADVERSE	MODERATE ADVERSE

Gabbiella candida	C	VERY HIGH	Barrier effects	LOW	LOW ADVERSE	MODERATE ADVERSE
Gabbiella humerosa ssp. *alberti*	C	VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Gabiella walleri	C	VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Other priority species						
Chambardia trapezia	C	HIGH	As above	MEDIUM	LOW ADVERSE	MODERATE ADVERSE
Shrimp	**Landscape Context**	**Sensitivity**	**Potential Direct and Indirect Impacts**	**Impact Magnitude**	**Residual Impact Significance**	
					Direct	**Indirect**
Other priority species						
Limnocaridella alberti	C	HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	LOW	LOW ADVERSE	MODERATE ADVERSE
Natural Habitat	**Landscape Context**	**Sensitivity**	**Potential Direct and Indirect Impacts**	**Impact Magnitude**	**Residual Impact Significance**	
					Direct	**Indirect**
Murchison Falls–Albert Delta Wetland System Ramsar Site	n/a	VERY HIGH	See Protected Area Summary in Appendix P	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Lake Albert	n/a	VERY HIGH	Reduction in water quality due to site clearance	NEGLIGIBLE	LOW ADVERSE	MODERATE ADVERSE

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives. Any Significant residual impacts are related to indirect impacts, which are more difficult to control.

Assuming the embedded and additional mitigation measures are undertaken as proposed, all residual Direct impacts will be **Low Adverse** Significance. There are therefore unlikely to be Significant direct and residual impacts on any species present in Landscape Contexts A and C during this phase of works.

The residual indirect impacts are of **Low** to **Moderate Adverse** Significance, hence potentially Significant. This is as a result of indirect impacts caused by in-migration pressures to the region. It is considered that these indirect impacts may be harder to mitigate as are more difficult to control, and the assessment therefore represents a conservative approach. However, if the implementation of indirect mitigations strategies are successful, pressures on aquatic species and natural habitats are likely to be insignificant.

During the Construction and Pre-Commissioning Phase of works the overall impact within the aquatic environment is considered to be **Low Adverse** Significance for Murchison Falls–Albert Delta Wetland System Ramsar Site, however, residual indirect impacts are considered to be **Moderate Adverse** significance within Lake Albert based on the impact of in-migration on increased fishing pressures.

There will need to be constant monitoring of the success of mitigation to review their effectiveness. A summary of the potential and residual impacts throughout the Pre-Commissioning and Construction Phase is provided in Table 15-42.

Table 15-42: Summary of the potential and residual impacts throughout the Construction and Pre-commissioning Phase

			POTENTIAL IMPACTS				RESIDUAL IMPACTS			
Fish	**Landscape Context**	**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species										
Lates macrophthalmus	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Citharinus citharus	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Citharinus latus	C A	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis albertiae	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE
Haplochromis avium	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis loati	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis mahagiensis	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Marcusenius victoriae	C A	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Mesobola bredoi	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Oreochromis leucostictus	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Synodontis afrofischeri	C A	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Synodontis victoriae	C A	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Thoracochromis wingatii	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE

Other Notable Species (not CHQS)											
Barbus huloti	C	A	MEDIUM	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Mollusc	**Landscape Context**		**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species											
Bellamya rubicunda	C		VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Biomphalaria stanleyi	C		HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Ceratophallus bicarinatus	C		HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Ceratophallus faini	C		VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Coelatura bakeri	C	A	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Gabbiella candida	C		VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Gabbiella humerosa ssp. *alberti*	C		VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Gabiella walleri	C		VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Other Notable Species (not CHQS)											
Chambardia trapezia	C		HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE
Shrimp	**Landscape Context**		**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
Other Notable Species (not CHQS)											
Limnocaridella alberti	C		HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE

Natural Habitat	Landscape Context	Sensitivity	Potential Direct impact Magnitude	Potential Direct Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
Murchison Falls–Albert Delta Wetland System Ramsar Site	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Lake Albert	C	VERY HIGH	LOW	MODERATE ADVERSE	LOW	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE

15.7.7 Assessment of Impacts: Commissioning and Operations

15.7.7.1 Introduction

The Commissioning and Operations Phase is described in detail in ***Chapter 4: Project Description and Alternatives***. The main activities during this Phase (identified in Table 15-31 above) may have the potential to influence aquatic life as described in the following sections.

15.7.7.2 Potential Impacts – Commissioning and Operations

15.7.7.2.1 Loss, degradation or fragmentation of species habitat

There will be 34 wellpads across 6 fields as described in ***Chapter 4: Project Description and Alternatives.*** A number of potential impacts on aquatic life will be associated with this process, particularly in relation to disturbance and degradation of smaller wetlands and waterbodies, such as the River Tangi, and are described below:

- The well pads and the CPF will include open and closed drainage systems. If not designed or operated effectively, there is the potential for contaminated water to enter the aquatic environment and have a detrimental influence on aquatic species; and
- Residual well fluids/sludge also has the potential to have a detrimental impact on the aquatic environment if not processed appropriately.

The operations of the WAS also have the potential to impact aquatic life. Peak water abstraction volume is estimated to be 0.013 billion m3/annum, which equates to around 0.034% of the annual outflow from Lake Albert for the years of production required. This will be reduced significantly thereafter as water is re-used. Abstracted water will pumped through a hypochlorite unit before being transferred via a pipeline to the CPF for further treatment. A number of potential impacts on aquatic life will be associated with this process and are described below:

- Use of Lake Albert Water for water injection - (e.g. leading to potential change in hydrodynamic regime of Lake Albert);
- Accidental releases of harmful substances during the activities;
- The amount of water abstracted could potentially influence water quality and habitat availability. However, the peak abstraction rate equates to 0.034% of the annual outflow from Lake Albert, so as described in ***Chapter 10: Surface Water*** this is expected to be Insignificant; and
- Impingement and entrainment of aquatic species at intake point.

15.7.7.2.2 Population changes

Population changes will be related to induced impacts on capture fisheries and the aquatic environment as a whole. See *Indirect Impacts for more information*.

15.7.7.2.3 Disturbance

Disturbance related to noise and accidental pollution may influence aquatic species causing dispersal and potentially reducing habitat availability.

15.7.7.2.4 Barrier Effects

None known.

15.7.7.2.5 Indirect Impacts

Indirect and induced impacts would be related to capture fisheries. Increase in the population resulting from an influx of people looking for employment opportunities has the potential to create an overall increase in those engaged in fishing. Alongside, rising disposable incomes may drive additional demand for fish and other fisheries products. This has the potential to exacerbate existing problems associated with over-fishing.

15.7.7.2.6 Overview of potential impacts

Table 15-43 summarises the potential direct and indirect significance of impacts of this phase of the works on priority species and Natural Habitats. Without additional mitigation there is the potential for Significant impacts on all species.

Overall, Potential impacts are higher than in previous phase mainly due to the longer time period of this phase, which means that the magnitude would be higher. As a result, the high sensitivities and high magnitude results in a higher significance of impact.

Table 15-43: Significance of Potential Direct and Indirect Impacts (without additional mitigation) during Commissioning and Operation Phase.

Fish	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Potential Impact Magnitude	Potential Impact Significance
CHQS					
Lates macrophthalmus	C	VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	HIGH	CRITICAL ADVERSE
Citharinus citharus	C	HIGH		HIGH	HIGH ADVERSE
Citharinus latus	C, A	HIGH		HIGH	HIGH ADVERSE
Haplochromis albertiae	C	VERY HIGH		HIGH	CRITICAL ADVERSE
Haplochromis avium	C	VERY HIGH		HIGH	CRITICAL ADVERSE
Haplochromis loati	C	HIGH		HIGH	HIGH ADVERSE
Haplochromis mahagiensis	C	VERY HIGH		HIGH	CRITICAL ADVERSE
Marcusenius victoriae	C, A	HIGH		HIGH	HIGH ADVERSE
Mesobola bredoi	C	HIGH		HIGH	HIGH ADVERSE
Oreochromis leucostictus	C	HIGH		HIGH	HIGH ADVERSE
Synodontis afrofischeri	C, A	HIGH		HIGH	HIGH ADVERSE
Synodontis victoriae	C, A	HIGH		HIGH	HIGH ADVERSE
Thoracochromis wingatii	C	VERY HIGH		HIGH	CRITICAL ADVERSE
Other priority species					
Barbus huloti	C, A	MEDIUM	As Above	MEDIUM	MODERATE ADVERSE

Mollusc	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Potential Impact Magnitude	Potential Impact Significance
CHQS					
Bellamya rubicunda	C	VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	MEDIUM	CRITICAL ADVERSE
Biomphalaria stanleyi	C	HIGH		MEDIUM	HIGH ADVERSE
Ceratophallus bicarinatus	C	HIGH		MEDIUM	HIGH ADVERSE
Ceratophallus faini	C	VERY HIGH		MEDIUM	CRITICAL ADVERSE
Coelatura bakeri	C A	HIGH		MEDIUM	MODERATE ADVERSE
Gabbiella candida	C	VERY HIGH		MEDIUM	CRITICAL ADVERSE
Gabbiella humerosa ssp. *alberti*	C	VERY HIGH		MEDIUM	CRITICAL ADVERSE
Gabiella walleri	C	VERY HIGH		MEDIUM	CRITICAL ADVERSE
Other priority species					
Chambardia trapezia	C	HIGH	As above	MODERATE	MODERATE ADVERSE
Shrimp	**Landscape Context**	**Sensitivity**	**Potential Direct and Indirect Impacts**	**Potential Impact Magnitude**	**Potential Impact Significance**
Other priority species					
Limnocaridella alberti	C	HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	MEDIUM	MODERATE ADVERSE
Natural Habitat	**Landscape Context**	**Sensitivity**	**Potential Direct and Indirect Impacts**	**Potential Impact Magnitude**	**Potential Impact Significance**
Murchison Falls–Albert Delta Wetland System Ramsar Site	n/a	VERY HIGH	See Protected Area Summary in Appendix P	HIGH	CRITICAL ADVERSE

Lake Albert	n/a	VERY HIGH	Reduction in water quality due to water abstraction Loss of habitat due to water abstraction Increase in fish mortality due to over fishing Reduction in fish population numbers due to over fishing	HIGH	CRITICAL ADVERSE

There are potentially Significant impacts for all aquatic receptor species within Landscape Contexts A (MFNP) and C (Lake Albert, rivers and wetlands). Impacts on Murchison Falls–Albert Delta Wetland System Ramsar Site and Lake Albert have also been assessed. These natural habitats have an elevated sensitivity and are therefore more vulnerable to pressures including population changes, likely changes in land use and pressure on natural habitats, causing degradation of habitats and increased mortality to some species. Potential impacts, before application of additional mitigation, on all species and habitats are considered to be Significant for this phase of the Project based on the long duration and induced pressures.

15.7.7.3 Additional Mitigation and Enhancement

Potential direct and indirect impacts on aquatic life will be further reduced using the measures presented in Table 15-36 and Table 15-37.

15.7.7.4 Residual Impacts – Commissioning and Operations

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives for direct impacts. Potential residual impacts on aquatic life receptors considered likely to occur during this phase when considering the precautionary principle, are mostly related to the potential influence of induced/indirect impacts detrimentally influencing the aquatic environment, not only overfishing, but also habitat degradation for shrimp and mollusc species.

The identified residual Impacts on aquatic species and habitats are defined in Table 15-44.

Table 15-44: Significance of Residual Direct and Indirect Impacts (with additional mitigation) during Commissioning and Operations Phase

Fish	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
					Direct	Indirect
CHQS						
Lates macrophthalmus	C	VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	LOW	LOW ADVERSE	MODERATE ADVERSE
Citharinus citharus	C	HIGH		MEDIUM	LOW ADVERSE	MODERATE ADVERSE
Citharinus latus	C, A	HIGH		MEDIUM	LOW ADVERSE	MODERATE ADVERSE
Haplochromis albertiae	C	VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis avium	C	VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis loati	C	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis mahagiensis	C	VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE

Marcusenius victoriae	C	A	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Mesobola bredoi	C		HIGH		MEDIUM	LOW ADVERSE	MODERATE ADVERSE
Oreochromis leucostictus	C		HIGH		MEDIUM	LOW ADVERSE	MODERATE ADVERSE
Synodontis afrofischeri	C	A	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Synodontis victoriae	C	A	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Thoracochromis wingatii	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Other priority species							
Barbus huloti	C	A	MEDIUM	As above	LOW	LOW ADVERSE	LOW ADVERSE
Mollusc	**Landscape Context**		**Sensitivity**	**Potential Direct and Indirect Impacts**	**Impact Magnitude**	**Residual Impact Significance**	
						Direct	**Indirect**
CHQS							
Bellamya rubicunda	C		VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	LOW	LOW ADVERSE	MODERATE ADVERSE
Biomphalaria stanleyi	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Ceratophallus bicarinatus	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Coelatura bakeri	C	A	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Ceratophallus faini	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Gabbiella candida	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Gabbiella humerosa ssp. *alberti*	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Gabiella walleri	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Other priority species							
Chambardia trapezia	C		HIGH	As above	MEDIUM	LOW ADVERSE	MODERATE ADVERSE
Shrimp	**Landscape Context**		**Sensitivity**	**Potential Direct and Indirect Impacts**	**Impact Magnitude**	**Residual Impact Significance**	
Other priority species							
Limnocaridella alberti	C		HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	LOW	LOW ADVERSE	MODERATE ADVERSE

Natural Habitat	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
Murchison Falls–Albert Delta Wetland System Ramsar Site	n/a	VERY HIGH	See Protected Area Summary in Appendix P	LOW	LOW ADVERSE	MODERATE ADVERSE
Lake Albert	n/a	VERY HIGH	Reduction in water quality due to water abstraction Loss of habitat due to water abstraction Increase in fish mortality due to over fishing Reduction in fish population numbers due to over fishing	LOW	LOW ADVERSE	MODERATE ADVERSE

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives. Any Significant residual impacts are related to indirect impacts, which are more difficult to control.

Assuming the embedded and additional mitigation measures are undertaken as proposed, all residual Direct impacts will be **Low Adverse** Significance. There are therefore unlikely to be Significant direct and residual impacts on any species present in Landscape Contexts A and C during this phase of works.

The residual indirect impacts are of **Low** to **Moderate Adverse** Significance, hence potentially Significant. Also, the overall impact within the aquatic environment Murchison Falls–Albert Delta Wetland System Ramsar Site and Lake Albert is considered to be **Moderate Adverse** Significance for residual indirect impacts. This is as a result of indirect impacts caused by in-migration pressures to the region.

It is considered that these residual indirect impacts may be harder to mitigate as are more difficult to control (such as increased pressures on fishing), and the assessment therefore represents a conservative approach. However, if the implementation of indirect mitigations strategies are successful, pressures on aquatic species and natural habitats are likely to be insignificant.

There will need to be constant monitoring of the success of mitigation to review their effectiveness. A summary of the potential and residual impacts throughout the Commissioning and Operations Phase is provided in Table 15-45.

Table 15-45: Summary of the potential and residual impacts throughout the Commissioning and Operations Phase

			POTENTIAL IMPACTS				RESIDUAL IMPACTS			
Fish	**Landscape Context**	**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species										
Lates macrophthalmus	C	VERY HIGH	HIGH	CRITICAL ADVERSE	HIGH	CRITICAL ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Citharinus citharus	C	HIGH	HIGH	HIGH ADVERSE	HIGH	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Citharinus latus	C A	HIGH	HIGH	HIGH ADVERSE	HIGH	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis albertiae	C	VERY HIGH	HIGH	CRITICAL ADVERSE	HIGH	CRITICAL ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis avium	C	VERY HIGH	HIGH	CRITICAL ADVERSE	HIGH	CRITICAL ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis loati	C	HIGH	HIGH	HIGH ADVERSE	HIGH	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis mahagiensis	C	VERY HIGH	HIGH	CRITICAL ADVERSE	HIGH	CRITICAL ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Marcusenius victoriae	C A	HIGH	HIGH	HIGH ADVERSE	HIGH	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Mesobola bredoi	C	HIGH	HIGH	HIGH ADVERSE	HIGH	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Oreochromis leucostictus	C	HIGH	HIGH	HIGH ADVERSE	HIGH	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Synodontis afrofischeri	C A	HIGH	HIGH	HIGH ADVERSE	HIGH	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Synodontis victoriae	C A	HIGH	HIGH	HIGH ADVERSE	HIGH	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Thoracochromis wingatii	C	VERY HIGH	HIGH	CRITICAL ADVERSE	HIGH	CRITICAL ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE

Other Notable Species (not CHQS)											
Barbus huloti	C	A	MEDIUM	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Mollusc	**Landscape Context**		**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species											
Bellamya rubicunda	C		VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Biomphalaria stanleyi	C		HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Ceratophallus bicarinatus	C		HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Ceratophallus faini	C		VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Coelatura bakeri	C	A	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE
Gabbiella candida	C		VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Gabbiella humerosa ssp. alberti	C		VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Gabiella walleri	C		VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Other Notable Species (not CHQS)											
Chambardia trapezia	C		HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Shrimp	**Landscape Context**		**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
Other Notable Species (not CHQS)											
Limnocaridella alberti	C		HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE

Natural Habitat	Landscape Context	Sensitivity	Potential Direct impact Magnitude	Potential Direct Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
Murchison Falls–Albert Delta Wetland System Ramsar Site	C	VERY HIGH	HIGH	CRITICAL	HIGH	CRITICAL	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Lake Albert	C	VERY HIGH	HIGH	CRITICAL	HIGH	CRITICAL	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE

15.7.8 Assessment of Impacts: Decommissioning

15.7.8.1 Introduction

The decommissioning program will be developed during the operational phase of the Project. It is likely that the technological options and preferred methods for decommissioning of such systems will be different in 28 years' time. The status of the Project at the time of decommissioning will also impact on the chosen decommissioning methods.

Under all circumstances, decommissioning activities will be undertaken in accordance with the international and national legislation and regulations prevailing at that time, and in liaison with the relevant regulatory authorities.

More detail on the Decommissioning Phase is provided in ***Chapter 4: Project Description and Alternatives***.

15.7.8.2 Potential Impacts – Decommissioning

During the actual decommissioning works, potential impacts are likely to be similar to those for the Construction and Pre-Commissioning Phase. However, it is generally expected that pipelines will be cleaned, capped and let in situ, to prevent disturbing the reinstated habitats. Where the environment assessment identifies it is acceptable, in some locations pipeline sections may be cleaned, reclaimed and re-used.

15.7.8.2.1 Loss, degradation or fragmentation of species habitat

During works potential habitat loss or degradation may occur if materials are allowed to escape from working areas, although embedded mitigation to control run off, chemical storage, release of contaminants and erosion should prevent this.

15.7.8.2.2 Population changes

Decommissioning and restoration should benefit species within aquatic habitats as disturbance should decrease and available habitat increase. However, there will be a temporary increase in human presence within the riparian zones of aquatic habitats during this phase, which may potentially impact on populations due to overfishing or other direct loss of species, as well as potential disturbance issues.

15.7.8.2.3 Disturbance

Disturbance is likely to be minimal at this stage and mostly related to human presence on the shores of aquatic habitats and Victoria Nile Ferry crossing use.

15.7.8.2.4 Barrier Effects

None known.

15.7.8.2.5 Indirect Impacts

Potential impacts on habitats and species that are caused by indirect factors, such as in-migration will be similar in all phases and have been discussed above. The causes of potential indirect impacts will be similar to those for previous phases of the Project.

15.7.8.2.6 Overview of potential Impacts

An assessment of potential impacts associated with Decommissioning can be found in Table 15-46.

Table 15-46: Significance of Potential Direct and Indirect Impacts (without additional mitigation) during Decommissioning

Fish	Landscape Context		Sensitivity	Potential Direct and Indirect Impacts	Potential Impact Magnitude	Potential Impact Significance
CHQS						
Lates macrophthalmus	C		VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	MEDIUM	HIGH
Citharinus citharus	C		HIGH		MEDIUM	MODERATE
Citharinus latus	C	A	HIGH		MEDIUM	MODERATE
Haplochromis albertiae	C		VERY HIGH		MEDIUM	HIGH
Haplochromis avium	C		VERY HIGH		MEDIUM	HIGH
Haplochromis loati	C		HIGH		MEDIUM	MODERATE
Haplochromis mahagiensis	C		VERY HIGH		MEDIUM	HIGH
Marcusenius victoriae	C	A	HIGH		MEDIUM	MODERATE
Mesobola bredoi	C		HIGH		MEDIUM	MODERATE
Oreochromis leucostictus	C		HIGH		MEDIUM	MODERATE
Synodontis afrofischeri	C	A	HIGH		MEDIUM	MODERATE
Synodontis victoriae	C	A	HIGH		MEDIUM	MODERATE
Thoracochromis wingatii	C		VERY HIGH		MEDIUM	HIGH
Other priority species						
Barbus huloti	C	A	MEDIUM	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	MEDIUM	MODERATE

Mollusc	Landscape Context		Sensitivity	Potential Direct and Indirect Impacts	Potential Impact Magnitude	Potential Impact Significance
CHQS						
Bellamya rubicunda	C		VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	MEDIUM	HIGH
Biomphalaria stanleyi	C		HIGH		MEDIUM	MODERATE
Ceratophallus bicarinatus	C		HIGH		MEDIUM	MODERATE
Ceratophallus faini	C		VERY HIGH		MEDIUM	HIGH
Coelatura bakeri	C	A	HIGH		MEDIUM	MODERATE
Gabbiella candida	C		VERY HIGH		MEDIUM	HIGH
Gabbiella humerosa ssp. *alberti*	C		VERY HIGH		MEDIUM	HIGH
Gabiella walleri	C		VERY HIGH		MEDIUM	HIGH
Other priority species						
Chambardia trapezia	C		HIGH	As above	MEDIUM	MODERATE
Shrimp	**Landscape Context**		**Sensitivity**	**Potential Direct and Indirect Impacts**	**Potential Impact Magnitude**	**Potential Impact Significance**
Other priority species						
Limnocaridella alberti	C		HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	MEDIUM	MODERATE
Natural Habitat	**Landscape Context**		**Sensitivity**	**Potential Direct and Indirect Impacts**	**Potential Impact Magnitude**	**Potential Impact Significance**
Murchison Falls–Albert Delta Wetland System Ramsar Site	n/a		VERY HIGH	See Protected Area Summary in Appendix P	MEDIUM	HIGH
Lake Albert	n/a		VERY HIGH	Loss of habitat due to water abstraction Increase in fish mortality due to over fishing Reduction in fish population numbers due to over fishing Reduction in water quality due to accidental spillage during decommissioning activities	MEDIUM	HIGH

15.7.8.3 Additional Mitigation and Enhancement

Potential direct and indirect impacts on aquatic life will be further reduced using the measures presented in Table 15-36 and Table 15-37.

15.7.8.4 Residual Impacts – Decommissioning

With additional mitigation measures in place, the residual magnitude of impact on aquatic species during the Decommissioning phase is Negligible. The identified residual impacts are not considered to be Significant and are classed as being either Insignificant or Low Adverse in nature. The identified residual impacts on aquatic species are defined in Table 15-47.

Table 15-47: Significance of Residual Impacts (with additional mitigation) during Decommissioning

Fish	Landscape Context		Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
						Direct	Indirect
CHQS							
Lates macrophthalmus	C		VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	NEGLIGIBLE	LOW ADVERSE	LOW ADVERSE
Citharinus citharus	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Citharinus latus	C	A	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis albertiae	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis avium	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis loati	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Haplochromis mahagiensis	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Marcusenius victoriae	C	A	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Mesobola bredoi	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Oreochromis leucostictus	C		HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Synodontis afrofischeri	C	A	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Synodontis victoriae	C	A	HIGH		LOW	LOW ADVERSE	LOW ADVERSE
Thoracochromis wingatii	C		VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Other priority species							
Barbus huloti	C	A	MEDIUM	As above	LOW	LOW ADVERSE	LOW ADVERSE

Mollusc	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
					Direct	Indirect
CHQS						
Bellamya rubicunda	C	VERY HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	LOW	LOW ADVERSE	MODERATE ADVERSE
Biomphalaria stanleyi	C	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Ceratophallus bicarinatus	C	HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Ceratophallus faini	C	VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Coelatura bakeri	C A	HIGH		MEDIUM	LOW ADVERSE	MODERATE ADVERSE
Gabbiella candida	C	VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Gabbiella humerosa ssp. *alberti*	C	VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Gabiella walleri	C	VERY HIGH		LOW	LOW ADVERSE	MODERATE ADVERSE
Other priority species						
Chambardia trapezia	C	HIGH	As above	MEDIUM	LOW ADVERSE	MODERATE ADVERSE

Shrimp	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
					Direct	Indirect
Other priority species						
Limnocaridella alberti	C	HIGH	Loss, degradation or fragmentation of species habitat Population impacts Disturbance Barrier effects	LOW	LOW ADVERSE	MODERATE ADVERSE

Natural Habitat	Landscape Context	Sensitivity	Potential Direct and Indirect Impacts	Impact Magnitude	Residual Impact Significance	
					Direct	Indirect
Murchison Falls–Albert Delta Wetland System Ramsar Site	n/a	VERY HIGH	See Protected Area Summary in Appendix P	NEGLIGIBLE	LOW ADVERSE	MODERATE ADVERSE
Lake Albert	n/a	VERY HIGH	Loss of habitat due to water abstraction Increase in fish mortality	NEGLIGIBLE	LOW ADVERSE	MODERATE ADVERSE

			due to over fishing Reduction in fish population numbers due to over fishing Reduction in water quality due to accidental spillage during decommissioning activities			

The assessment assumes that the embedded and additional mitigation will be successful in achieving its objectives. Any Significant residual impacts are related to indirect impacts, which are more difficult to control.

Assuming the embedded and additional mitigation measures are undertaken as proposed, all residual Direct impacts will be **Low Adverse** Significance. There are therefore unlikely to be Significant direct residual impacts on any species present in Landscape Contexts A and C during this phase of works.

The residual indirect impacts are of **Low** to **Moderate Adverse** Significance, hence potentially Significant. This is as a result of indirect impacts that could be caused by in-migration pressures to the region. It is considered that these indirect impacts may be harder to mitigate as are more difficult to control, and the assessment therefore represents a conservative approach. However, if the implementation of indirect mitigations strategies are successful, pressures on aquatic species and natural habitats are likely to be insignificant.

The overall impact within the aquatic environment is considered to be **Moderate Adverse** Significance for Murchison Falls–Albert Delta Wetland System Ramsar Site, and Lake Albert based on the impact of in-migration pressures.

There will need to be constant monitoring of the success of mitigation to review their effectiveness.

If the implementation of indirect mitigations strategies are successful, pressures on aquatic species are likely to be insignificant, however, there will need to be constant monitoring of the success of mitigation to review their effectiveness. A summary of the potential and residual impacts throughout the Decommissioning Phase is provided in Table 15-48.

Table 15-48: Summary of the potential and residual impacts throughout the Decommissioning Phase

Fish	Landscape Context	Sensitivity	POTENTIAL IMPACTS: Potential Direct impact Magnitude	POTENTIAL IMPACTS: Potential Direct Impact Significance	POTENTIAL IMPACTS: Potential Indirect Impact Magnitude	POTENTIAL IMPACTS: Potential Indirect Impact Significance	RESIDUAL IMPACTS: Residual Direct Impact Magnitude	RESIDUAL IMPACTS: Residual Direct Impact Significance	RESIDUAL IMPACTS: Residual Indirect Impact Magnitude	RESIDUAL IMPACTS: Residual Indirect Impact Significance
CHQS Species										
Lates macrophthalmus	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Citharinus citharus	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Citharinus latus	C A	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis albertiae	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis avium	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis loati	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Haplochromis mahagiensis	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Marcusenius victoriae	C A	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Mesobola bredoi	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Oreochromis leucostictus	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Synodontis afrofischeri	C A	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Synodontis victoriae	C A	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	NEGLIGIBLE	LOW ADVERSE
Thoracochromis wingatii	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE

Other Notable Species (not CHQS)										
Barbus huloti	C A	MEDIUM	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	LOW	LOW ADVERSE	LOW	LOW ADVERSE
Mollusc	**Landscape Context**	**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
CHQS Species										
Bellamya rubicunda	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Biomphalaria stanleyi	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Ceratophallus bicarinatus	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Ceratophallus faini	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Coelatura bakeri	C A	HIGH	MEDIUM	MODERATE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Gabbiella candida	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Gabbiella humerosa ssp. alberti	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Gabiella walleri	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Other Notable Species (not CHQS)										
Chambardia trapezia	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Shrimp	**Landscape Context**	**Sensitivity**	**Potential Direct impact Magnitude**	**Potential Direct Impact Significance**	**Potential Indirect Impact Magnitude**	**Potential Indirect Impact Significance**	**Residual Direct Impact Magnitude**	**Residual Direct Impact Significance**	**Residual Indirect Impact Magnitude**	**Residual Indirect Impact Significance**
Other Notable Species (not CHQS)										
Limnocaridella alberti	C	HIGH	MEDIUM	MODERATE ADVERSE	MEDIUM	MODERATE ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE

Natural Habitat	Landscape Context	Sensitivity	Potential Direct impact Magnitude	Potential Direct Impact Significance	Potential Indirect Impact Magnitude	Potential Indirect Impact Significance	Residual Direct Impact Magnitude	Residual Direct Impact Significance	Residual Indirect Impact Magnitude	Residual Indirect Impact Significance
Murchison Falls–Albert Delta Wetland System Ramsar Site	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE
Lake Albert	C	VERY HIGH	MEDIUM	HIGH ADVERSE	MEDIUM	HIGH ADVERSE	NEGLIGIBLE	LOW ADVERSE	LOW	MODERATE ADVERSE

15.8 Biodiversity Loss/Gain Accounting and Measures to Achieve Net Gain

15.8.1 Overview

In consideration of the objectives of PS6 there is a requirement to achieve no net loss of natural habitat and net gain of Critical Habitat. From the above impact assessment, it should be noted that for the most sensitive species, particularly those that comprise CHQS it is very difficult to mitigate down to an insignificant condition using standard Project level mitigation.

This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain for Critical Habitat lost or compromised as a result of the Project and CHQS is required. Further details on Biodiversity Loss/Gain Accounting and measures to achieve Net Gain are provided in ***Chapter 14: Terrestrial Wildlife*** (section 14.8).

15.8.2 Measures to achieve Net Gain

Addressing impacts that are out of the Project's immediate sphere of control and which may be only partially attributable to the Project requires a collaborative strategic approach involving multiple stakeholders (e.g. regional government, local communities, UWA, NFA and other partners and stakeholders as appropriate).

The Project has developed a number of mitigation concepts (also referred to as 'Biodiversity Conservation Initiatives') for dealing with likely residual indirect impacts. These concept strategies form the core of the approach to achieving net gain / no net loss for the Project in line with requirements of IFC PS6 , and are part of the Net Gain Strategy (that some may refer to as "Offset Strategy") and Implementation Plan.

These strategic programmes to mitigate indirect impacts will be implemented in a timely way and will start early in the Project cycle, both because significant adverse impacts may occur early Project phases, and because there is a lead-in time associated with negotiating and developing collaborative approaches involving multiple stakeholders. Early commencement will mean that their effectiveness can be monitored throughout the life of the Project and remedial actions taken as appropriate in order to achieve mitigation objectives.

A short list of three concept strategies has therefore been agreed with the Project Proponents at this stage, which will be developed in more detail. These concept strategies are relevant to all stages of the Project and are summarised below below.

15.8.2.1 Reducing human pressures and increasing resilience of the Murchison Falls Protected Area (MFPA)

Measures to reduce human pressures and increase resilience of the MFPA: through enhanced park protection and community-based management. This will also include measures to protect and maintain connectivity of the savanna corridor outside the MFNP and including Bugungu Wildlife Reserve: manage in-migration impacts to savanna habitat and associated species by addressing threats and maintaining connectivity within and around Bugungu Wildlife Reserve. The following will be considered (Subject to feasibility study):

- In-kind Support to UWA for:
  - Equipment needed to enhance its ability to protect the MFPA;
  - Recruitment, training and deployment of a rapid reaction team (RRT) for MFPA;
  - Training in community conservation; and
  - Strategic and tactical support to UWA including training, capacity building and independent data management, analysis and reporting.
- Community-based interventions including:
  - Establishing community governance structures such as Village Saving and Loans Associations (VSLAs) and Community Land Associations (CLAs) assisting local communities

to establish and develop PES or micro-credit schemes or animal husbandry and, where appropriate, to promote alternative wildlife-friendly enterprises

  - Recruitment and training of village wildlife scouts to empower and involve communities in park management;
  - Promotion of alternative fuel use and clean cooking stoves to reduce level of fuelwood harvesting;
  - Identify areas with high incidence of human-wildlife carnivore conflict and assess means to address this, for example community-based insurance schemes linked to land-use planning; and
  - Assist local communities to establish and develop simple wildlife-friendly management plans.

15.8.2.2 Conserving and Restoring Wetlands and Riparian Vegetation

Actions to manage and restore wetlands along the southern shore of the Albert Delta Ramsar site: manage anticipated impacts of in-migration on wetland habitat, fisheries and associated biodiversity around the Albert Delta Ramsar site through community-based management. The following will be considered (Subject to feasibility study):

- Organisation/establishment of wetland user groups/management committees;
- Developing agreed community management rules and regulation approaches;
- Environmental awareness raising in local communities;
- Establishing nurseries for revegetation of papyrus (and/or applying ecological engineering approaches to restoration);
- Participatory monitoring and evaluation of wetland areas and resources; and
- Micro-credit schemes to support livelihood diversification.

15.8.2.3 Conserving and Restoring Forests [Landscape Contexts D & F]

Measures to conserve and restore forests and forest connectivity along the eastern shore of Lake Albert (including Budongo and Bugoma FRs). As part of reduction effort of in-migration impacts on forests, in order to maintain and restore key forest corridors and enhance protection of threatened species; the following will be considered (Subject to feasibility study):

- Establishing agroforestry systems (combining shrub/tree planting with agricultural practices to create more diverse, healthy, productive and profitable sustainable land-use;
- Support establishment of CLA’s through which to coordinate and implement PES and micro-credit schemes to support livelihood diversification;
- Promotion of alternative fuel use and clean cooking stoves to reduce rate of fuelwood harvesting;
- Establishing nurseries for community reforestation and sustainable resource extraction (e.g. wood production and NTFPs);
- Specific activities to target the conservation of high priority species (e.g. actions to reduce hunting pressures (e.g. removal of snares) and activities that combat illegal hunting and trading will be important); and
- Enhanced management of existing FRs will require support to the Government for enforcement activities (e.g. improved patrolling and boosting community conservation efforts).

15.9 Monitoring

There are a significant number of mitigation measures that will be implemented as part of this Project. These are necessary to ensure that potential impacts are managed and that significant impacts are controlled and reduced. In consideration of the general lack of data for most aquatic species, the main recommendation is to undertake monitoring of potential threats through pressure and response indicators. In this way, the feedback mechanisms can be employed to ensure that any deterioration of the status of defined indicators can be monitored and timely corrective actions taken.

Targeted monitoring and research to validate the assumptions used in the loss/gain accounting forecast is therefore appropriate to narrow these confidence intervals and ensure that the nature, scale and intensity of mitigation are appropriate. This research will be useful if conducted on a timeline that realistically allows for adaptation of mitigation measures prior to significant impacts occurring.

15.10 In-Combination Effects

For the purpose of this ESIA, in-combination impacts are determined when we consider the joint impacts of both the Project and the Supporting Infrastructure and associated facilities.

As described in ***Chapter 4: Project Description and Alternatives***, the Project has a number of supporting and associated facilities that are being developed separately (i.e. they are subject to separate permitting processes and separate ESIAs or EIAs). These facilities include:

- Tilenga Feeder Pipeline;
- East Africa Crude Oil Export Pipeline (EACOP);
- Waste management storage and treatment facilities for the Project;
- 132 kV Transmission Line from Tilenga CPF to Kabaale Industrial Park; and
- Critical oil roads.

As these facilities are directly linked to the Project and would not be constructed or expanded if the Project did not exist, there is a need to consider the in-combination impacts of the Project and the supporting and associated facilities. This is distinct from the Cumulative Impact Assessment (CIA) which consider all defined major developments identified within the Project AoI (and not just the associated facilities) following a specific methodology which is focussed on priority Valued Environmental and Social Components (VECs) (see ***Chapter 21: Cumulative Impact Assessment***).

The in-combination impact assessment considers the joint impacts of both the Project and the supporting and associated facilities. The approach to the assessment of in-combination impacts is presented in ***Chapter 3: ESIA Methodology*, **Section 3.3.5.

In-combination impacts have the potential to exacerbate influences on aquatic species, however, the increase in magnitude will be Insignificant with mitigations measures in place, therefore, there will be no change in the residual significance proposed in Section 15-36 and no Significant in-combination impacts are predicted. A further summary and justification is provided in the species summary tables provided in Appendix P.

Nonetheless, comments are provided below (Table 15-49) on the potential in-combination impacts and collaborative mitigation that can be provided between project proponents to address these impacts.

Table 15-49: In-combination Impacts

Description of Potential Impact of Project	***Comment on potential In-combination impacts with associated facilities***
Disturbance	Site preparation and construction of the Tilenga Feeder Pipeline and critical oil roads, will further increase in vehicles on roads and increased disturbance (artificial lighting, noise, vibration). The effects of the Project will therefore have the potential to be exacerbated in areas where these activities occur in the same locations.

Description of Potential Impact of Project	*Comment on potential In-combination impacts with associated facilities*
Direct loss and degradation of habitats	Site preparation and construction of the Tilenga Feeder Pipeline and critical oil roads will have the potential to impact aquatic habitats through direct loss of habitat or impacts on water quality from associated activities (e.g. contaminated run-off).
Project-associated induced access and in-migration leading to land-use change.	The oil roads will further improve access within the region and allow more people to travel to previously isolated areas such as the MFPA. This will exacerbate the Project's effects with respect to increased human settlement and land-use change and increased demand for protein sources from fish.

Addressing impacts that are out of the Project's immediate sphere of control and which may be only partially attributable to the Project requires a collaborative strategic approach involving multiple stakeholders. The following collaborative approach is proposed:

- Project Proponents will invite other developers to participate in joint planning initiatives with local government and other relevant stakeholders, and will continue to share best practices to allow other developers to learn from successful implementation of mitigation measures addressing impacts on aquatic life for the Project, also aiming at minimising potential combined disturbance and barrier-effects
- The Project Proponents will invite other developers, local and national government and other relevant stakeholders to participate in joint planning of the mitigation concepts for dealing with likely residual indirect impacts (as presented in section 15.8);
- Strategic collaboration platforms will be established with local and regional authorities, UWA, NFA development and conservation NGOs and other stakeholders as appropriate to regularly evaluate and review the extent of impacts, share understanding of causes and identify adapted or additional mitigation requirements; and
- The Project Proponents will invite other developers, local and national government and other relevant stakeholders to participate in joint planning initiatives to address influx. Feasibility of jointly sponsoring a regional level Influx Management Strategy will be assessed.

15.11 Unplanned Events

Further details on unplanned events relevant to the Project are detailed in ***Chapter 20: Unplanned Events***.

15.12 Cumulative Impact Assessment

Chapter 21: Cumulative Impact Assessment provides an assessment of the potential cumulative effects of the Project together with other defined developments in the Project AoI. The CIA focussed on VECs that were selected on the basis of set criteria including the significance of the effects of the Project, the relationship between the Project and other developments, stakeholder opinions and the status of the VEC (with priority given to those which are of regional concern because they are poor or declining condition). On the basis of the selection process, Lake Albert Capture Fisheries was considered to be a priority VEC and is considered further in the CIA.

15.13 Conclusions

This chapter assesses the potential impacts of the Project on aquatic life within the Project AoI. In consideration of the objectives of PS6, there is a requirement to achieve no net loss of natural habitat and net gain of Critical Habitat. The assessment has defined priority species as receptors, based on a number of criteria including whether they are CHQS but also if they are otherwise of stakeholder interest. There is therefore a large number of receptors and the assessment is therefore quite complex.

The presence and sensitivity of receptors has been identified based on numerous field and desk based studies, some of which are at a landscape level and others which were commissioned specifically for this assessment. It should be noted, however, that for most aquatic species there is lots of unknowns about their distribution, their population trends, and therefore the precautionary principle has been applied when assessing impacts and developing mitigation.

Potential impacts have be considered to be direct, i.e. those impacts that may occur as a consequence of the project design or activities and indirect, which may occur as a result of induced effects, for example an associated increase in human population that puts pressure on biodiversity through habitat loss, pollution or human-wildlife interactions.

The findings from the assessment of direct impacts indicate that, taking all embedded and additional mitigation into account, no significant direct residual impact is expected to remain. The assessment indicates however that there could be indirect residual impacts on a variety of priority species across different landscapes and that the indirect impacts are overall expected to be more significant than the direct ones. Increased pressure on fisheries due to influx is expected to be the main cause of impact to the aquatic species. Consequently there will be a need for some broader strategies and initiatives, involving other stakeholders (see section 15.7.5.2 above), to manage and reduce the indirect impacts on these priority species and the habitats upon which they are dependent.

From the above impact assessment, it should be noted that for the most sensitive species, particularly those that comprise CHQS it is difficult to mitigate down to an insignificant condition using standard Project level mitigation.

This is therefore where the requirement for additional measures to achieve no net loss (for Natural Habitat) and net gain for Critical Habitat lost or compromised as a result of the Project and CHQS is required. These actions consist of the concept strategies (biodiversity conservation initiatives) (summarised in Section 15.8 above), which will be scoped and developed to achieve the quantitative targets presented in the report. These will be organised around three main priority areas aiming at improving protection of existing protected areas, particularly savanna, wetlands and forests; improving connectivity between areas of natural habitat; and improving the quality of existing habitats.

These initiative will include working together with other developers, local and national government agencies and other relevant stakeholders through partnerships and other arrangements. The success of these initiatives relies therefore heavily on an optimum multiple Parties partnership. In consideration of general the lack of data for most aquatic species, the main recommendation however is to undertake monitoring of potential threats through pressure and response indicators.

Given the complexity of the Project, the Project Proponents will adopt a practice of adaptive management in which the implementation of defined mitigation and management measures will be responsive to changing conditions. Long term monitoring of agreed indicators will then be required to ensure that the identified requirements for no net loss / net gain and fulfilment of all defined mitigation management objectives have been achieved.

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