REPORT – NON-TECHNICAL SUMMARY

September 2018

CNOOC UGANDA LIMITED

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE CNOOC UGANDA LTD KINGFISHER OIL DEVELOPMENT, UGANDA

Submitted to:
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1.0 INTRODUCTION AND OVERVIEW

CNOOC Uganda Limited (CUL), Tullow Uganda Operations Pty Ltd (Tullow) and Total E&P Uganda Ltd (Total) in equal partnership are planning to develop oilfields in three government-designated oil license areas on the eastern border of Lake Albert in western Uganda (see Figure 1-1). Each company is operating in a different license area.

CNOOC Uganda Limited (CUL) is the Ugandan subsidiary of the China National Offshore Oil Corporation (CNOOC), the largest offshore oil and gas producer in China. CNOOC Uganda was established in 2010, and employs around 130 permanent staff, of whom approximately 60% are Ugandan.

1.1 Project overview

Photograph 1-1 shows the Buhuka Flats where the proposed production facility will be located. The production facility will consist of a central processing facility (CPF) where well fluids from wells drilled under Lake Alert will be processed and transported via a feeder pipeline to Kabaale, where government intends to establish an industrial park including an oil refinery. LPG (liquid petroleum gas) will also be produced for the local market, and electricity will be generated during the initial years of operation and provided into the national grid. Supporting infrastructure includes flowlines from the well pads to the CPF, access roads, an upgraded jetty, a water abstraction station on Lake Albert, temporary and permanent personnel camps, a materials yard, underground power cables from the CPF to other infrastructure, truck buffer yard, drilling storage yard, airfield / helipad etc and a safety check station at the top of the escarpment. Chapter 2 contains more details.

The project will be constructed over a period of three years, starting in 2019. Drilling of additional wells and supporting infrastructure will continue for five years during the operational phase.

Oil production will ramp up over time as new production wells are added: 20,000 BOPD in the first year of operation, 30,000 BOPD in the second year, and 40,000 BOPD, i.e. full production, in the third year, for almost 6 years. From that point until the end-of-life of the field in year 25, there will be a gradual reduction in oil production.

Photograph 1-1: The Buhuka Flats between the shore of Lake Albert and the escarpment, where the proposed project will be located.

Whilst this report provides the most accurate account possible of the project, the nature of engineering is that the design develops over time. Major changes that could influence the findings of the ESIA are not expected.

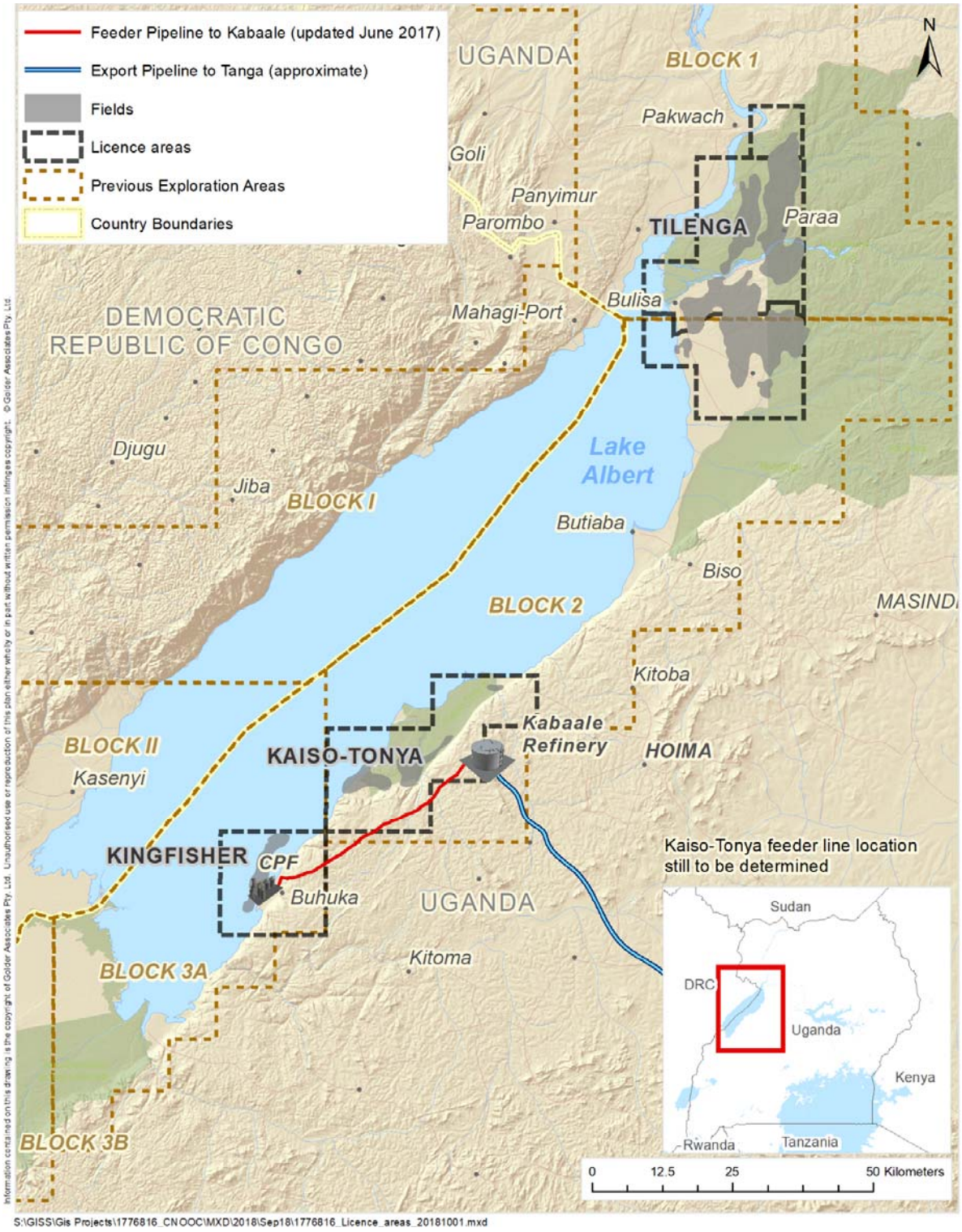

Figure 1-1: Location of the three government-designated oil license areas along Lake Albert and their operators. CNOOC operates in the Kingfisher License Area where the first oil in Uganda was discovered

2.0 PROJECT DESCRIPTION

2.1 Existing infrastructure

Figure 2-1 shows the existing project infrastructure, all of which have already received environmental authorisation and have been built.

*Figure 2-1: Overview of the **existing** main project infrastructure*

2.2 Well pads

Three existing well pads, pads 1, 2 and 3, will be upgraded. A new well pad, pad 4A, will be constructed to replace an existing well pad which was established on a geological unstable site.

The well pads (7–9 ha in size) will be fenced, will not be manned, and will be managed from the control room at the CPF. There will be no flaring or venting, except during well testing prior to commissioning.

2.2.1 Production and injection wells

Approximately 20 production wells and 11 water injection wells will be drilled from the four well pads. Production wells will extract well fluids containing oil from the underground oil reservoirs. One of existing exploration / appraisal wells (Kingfisher-4C, well pad 2) is initially going to be a production well, but will be converted from a production well to an injection well after several years

Injection wells will be used to inject water that was heated in the CPF into the oil reservoir to force the oil upwards, to warm up the oil to flow more easily, and to safely dispose of large quantities of produced water that will be removed from the well fluids. Injection water will be treated to meet injection water quality specifications.

ENSURING CRUDE OIL FLOW

The crude oil will have a high wax content (31.2%) meaning it will thicken and congeal. For this reason, all infrastructure will be heated to ensure that the oil flows.

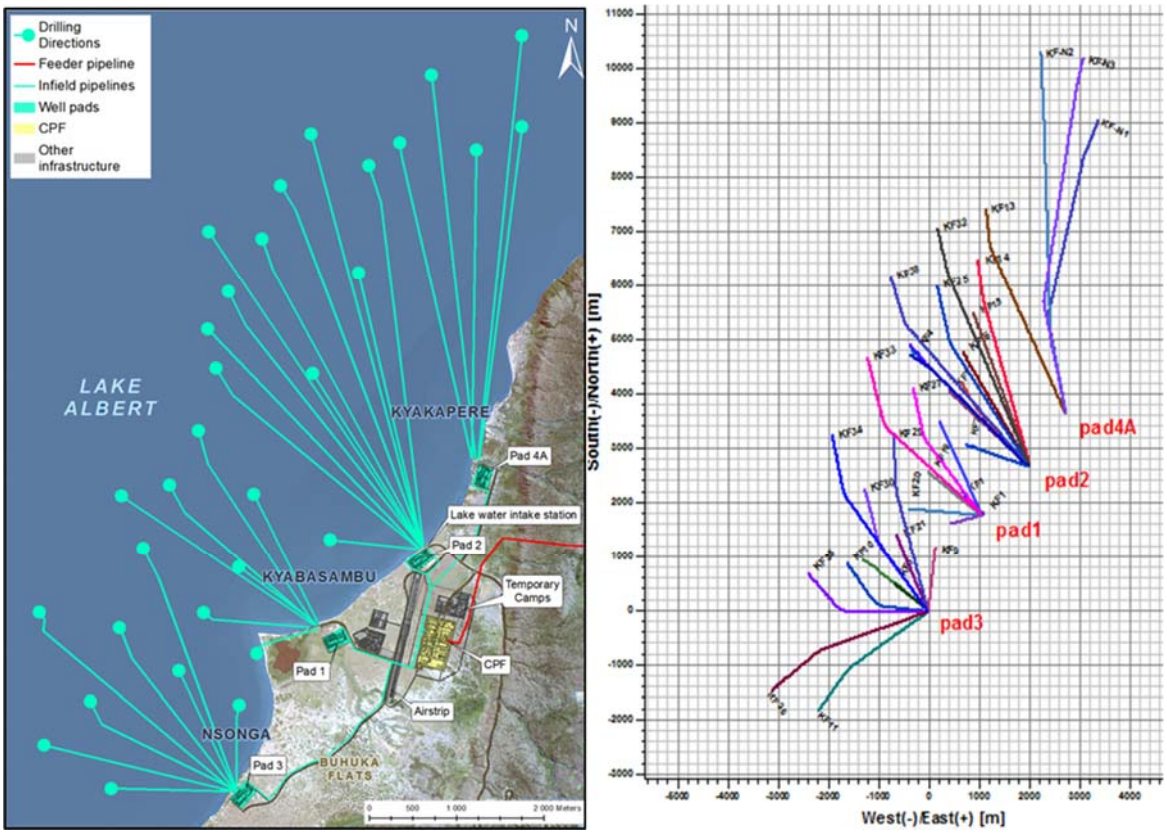

Figure 2-2: Approximate subsurface extent of the wells and wellbores (left side) with the latest extent indicated on the right as of September 2018 .

2.2.2 Drilling

Only one drilling rig (see Photograph 2-2) will operate on site at any time, moving from well pad to well pad.

Figure 2-3 shows how drilling will be done, first vertically, and then horizontally under the Lake. It will take two to four months to drill a well depending on the depth and distance of horizontal drilling.

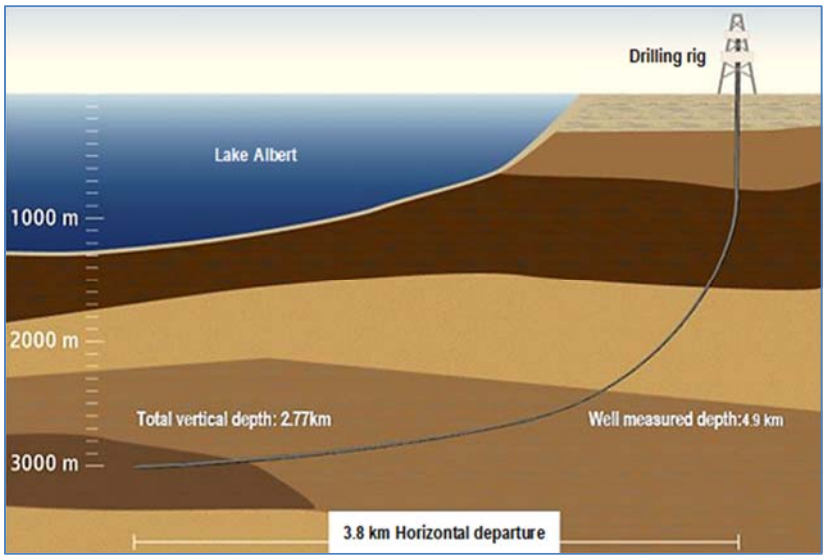

Figure 2-3: An illustration of directional drilling under Lake Albert

Photograph 2-1: A drilling rig at Lake Albert, about 45 m high

2.2.2.1 Drilling fluids

Drilling fluid (also known as 'mud') is used to transport rock cuttings from the wells being drilled up to the surface, cool and lubricate the drill bit, and to transmit hydraulic energy to the drilling tools and bit. Water-based drilling fluids will be used for the upper sections of the wells and synthetic drilling fluids for the deeper sections. Both types include weighting materials to minimise the risk of well instability, and chemicals to control pH or shale, to lubricate the well bore, inhibit corrosion, keeping the temperature stable, etc. Synthetic drilling fluids are internationally classified into *high*, *medium* and *low* based on their toxicity determined by the content of aromatic hydrocarbons, CNOOC will use *low* aromatic synthetic fluids.

2.2.2.2 Drilling wastes

A rule of thumb is roughly 0,5 m^3 of drilling mud per metre of well drilled. The bulk of drilling waste, both hazardous and non-hazardous, will consist of:

- drilling cuttings of about 600 m^3/well, one third water-based and two thirds synthetic, and
- clear liquids of about 1,000 m^3 per well.

Table 2-1: Flowline length and diameter

Flowlines to the CPF	Length (km)	Diameter (inches)
From Pad 1 (well fluids)	1.63	10
From Pad 2 (well fluids)	1.64	12
From Pad 3 (well fluids)	3.5	12
From Pad 4A (well fluids)	2.58	8

2.3 Flowlines

Table 2-1 shows the length and diameter of flowlines from the well pads to the CPF, and from the water abstraction point on Lake Albert to the CPF.

Well fluids will be transported to the CPF via flowlines, buried along the access roads 1 m below ground to top-of-pipe. Figure 2-3 shows how the pipeline is buried and protected. Indigenous grass cover will be encouraged over the flowlines to prevent erosion

Once the flowlines are buried, Lake Albert water will be pumped to maximum pressure into the flowlines to test that the pipes and welds can withstand the pressures under which they will be operated (hydrotesting). After testing, this water will be treated and returned to Lake Albert. Flowlines require little maintenance, and leaks are very rare.

There will be no fencing so local people will have free access during the operational phase. For safety, cultivation or structures on the flowlines may not take place, but stock grazing is permitted.

2.4 Central processing facility (CPF)

Figure 2-4 shows the layout of the CPF, which will cover an area of 20 ha. Well fluids will be processed into the following:

- **Oil,** 40,000 barrels per day: to be transported via the feeder pipeline to the oil refinery to be built at Kabaale
- **Gas**, 9.1 MM standard cubic feet of gas: to be used to generate electricity and to produce LPG (liquid petroleum gas) for sale into the local market
- **Produced water,** 112,563 barrels per day: to be treated to international specifications for injection into oil reservoirs.

There will be no continuous gas flaring at the CPF. During maintenance or emergencies, a ground flare will be used.

Photograph 2-2: Oil will be stored in 10,000 m^3 tanks with floating roofs. Temperature in the tanks will be maintained at 68ºC.

The CPF will comprise the following activities and areas:

- Oil separation flash gas facilities
- Gas treatment & compression facilities
- Produced water treatment & Injection facilities
- Oil storage & export facilities
- Enclosed ground flare
- Power generation plant
- LPG production and loadout
- Electrical substation
- Water treatment plant
- Heat exchange unit for recovery of waste heat
- Fire water and pumps
- Plant Utilities area
- Control room and administrative buildings
- Maintenance workshop
- Gatehouse
- Perimeter fencing, lighting and internal access road system

Full details are contained in the main report

2.4.1 Power generation and heating

Electricity will be generated at the CPF from fuel gas used and supplied to project infrastructure by way of underground cables buried in flowline trenches. A 1,000 KW low voltage diesel generator will provide power to essential services during power failures.

In the first 10/11 years, the CPF will generate more electricity than the project needs, and CNOOC will sell it to government through a connection to the national grid. After 10/11 years, gas volumes will reduce, and

power lines will be used in the reverse direction to import power from the national grid. Power lines and infrastructure will be the responsibility of Government.

2.4.2 Water intake from Lake Albert

Water for the project, 390 m^3/hr, will be supplied from a water intake station on Lake Albert. This will supply sufficient water for make-up injection water, potable water and other water requirements at the CPF.

2.4.3 Water treatment and management

A produced water treatment plant at the CPF will remove oil and impurities from the produced water before returning it to the injection wells. Filter aids, demulsifiers and biocides may be added during treatment. Just before injection into the injection wells, corrosion inhibitor, scale inhibitor, oxygen scavenger and biocide will be added. Make-up water from Lake Albert will be heated and mixed with the produced water.

Large quantities of filter backwash water will be generated at the water treatment plant. Clarified water will be re-used in the plant, and solids and sludges will be collected and removed by a registered third-party waste contractor for disposal.

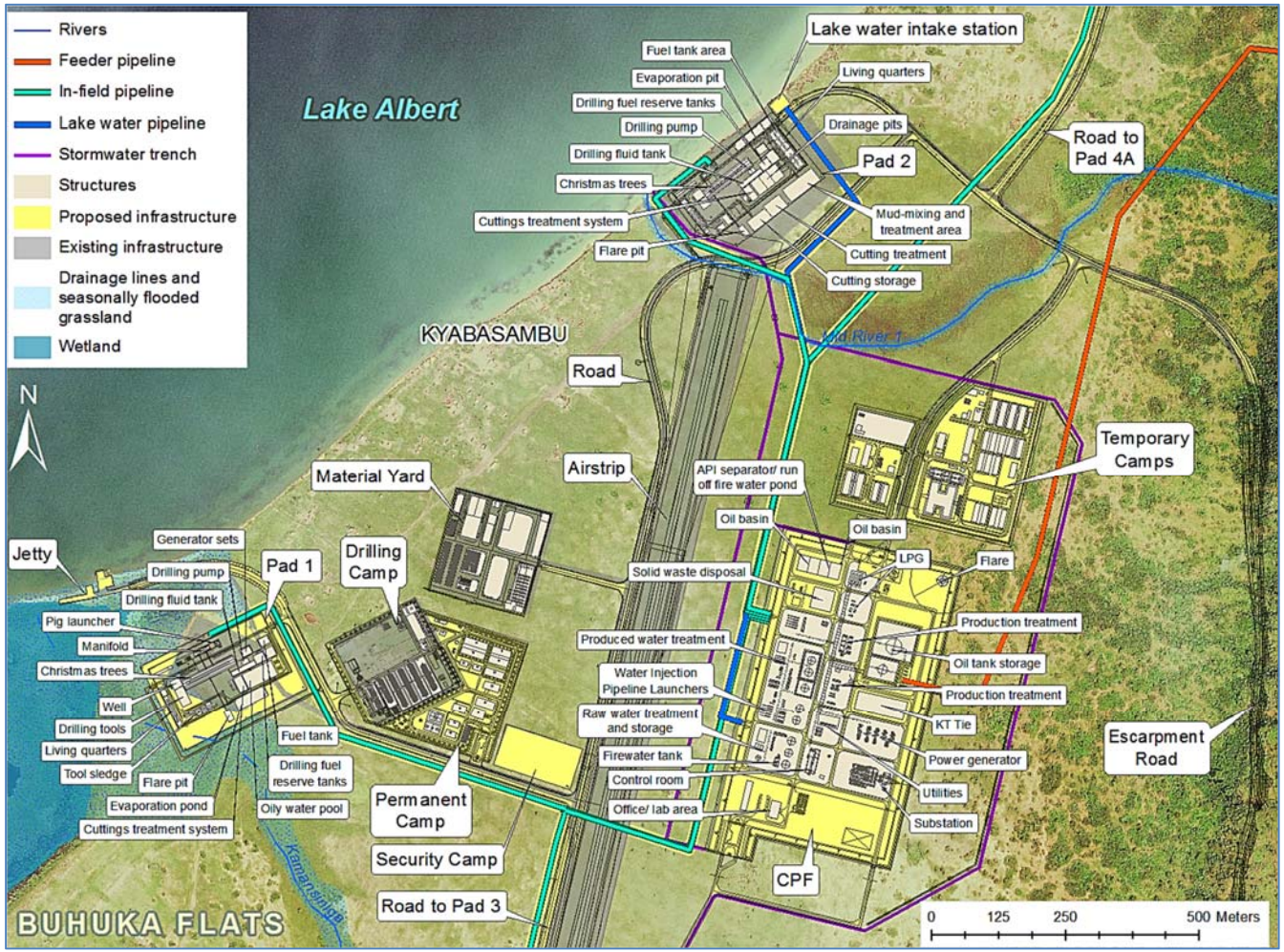

Figure 2-4: Footprint and typical layout of the CPF, showing the context of the well pads and associated infrastructure

The following other types of process effluent will be generated:

- Potentially oil contaminated water. This could be from work areas, from wash water or from accidentally oil-contaminated areas, and could include stormwater coming into contact with oil-contaminated work areas
- Sewage: All sewage will be treated and where possible used on roads to suppress dust in the construction phase and to irrigate green spaces around the camp and CPF, and also on community grazing areas in the operational phase.
- Laboratory water. Due to possible chemical contamination this water will be contained for testing and treated.

Accidental spills containment

Accidental leaks/spills from storage tanks containing hazardous liquids will be captured in secondary containment areas around each tank made of impervious, chemically resistant material capable of containing 110% of the volume of the tank.

2.4.4 Air Emissions

Air emissions will include flue gases from the gas-fired power plant, emissions from pumps, compressors and other equipment at the CPF, and from the flare during upset or emergency conditions. The project will use IFC/World Bank guidelines, based on World Health Organisation guidelines, to minimise health risks.

2.4.5 Solid waste

CNOOC's Waste Management Design Philosophy complies with the principles of the waste hierarchy shown in Figure 2-5. This is in line with the Ugandan Waste Management Regulations and international standards and guidelines such as those of the IFC/World Bank.

Figure 2-5: The solid waste management hierarchy

Most hazardous wastes will be classified as petroleum wastes. In terms of the Draft Petroleum Waste Management Regulations (2016), a petroleum waste handler licensed by the Ugandan regulator, has to collect and manage this waste.

Small quantities of solid waste (less than 0.5 t/well/year) will be generated at the well pads during operation, both hazardous (oil-contaminated) and non-hazardous. These wastes will be taken to the CPF and handled with the CPF's waste. Wastes will be segregated into hazardous, non-hazardous, domestic and recyclable waste and stored at designated points at the CPF from where it will be removed by waste contractors for disposal. At the CPF, the principal hazardous waste will be oily sludges generated by cleaning the produced water. This waste, together with small quantities of other oil/contaminated and other hazardous waste, will be first dewatered at well pad 2, and then stored at the CPF for removal by a hazardous waste contractor.

2.4.6 Construction

Construction will involve a multitude of activities. Cranes, excavators, bulldozers, heavy vehicles, vibrating rollers, and a wide range of other mechanical and hand-operated equipment will be used. For safety reasons and the expected limited use of the airstrip during field development, it will be converted into a materials lay-down area.

2.4.7 Personnel and accommodation

CNOOC has a local labour policy and currently employs roughly 60% of all unskilled labour from the local area. During construction, between 1,000 up to 2,000 personnel (including day workers) will be employed at peak times. A temporary and permanent personnel camp will house employees. Both camps will be fully serviced with waste management, sewage treatment, medical and recreational facilities. The temporary camp will accommodate roughly 800. Day workers will be brought to site from surrounding villages.

2.5 Feeder pipeline to Kabaale

Figure 2-7 shows the proposed route of the 46.2 km feeder pipeline and adjacent land use and settlement. Construction will start in early 2020. Block valves and cathodic protection posts will be located at intersections with existing roads. The pipeline will be heated to approximately 80ºC degrees to ensure the crude oil keeps flowing.

There will be no fencing so local people will have free access during the operational phase. The pipeline right of way will be 10 m wide once established. All trees will be removed to ensure their roots do not interfere with the pipeline. For safety reasons, cultivation or building of structures on the pipeline may not take place, but stock grazing will be permitted.

2.5.1 Pipeline construction

It will take 8-10 months to construct the pipeline. The width needed for construction is 30 m, i.e. the right of way. Construction vehicles and equipment will be restricted to this area. Figure 2-6 shows the stages of construction, from bush clearing to final restoration. Figure 2-8 shows how the pipeline is buried underneath steams or rivers by way of directional drilling. Photograph 2-3 show how typical pipeline construction is done. Once the pipeline is buried, stored topsoil will be returned over the trench and surrounding disturbed areas. Natural grasses can return. An access road along the pipeline right of way is not proposed.

A 200-person construction camp will be located roughly mid-way along the pipeline route. Some personnel will come to work daily from their homes along the pipeline route. The camp will be decommissioned once construction is complete, with all infrastructure being removed.

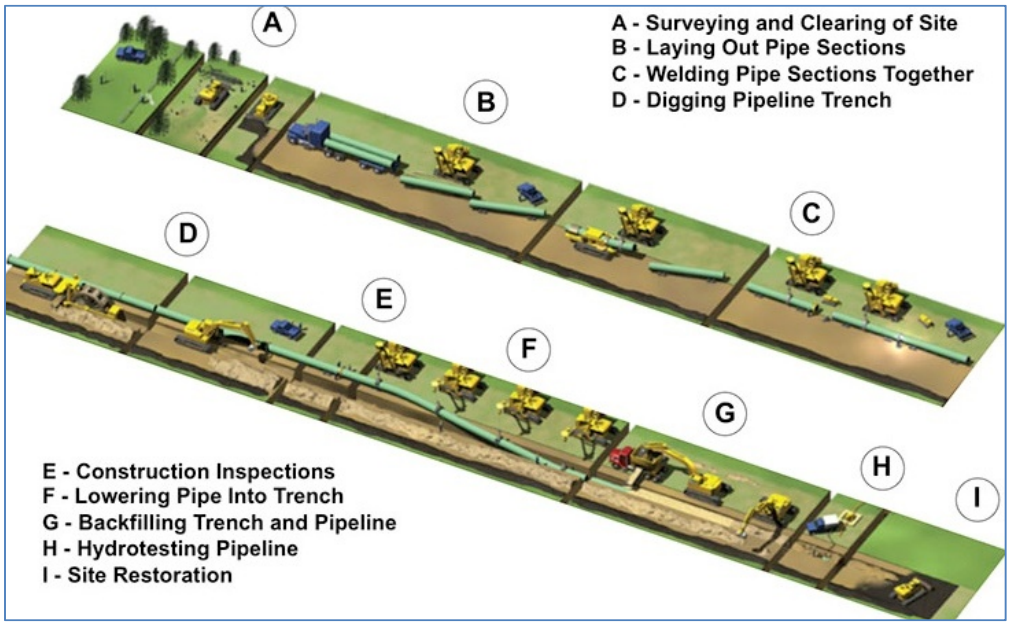

Figure 2-6: Construction stages of laying a pipeline [Source: Association of Oil Pipelines (AOPL)]

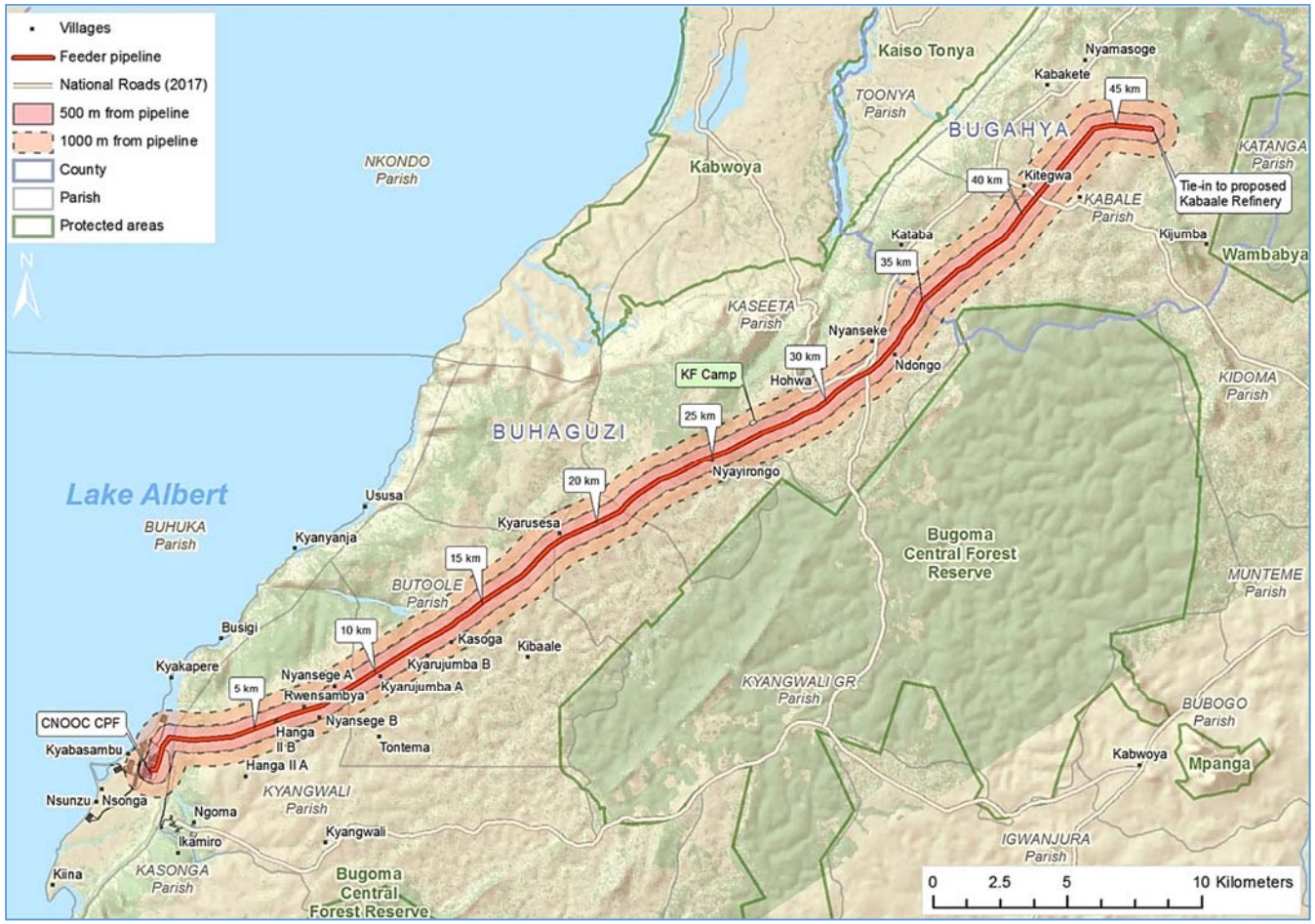

Figure 2-7: Proposed route of the feeder pipeline from the CPF to Kabaale. The temporary camp for pipeline construction personnel is shown between km 25 and km 30.

2.5.2 Pipeline safety

Although leaks are very rare, a crude oil pipeline needs to be protected to ensure its safety and long operating life. Decades of data on hazardous pipelines show that the design life of a pipe can exceed 30 years.

Protection measures include constructing the pipeline from steel, burying it at least 1 m below ground and at a safe depth below streams and rivers (Figure 2-8) and burying a red warning tape on top of the pipeline to warn anyone inadvertently digging.

In addition, before use, the pipe is hydro-tested (pumping water to maximum pressure in the pipeline to test the welds). Regular monitoring for leaks and human activity that could cause risks will take place, and a fibre-optic cable buried with the pipe will provide continuous, real time monitoring, including movement due to seismic activity. The CPF control room would pick up any major leaks as a result of a drop in pressure, and fully automated block valves can shut the pipeline down in case of an emergency.

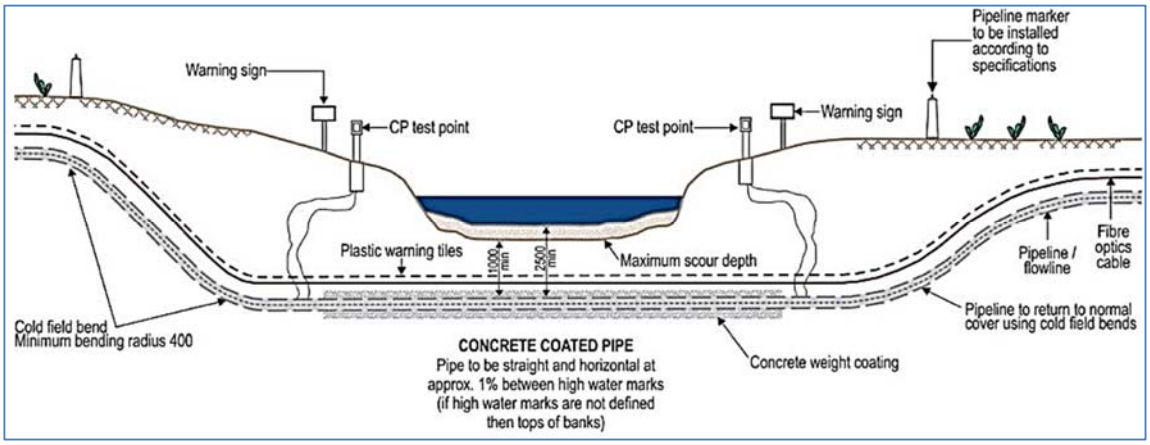

Figure 2-8: Cross section of a pipeline buried below a stream/drainage line

Clearing and grubbing

Pipe string along the construction right of way

Cleveland excavator

Blasting in rocky areas

Manual welding

Lowering in

River crossing (note flume pipes)

Trench breakers on steep slopes

Screening plant backfilling the trench

Closing up

Reinstated surface with drainage berms

Reinstated surface with pipeline centreline marker

Photograph 2-3: Typical illustrations of pipeline construction

3.0 PROJECT AREA OF INFLUENCE

For the purpose of the impact assessment, two study areas were used, namely:

The Local Study Area or 'LSA': This area covers the production facility and associated infrastructure on the Buhuka Flats, and for the feeder pipeline to Kabaale a materials yard and stockpile area on top of the escarpment, temporary construction camp and the pipeline construction right of way. A 1 km buffer around infrastructure was included to capture all potential direct effects.

The Regional Study Area or 'RSA': This is a larger area within which potential effects arising from the Project may impact on biodiversity. This is also the area defined as the 'Critical Habitat Area of Analysis' as discussed later for the biodiversity assessment.

4.0 ESIA PROCESS, PUBLIC PARTICIPATION AND SCOPED ISSUES

The ESIA comprises 5 volumes, with a "road map" shown in Section 4.1 of Volume 2, Chapter 4. At the request of NEMA, the ESIA divides the project into two main components: the production facility, which includes associated infrastructure, most of which is situated on the Buhuka Flats; and the feeder pipeline, which will transport oil from the production facility to Kabaale.

Project components that are *not* CNOOC's responsibility and that are only considered under cumulative impacts are:

- The industrial park and oil refinery at Kabaale; powerlines and substations; and the proposed export East African Crude Oil Pipeline to an oil export terminal on the Tanzanian coast near the Kenyan border;
- The oil roads to be widened and upgraded by Government for use by multiple users (the P1 and P5);
- Associated infrastructure**:** petroleum waste management facilities (by law, Ugandan oil licensees may not engage in business related to their petroleum waste), and a pipeline (tie-back) linking the Kaiso-Tonya field operated by Tullow to the CPF. Tullow will operate this pipeline.

4.1 Consultation for the ESIA

Consultation for the ESIA was extensive. All villages on and adjacent to the flats, on top of the escarpment at the start of the escarpment road, and along the pipeline route, were consulted (Photograph 4-1). Consultation also took place at all spheres of government, with the Bunyoro Kingdom and a range of other stakeholders.

Meetings in the villages along the Lake Shore and on top of the escarpment

Meeting with women from the Bunyoro Kitara Kingdom

Posters and booklets in four languages with copious visuals illustrated the proposed project

Meetings with LCII and LCIII sub county leaders

Meetings along the pipeline route

Photograph 4-1: Consultation for the ESIA, some examples

4.2 Impact Assessment Methodology

All potential impacts that may be caused by the project were assessed based on a rating scale which took into consideration the nature, magnitude, duration and the scale (geographic extent) of change, as well as the probability of occurrence. A simple scoring system was then applied to determine the "significance" of the change (or impact). Significance scores and their implications for the project are set out in Table 4-1.

Table 4-1: Significance scores and their implications for the project

Value	Significance	Implications for the Project
SP ≥75	Indicates **high** environmental and/or social significance	The degree of change (or impact) that the Project may have upon the environment and/or the community(s) is unacceptably high. High residual impacts carry substantial weight for authority decision making about the project. The impact must be mitigated or avoided. If this impact cannot be mitigated or avoided, the Project is unlikely to be permitted for development.
SP 30 - 75	Indicates **medium** environmental and/or social significance	The degree of change (or impact) that the Project may have upon the environment and/or the community(s) is medium. The Project may be compromised if this residual impact cannot be avoided or sufficiently mitigated
SP ≤30	Indicates **low** environmental and/or social significance	The degree of change (or impact) that the Project may have upon the environment and/or the community(s) is relatively low. Opportunities to avoid or mitigate the impact should still be considered, however this should not compromise the viability of the Project.
+	**Positive impact**	The changes will have a positive benefit upon the existing environment and/or the community(s).

Adopting this approach, where it is deemed that the Significance Points of the project exceed a value of 30, the project design should be reviewed in an effort to avoid or mitigate the potential impact that the development will have upon the existing environment. This will involve the modification of the design to avoid sensitive areas of the site, and/or to incorporate additional measures that will reduce the resulting significance of the change.

5.0 LEGAL, POLICY AND PERMITTING REQUIREMENTS

Uganda has a comprehensive range of national policies, laws and regulations, and national standards and guidelines, and authorities at national, provincial, district and local levels to give effect to these. Uganda is also a signatory to international conventions and agreements. Please see Section 5.5 and Table 5-1 of the ESIA for further details.

In addition to its own policies and standards, CNOOC has committed to follow international good practice in line with the Performance Standards of the International Finance Corporation/World Bank (Table 5-1).

Table 5-1: IFC Performance Standards Relevant to the Proposed CNOOC Project

Performance Standard	Scope
Assessment and Management of Environmental and Social Risks and Impacts	Objectives are to: ■ identify and evaluate environmental and social risks and impacts of the project; ■ adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, affected communities, and the environment; ■ promote improved environmental and social performance through effective use of management systems; ■ ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately; ■ promote and provide means for adequate engagement with affected communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed.

Performance Standard	Scope
Labour and Working Conditions	Objectives are to: ■ promote the fair treatment, non-discrimination, and equal opportunity of workers; ■ establish, maintain, and improve the worker-management relationship; ■ promote compliance with national employment and labour laws; ■ protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the supply chain; ■ promote safe and healthy working conditions, and the health of workers; and ■ avoid child and forced labour.
Resource Efficiency and Pollution Prevention	Objectives are to: ■ avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; ■ promote more sustainable use of resources, including energy and water; and ■ To reduce project-related greenhouse gas (GHG) emissions in a manner appropriate to the nature and scale of project operations and impacts".
Community Health, Safety and Security	Objectives are to: ■ anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances; ■ ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.
Land Acquisition and involuntary resettlement	Objectives of this standard are to: ■ avoid, and when avoidance is not possible, minimize displacement through alternative project design; ■ avoid forced eviction; ■ anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by compensation for loss of assets at replacement cost; and through appropriate disclosure of information, consultation, and informed participation of those affected. ■ improve, or restore, the livelihoods and standards of living of displaced persons; and ■ improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.
Biodiversity and Sustainable Management of Living Resources	Objectives are to: ■ protect and conserve biodiversity; ■ maintain the benefits from ecosystem services; and ■ promote the sustainable management of living natural resources through practices that integrates conservation needs and development priorities.

6.0 RECEIVING ENVIRONMENT

6.1 Physical Environment

6.1.1 Climate of the Buhuka Flats and escarpment

Wind speed and direction are important in respect of the dispersion potential of air pollutants. The Buhuka Flats experience considerable daily variation in wind. Predominant winds blow from SE to SW for 53% of the time, and NW for 10% of the time. The average wind speed is 2.9 m/s with 10% calms.

Peak rainfall is between March and May and between September and December, although patterns have become more erratic in recent years. August to November rainfall is higher than the early peak. Annual average rainfall is around 900 mm, increasing to 1,400 mm per annum on the escarpment due to the higher terrain forcing moist air off the Lake to rise. January is the driest month.

Temperatures are highest in March (>29^{o}C) and lowest in November (~27^{o}C). Minimum monthly temperatures are between 17.5 and 21.1^{o}C.

6.1.2 Air Quality

Burning bush for land clearing, setting fires to drive game and unintentional fires affect air quality, particularly in the drier months. Emissions include carbon monoxide, methane and nitrogen dioxide, and large quantities of smoke which include fine particulates and creates haze over large areas. Domestic burning of wood or charcoal generates respirable particulates, nitrogen dioxide, carbon monoxide and other air pollutants.

Industrial activities on the Flats and eastern Lake shore are presently limited to oil. Large diesel generators drive drilling rigs and are potential sources of short-term nitrogen, sulphur dioxide and particulate emissions. The escarpment road caused increased traffic to the Flats which, together with oil exploration and drilling traffic, is now a source of dust and exhaust emissions although at present with minor impact on air quality.

6.1.3 Geology, Topography and Geomorphology

The Kingfisher field is formed by a structural trap about 10 km long by 2 km wide. The hydrocarbon reservoirs are between 1,783 and 2,375 m below the Lake. Topography of the study area is illustrated in Photograph 6-1 to Photograph 6-8.

The surface of Lake Albert is on average 615 meters above sea level. The Buhuka Flats is a flat, low-lying terrain intersected by drainage lines from the escarpment. At Kyakapere village, 325 m north of well pad 4A, the escarpment plunges almost directly into the lake. The top of the escarpment is roughly 930 meters above sea level, with gently rolling hills to the east, 950-1,450 meters above sea level.

Photograph 6-1: Typical village on a flat area between the Lake and escarpment

Photograph 6-2: Kyakapere village just north of Pad 4A and the last village to the north which can be reached over land from the Buhuka Flats

Photograph 6-3: Steep slopes north of the Buhuka Flats where the escarpment plunges directly into Lake Albert

Photograph 6-4: A village located on the alluvial fan immediately below a gorge in the escarpment

Photograph 6-5: Buhuka Flats from near the shoreline north-east of the proposed CPF

Photograph 6-6: A typical rural scene along the pipeline route

Photograph 6-7: Gently rolling terrain along the feeder pipeline route

Photograph 6-8: Subsistence cultivation along the feeder pipeline route near Nyirongo

6.1.4 Hydrogeology

6.1.4.1 Site Hydrogeology

Generally, groundwater is the most important source of potable water in Uganda, particularly in the rural areas, providing 80% or more of the water supply. Lake-front groundwater levels are between 5.4 m and 6.4 m below surface. Above the escarpment, groundwater levels are on average 18.1 m below surface. Only five on the 11 villages along the Lake have functioning wells since pipes are not being maintained. Villagers note that the wells often yield insufficient water. Along the pipeline route, 15 wells supply villages and is their main source of water. Users complained about seasonality of the shallow wells. The deeper wells are generally reliable.

6.1.4.2 Groundwater Quality

Groundwater quality on the Buhuka Flats is generally poor. Boreholes in Kiina and Kyabasumbu have high pH, very high salinity and very high hardness which significantly exceeds potable water quality standards. Groundwater quality along the escarpment and pipeline route is generally good and within the drinking water standard, with the exception of some trace metals occurring naturally. Long-term exposure to these elements in drinking water pose some health risk to users.

In most boreholes on the Flats and along the pipeline route, groundwater is contaminated with coliforms, including *E. coli,* caused by poor sanitary practices, and leading to outbreaks of diarrhoea and cholera. No organic (hydrocarbon) pollution was found in any sample.

Photograph 6-9: Typical well installation in the project area

Photograph 6-10: Community water point

6.1.5 Surface Hydrology

A conceptual model of the hydrology of the Buhuka Flats is shown in Figure 6-1. Water drains from the escarpment to Lake Albert via the Kamansinig and Masika Rivers and their tributaries.

Lake Albert is the 7th largest lake in Africa. It has a surface area of about 5,300 km^2, is roughly 150 km long, 35 km wide and 56 m deep. The water level averages 615 meters above sea level. Analysis shows annual variations of approximately 4 m in water levels due to the hydrology, releases from the Kabelaga Dam, and wind-generated waves (Photograph 4-12). A water level logger has now been installed on the Flats to monitor the local water level. Lake Albert is strongly alkaline (a pH of 9), higher than the Uganda National Standards, with faecal contamination at both inshore and offshore sites.

Photograph 6-11: The Bugoma Lagoon from the top of the escarpment, Lake Albert in the background

Photograph 6-12: The effect of wind driven wave action near Nsunzu)

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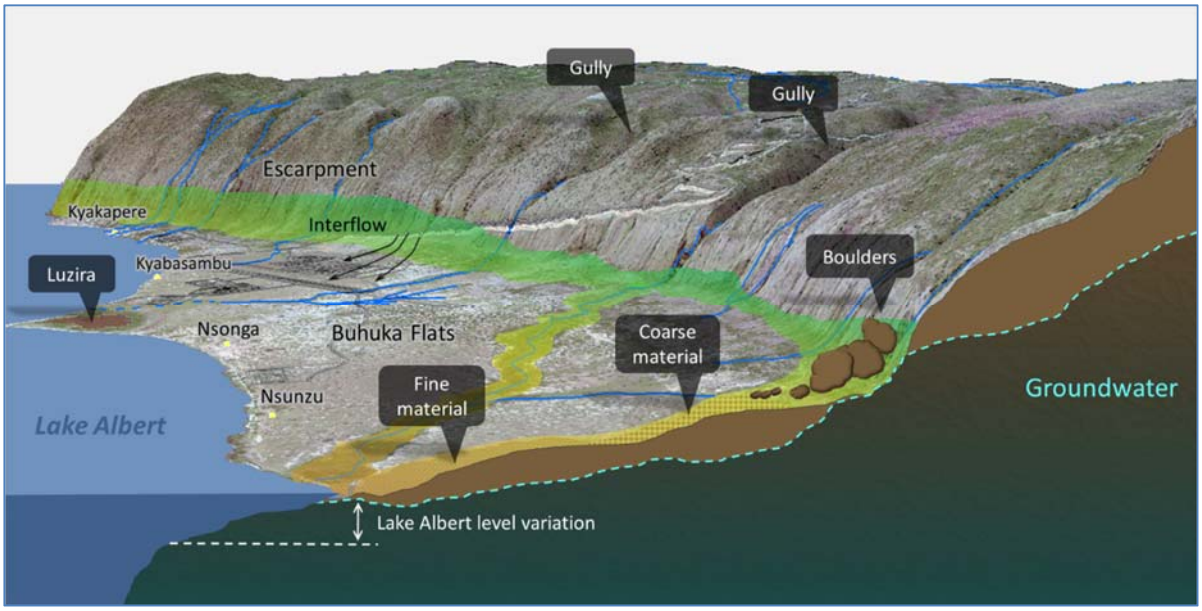

Figure 6-1: Hydrological conceptual model of water drainage from the escarpment via the Buhuka Flats into Lake Albert. Note: Luzira is a local name for the Bugoma Lagoon.

6.1.6 Soils

The dominant soils on the Buhuka Flats according to the FAO Soil Classification System include ferrasols, litosols, gleysols and vertisols. Plant available nitrogen, phosphorus and potassium are readily available for plant growth. Along the feeder pipeline route, soil types are ferrasols, greysols, vertisols and litosols.

6.1.7 Ambient Sound Levels

The Buhuka Flats is a typical deep rural area without electricity. The only sounds are caused by people and animals and the occasional activity such as a television powered by a car battery, or a local boat with a diesel engine. Sound levels at night are particularly low, with long periods of less than 40 dBA, dropping on occasions to less than 30 dBA. Sound levels along the feeder pipeline route are similarly low.

6.2 Biological Environment

6.2.1 Terrestrial and Aquatic Biodiversity

Vegetation in the area has been altered as a result of intensive subsistence agriculture and charcoal manufacture, especially above the escarpment to the Bugoma Central Forest Reserve. The steep slopes of the escarpment have protected it from cultivation.

Figure 6-2 shows the vegetation and aquatic communities on the Buhuka Flats, escarpment and top of the escarpment i.e. the local study area potentially directly affected. Table 6-1 shows the seven broad vegetation communities identified in the regional study area, indicating where they occur.

Figure 6-3 shows the vegetation and aquatic communities in the regional study area.

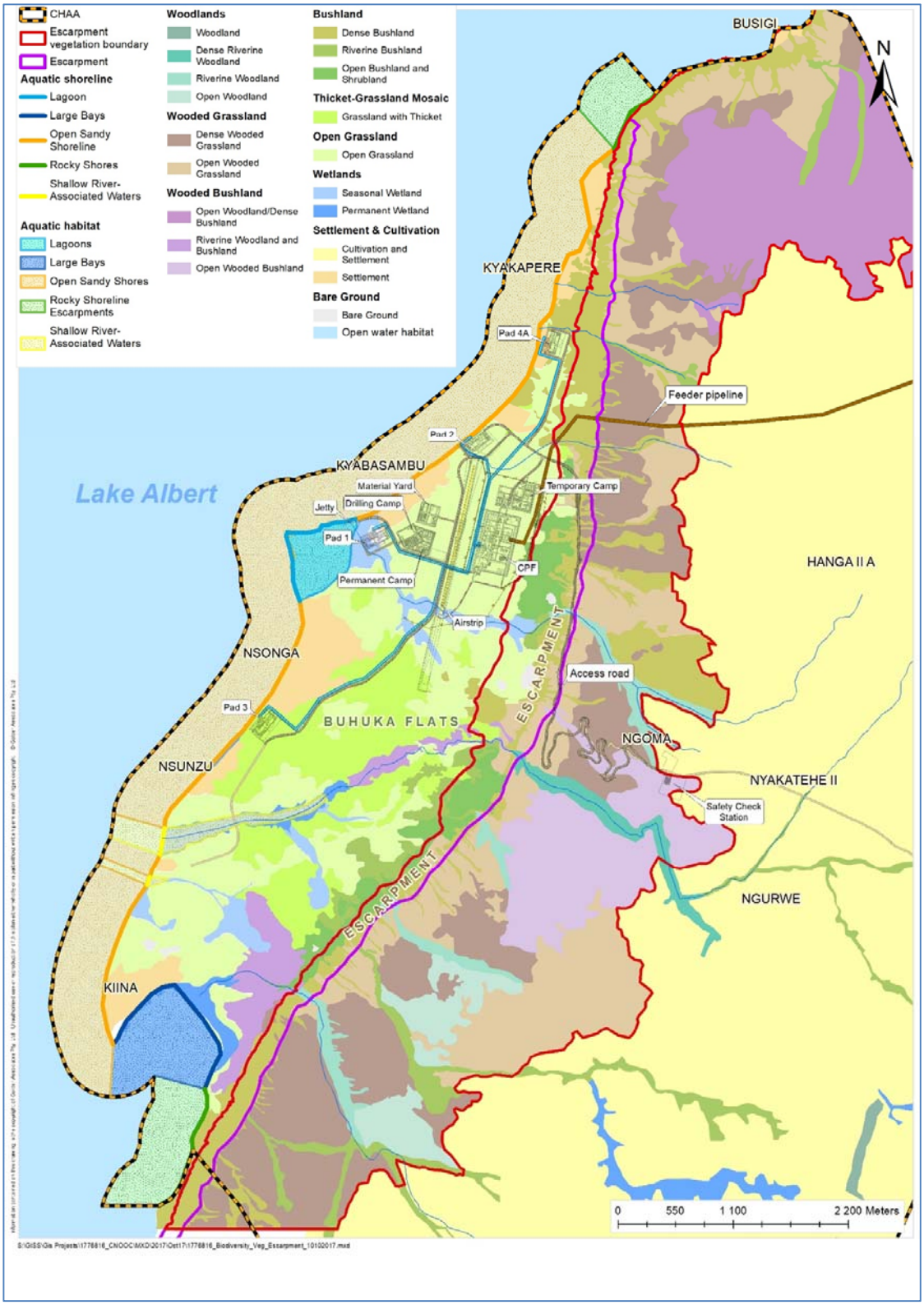

Figure 6-2: Vegetation and aquatic communities on the Buhuka Flats, escarpment and top of the escarpment i.e. the local study area potentially directly affected

Table 6-1: Summary of vegetation communities in the regional study area

Vegetation Community	Classification and Summary Description	Vegetation Community	Classification and Summary Description
Wooded Grassland 	**Dry *Combretum-Hyparrhenia* Savanna** These communities occur **on the escarpment and beyond**. Their original extent on the plateau above the escarpment has been significantly reduced in the last 50 years due to subsistence agriculture and frequent fires.	**Bushed Grassland** 	**Dry *Combretum-Hyparrhenia* Savanna** These communities occur **above the escarpment**. Clearing for agriculture, frequent fires and livestock grazing are noticeable causes of change in these communities.
Woodland 	***Cynometra-Celtis* medium Altitude Moist Semi-deciduous Forest** These communities are mostly dominated by *Acacia* species and occur mainly in **riverine areas**. Large trees are harvested for making charcoal. Trampling and grazing by cattle have affected this woodland	**Bushland and Shrubland** 	**Dry *Combretum-Hyparrhenia* Savanna** These communities occur in **ravines on the escarpment, some at the base, and at some places beyond the escarpment**. They are affected by frequent fire, harvesting of trees for charcoal manufacture and livestock grazing.
Thicket-Grassland Mosaic 	**Dry *Hyparrhenia* Grass Savanna** These thickets are interspersed with grassland, forming a mosaic on the **Buhuka Flats**. Cattle limit bush encroachment and are the main reason for the vegetation mosaic.	**Wetlands (including permanent wetlands and seasonally-flooded grassland)**  These communities occur **on the Buhuka Flats and shores** of Lake Albert, and include watercourses running off the escarpment (Masika River and its tributaries, the Kamansinig River, and River 1 south of well pad 2). They are affected by altered flow regimes, cattle grazing and trampling and harvesting of fibre by local people.	
Open Grassland 	***Themeda-Chloris* Grass Savanna** Livestock grazing is by far the most important factor affecting the structure of these plant community on the **Buhuka Flats**, keeping the grass closely cropped.		

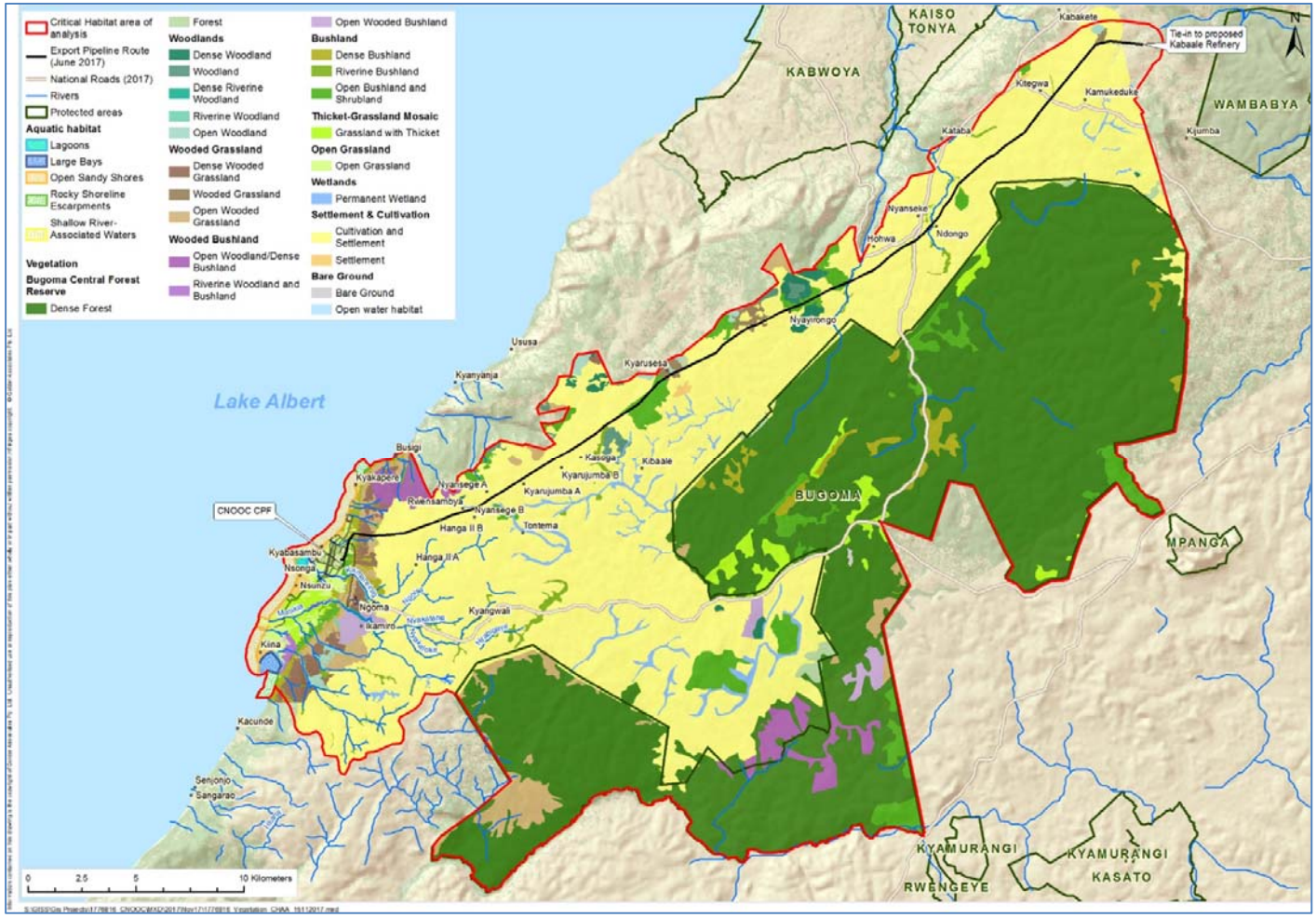

Figure 6-3: Vegetation and aquatic communities in the regional study area

6.2.2 Overall Biodiversity Value - Ecosystems and Habitats

The biodiversity and biogeography of the Lake Albert Basin are unique. It is part of the Eastern Afromontane Biodiversity Hotspot, an Endemic Bird Area, an IUCN Key Biodiversity Area, a 'Global-200' priority eco-region and part of three globally important ecoregions.

Near-shore environment of Lake Albert: The area within 500 m of the Lake shore contains diverse habitats, water depths and temperatures important for the life cycle of flora and fauna including commercial and other fish species. The Lake supports the most diverse commercial fishery in Uganda. The Bugoma Lagoon is an important habitat for fish and is one of only six such environments on the Lake.

Biodiversity in the regional study area

Biodiversity value represents components of biodiversity, such as species or ecosystems that are important for conservation. The biodiversity value assessed in this study focuses on:

- the near-shore environment of Lake Albert;
- the vegetation communities and corridors along the Rift valley escarpment;
- wetlands of the Buhuka Flats and pipeline route;
- the Buhuka Flats and pipeline route; and
- the Bugoma Central Forest Reserve.

Despite pressures by the local population, these habitats are still in a natural state. Around fishing villages some areas are degraded due to polluted run-off but it has not yet materially affected the integrity of the Lake. However, nutrients associated with increased agricultural runoff and human pollution will elevate the risk of eutrophication. The Bugoma Lagoon is already significantly affected having stagnant water. Intense pressure from commercial and artisanal fishing has decreased populations of many commercially important species.

Photograph 6-13: Carapace of Nile Soft-shelled Turtle fetches a high price in the markets of Kampala for medicinal purposes.

Vegetation communities and corridors along the escarpment: This natural corridor is an important linkage between the Semliki/Toro Wildlife Reserve in the south, to the Budongo–Bugoma–Kagombe–Itwara Forest Reserves, through to the Murchison Falls National Park, in the north and plays an important role in maintaining evolutionary processes. Subsistence farming is the main cause of change along the escarpment (Photograph 6-14). Local people hunt, graze livestock, harvest fuel wood and house construction materials, and manufacture charcoal. Frequency of fires is increasing. Increasing populations moving into the area will speed up this transformation.

Photograph 6-14: "Chutes" used for the transport of thatching grass harvested from the escarpment

Wetlands: The regional study area supports around 323 ha of permanent and seasonally flooded wetlands, important habitats for species such as the Grey Crowned Crane and migratory birds. On the Flats, the Masika River forms permanent wetlands and the Kamansinig River seasonally flooded grasslands, providing habitats for wetland species. Many permanent wetlands along the feeder pipeline route connect to those in the Bugoma Forest Reserve.

The permanent wetlands are important sources of fibre for house construction and making baskets, especially close to human settlements, such as along the pipeline route and the lower Masika River on the Flats. While permanent wetlands are reasonably resilient, seasonally flooded grasslands are not, evidenced by the damage to the Kamansinig River wetland as a result of the borrow pit for the escarpment road. In

summary, the overall condition of wetlands in the larger study area is slightly to moderately degraded due to the impact of livestock, natural resource harvesting and in one case damage by the escarpment road.

Bugoma Central Forest Reserve: This Reserve (401 km^2) supports populations of Eastern Chimpanzee (*Pantroglodytes schweinfurthii*), African Elephant (*Loxodonta africana*), Nahan's Francolin (*Ptilopachus nahani*), and a variety of endemic birds and butterflies. It is also the source of numerous rivers in the region, and an Important Bird Area. Species include 257 tree and shrub species, seven of which are Albertine Rift endemics, 12 are globally threatened and 14 are on the IUCN Red list.

Key risks are increasing illegal logging, firewood collection and charcoal manufacture, and bush meat harvesting. Being isolated from other forests in the region, and without protective buffers around it, it is being eroded around the outer edges. The overall condition of the Reserve is slightly to moderately degraded.

6.2.3 Critical Habitat

Critical habitats are areas with high biodiversity value according to criteria defined in IFC Performance Standard 6, *Biodiversity Conservation*. Table 6-2 summarises these triggers in the regional study area. Identified Critical Habitat is shown in Figure 6-4.

Table 6-2: Triggers of Critical Habitat in the regional study area

Valued Component	Potential triggering criteria*	Critical Habitat Designation*	Habitat and reasoning**
Mud Snail (*Gabbiella candida*)	1 and 2	Criterion 1 Tier 2	■ Near-shore aquatic habitats (Bugoma Lagoon, large bays, open sandy shores, shallow river-associated water)
Nahan's Francolin (*Ptilopachus nahani*)	1, 2 and 5	Criterion 1 Tier 1	■ Bugoma Central Forest Reserve, possibly one of less than 10 discrete management units (DMUs) globally, which are areas with clearly demarcated boundaries within which the biological communities and/or management issues have more in common with each other than they do with those in adjacent areas (IFC 2012b). ■ Possible that the regional study area supports >10% of this species' known global population
Eastern Chimpanzee (*Pan troglodytes schweinfurthii)*	1	Criterion 1 Tier 1	■ Bugoma Central Forest Reserve ■ Great apes are an iconic species
Bugoma Central Forest Reserve	4, 6, 7, 9, 11, 12, 13, 15, 16	Criterion 4	■ Threatened ecosystem – over 110 km^2 of forest has been cleared within 15 km of Reserve since mid-1980s ■ Vulnerable – suspected of undergoing a ≥30% decline in extent of occurrence over the last 50 years in the region ■ Of recognised importance as a climate change refugium for Endangered Nahan's Francolin and Eastern Chimpanzee and a recognised chimpanzee conservation unit ■ Recognised area of old growth forest ■ Supports a population of Eastern Chimpanzee recognised as being one for the four largest in the region; apart from being an Endangered species, chimpanzees are also recognised as keystone species and ecosystem engineers ■ Recognised for its unique biodiversity values, including biome restricted species ■ Local people harvest timber, fibre, fuel wood and charcoal, and non-timber forest products from the forest ■ Recognised as an Important Bird Area ■ Recognised as a high conservation priority area
Near-shore habitats of Lake Albert	13	Criterion 13	■ Important fishing grounds that support 11 fishing villages on the Buhuka Flats and surrounds

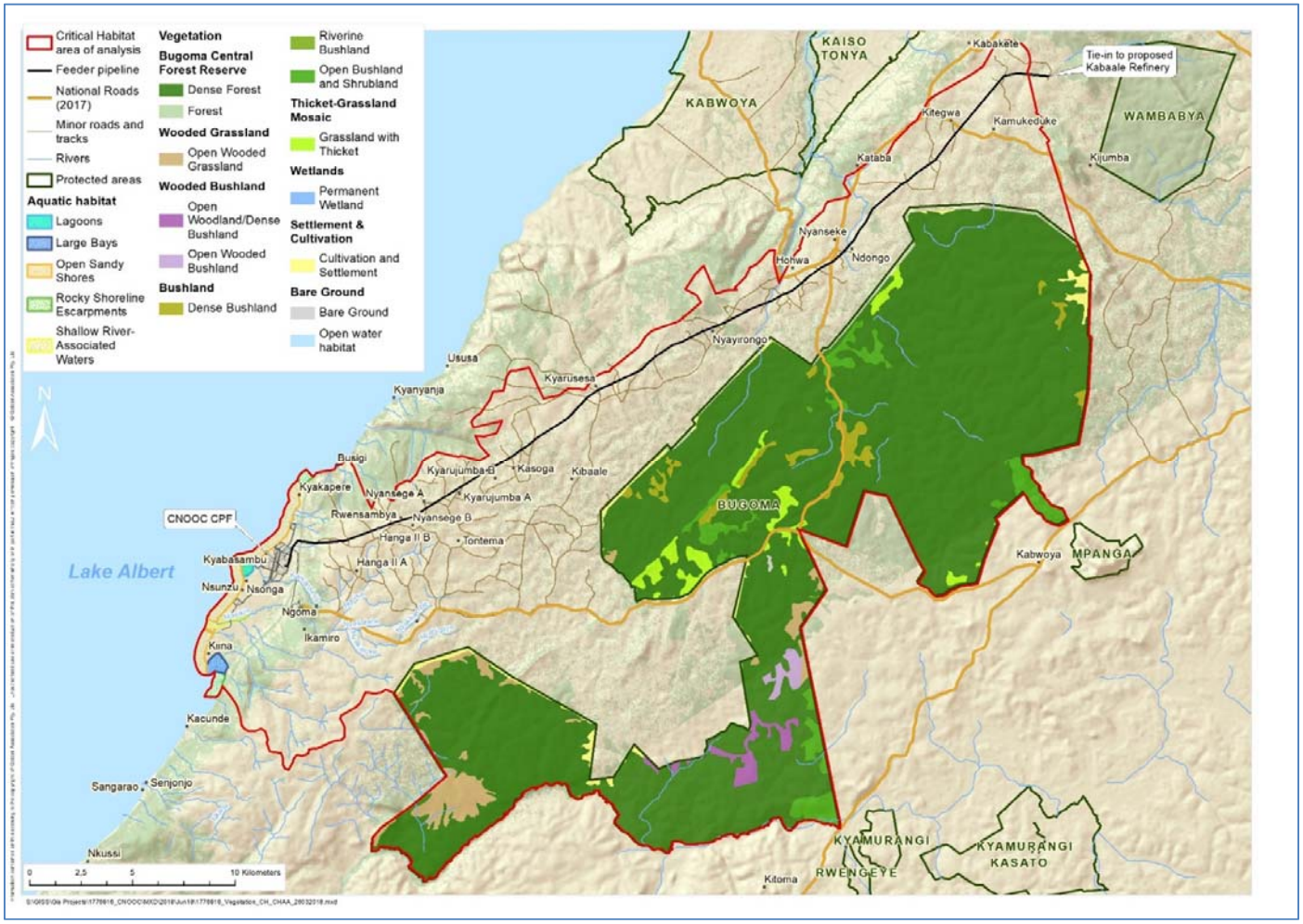

Figure 6-4: Critical Habitat identified within the regional study area

6.3 Socio-economic

6.3.1 Regional Study Area – Hoima District

The CNOOC oil project is located in the Buhuka Parish, Kyangwali Sub-County, Hoima District, western Uganda (Figure 6-6). Lake Albert is a major feature of that area.

Administrative structure: Hoima District comprises 24 sub-counties with Hoima town as the main urban centre. Districts and sub-counties are shown on Figure 6-5, Kyangwali Sub-County being one of nine sub-counties and consisting of four parishes (Kyangwali, Butoole, Kasonga and Buhuka) with 54 villages. Besides government administration structures, the Bunyoro Kingdom is an important traditional or cultural institution in the project area.

Population: The Hoima District population is around 349,204 persons (50.4% males and 49.6% females), with an annual population growth rate of 4.87%. Children under 18 years make up 55.3% of the population. The fertility rate is about 7 children per woman,

Between 1980 and 2002, the District's population increased nearly threefold due to high fertility rates, early marriages (2% of males and 3% of females are married between the ages of 10 to 14) and immigrants from other parts of Uganda and other countries moving into the area in search of opportunities mainly related to fishing on Lake Albert. People move freely across the Lake between the DRC and Uganda. In addition, refugees from nearby countries are provided with arable land, increasing population numbers.

Major economic activities: Agriculture: cultivation and livestock, both subsistence and small-scale commercial, including tobacco and tea farming. Fishing: Lake Albert contributes the second biggest proportion of fish catch in Uganda after Lake Victoria. Fish is dried and/or salted and sent to markets in Hoima and elsewhere. Fish catches are declining due to destructive fishing methods, using illegal fishing gear, fishing in breeding areas, non-compliance with regulations and inadequate control of catches.

Ethnicity and Citizenship: Hoima District has a multitude of ethnic groups, with the indigenous Banyoro and Bagungu comprising about 77% of the people, followed by the Alur and others. In 2002, the majority of the population were Ugandans, but this has altered significantly, at least in the Buhuka Parish, discussed later.

Religion: All religions are welcomed under the Ugandan constitution.

Health: In 2013, Hoima District had 52 health units including a government hospital with about 200 beds, but access to healthcare is hampered by terrain and poor road infrastructure. Generally, the District's health indicators are slightly better than the national average, with HIV prevalence roughly the same as the national average.

Education: Uganda subscribes to Universal Primary and Secondary Education. The formation of the Hoima Municipality in July 2010 resulted in sharing of a number of education resources. Primary schools were reduced from 164 to 131 and teaching staff reduced from 1,591 to 1,252.

Water, sanitation and waste: Whilst safe water covers 74.2% of the Hoima District, this varies significantly in the sub-counties; Kyangwali has only 47.7% coverage. There are no formal domestic waste disposal services or facilities in the District.

Energy: Most people in the District (98.9%) depend on wood fuel. Less than 3% have access to electricity. The District is not connected to the national grid but mini hydro-power plants are currently being developed.

Roads and Communication: Roads are indicated on Figure 6-4 earlier. Trunk roads are maintained by the Ministry of Works and Transport, feeder roads by the Local Administration. Gravel roads in the Counties and sub-counties are in varying states of repair. Recently, CNOOC constructed a road down the escarpment connecting the Buhuka Flats with roads on top of the escarpment.

Land Access and Tenure: Customary tenure is the most widespread where local landowners have the right to build a house, cultivate crops or graze animals. Forest and wildlife conservation in protected areas

occupies 20.9% of the total land area, reducing land availability for agriculture. The lack of a uniform land tenure system negatively affects land management, with land fragmentation. Land speculation have been exacerbated by the discovery of oil.

Concerns about oil industry: While some people acknowledge the benefits such as improved roads, clinics, jobs and an increased market for their products, there is a general lack of understanding of what the consequences of oil development will be and people fear the worst, including an influx of foreign and disruptive people, increasing pressure on land, lack of fair compensation for lost land and infrastructure, an increase in corrupt practices, increased prostitution and disruption of family life, a drop in average living standards, increased accidents and air pollution.

6.3.2 Buhuka Parish on Lake Albert – local study area

Figure 6-6 shows the Buhuka Parish on Lake Albert, and the 11 Lakeside fishing villages in the vicinity of the proposed project. Figure 6-7 shows land-use patterns on the Buhuka Flats. *Photograph 6-15* shows the typical location of the smaller villages not located on the Flats, and Photograph 6-16 a Lakeside village.

Photograph 6-15: Kyenyanya village on a flat area between the escarpment and Lake Albert

Photograph 6-16: Kiina Village on the shore of Lake Albert

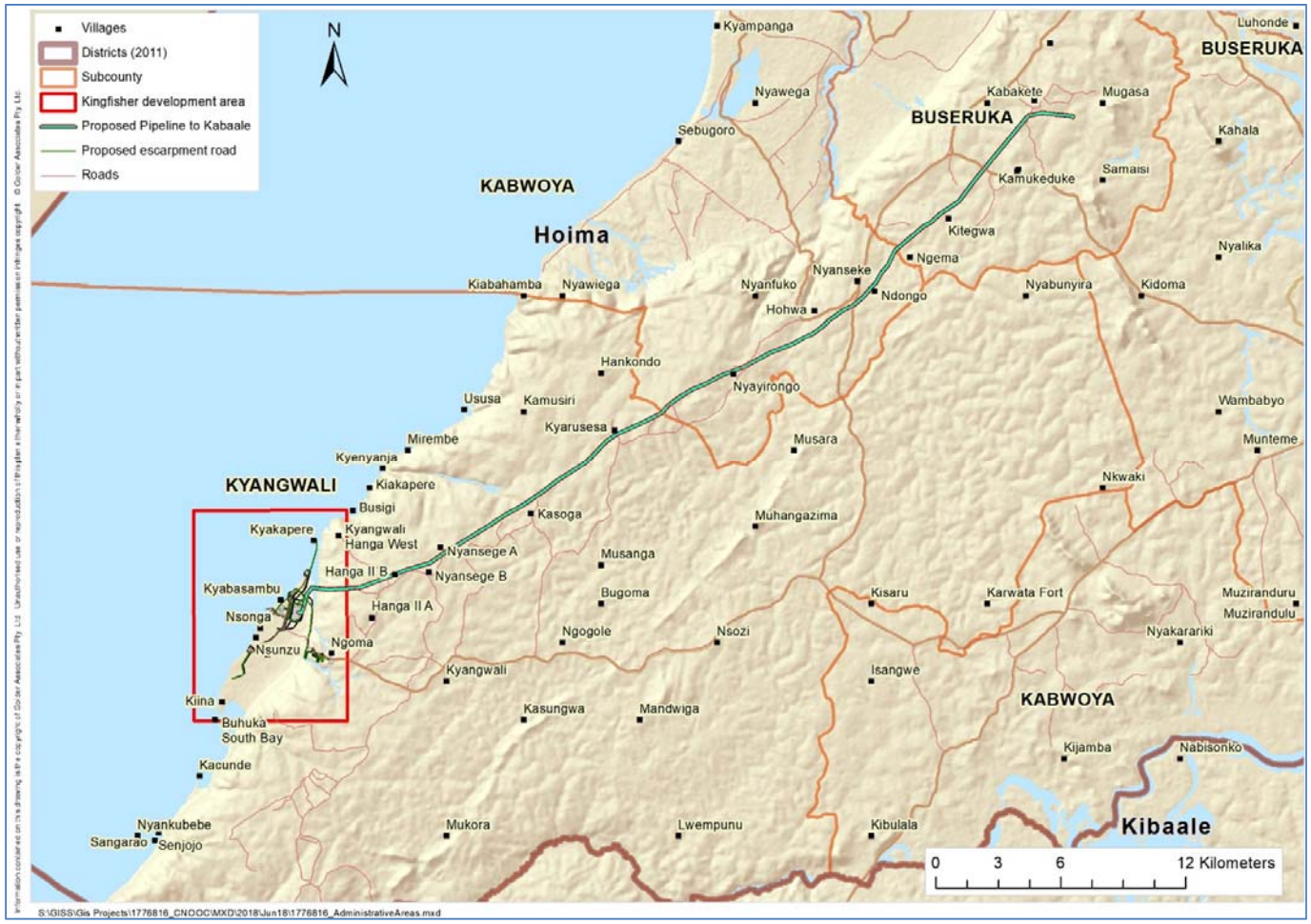

Figure 6-5: Districts and sub-counties in the region

Administration and governance: The Kyangwali Sub-county has as Political Head the Local Council III Chairman. The Sub-county is divided into parishes: Buhuka, Kyangwali, Butoole and Kasonga. The Political Head of the Buhuka Parish is the Local Council II Chairman.

Population: Households have an average of 8 members per household, equal numbers of males and females, and in 34% of households people are between the ages of 18 and 35. The high percentage of children results in a higher demand for provision and sustainability of social services, especially schools and health facilities.

Ethnicity and Citizenship: Ethnic groups in the Buhuka Parish are 44% Alur, 28% Bangungu, 11% Buhuka and 5% Banyankole, with several smaller ethic groups also represented. Congolese Nationals make up 42.4% of the population in Kyakapere, 22.4% in Kyabasumbu and 6.3% in Nsonga. There is however reluctance by Congolese nationals to reveal their identity. Spoken language is dominated by Alur (46.9%), followed by Swahili (30.6%). There are ethnic tensions in the villages, especially on top of the escarpment, with arguments about community leadership, speculative land acquisition by immigrants and historic tribal tensions.

Household heads: More than half of household heads migrated to the study area less than 10 years ago in search of employment (77.3%) linked to the fishing industry and to get married (5.5%). Most household heads (89%) are Ugandan and 68.9% are Alur, the rest are Rwandese. Just more than 50% of household heads have at least primary education or above but 25% have no formal education. Only Kyakapere and Nsonga have tertiary qualified household heads.

Economic activities: Fishing and livestock (mainly cattle) are the major economic activities on the flats. Substantial fish processing and other trade across Lake Albert occurs. Fishing is the primary economic activity of 75.8% of the household heads.

Retail trading forms the primary livelihood of 9.8% of households. About a quarter trade outside of the Parish, selling fish produce (79.8%), general merchandise and other foodstuffs (Photograph 6-17). Some villagers grow crops (beans, groundnuts, bananas, cassava) on small plots for own consumption or sale, while 33.7% have access to arable land away from their homesteads, 70.2% on top of the escarpment and 29.8% on the Buhuka Flats. Most people have no means of storing food.

Most households keep livestock - poultry, goats (the most commonly reared livestock, 42% of households), pigs and cattle. 11% of households keep cattle, totalling 658 cattle grazing on the Flats, far exceeding the carrying capacity of the available grassland. Livestock owners' main problems are animal diseases (58%), expensive medicines (38%), cattle theft (24%) and limited support from government (35%). They complain that oil firms import food from Kampala, not purchasing from them.

Photograph 6-17: Fish processing in Senjojo (left) and trading in a daily market in Sangarao (right)

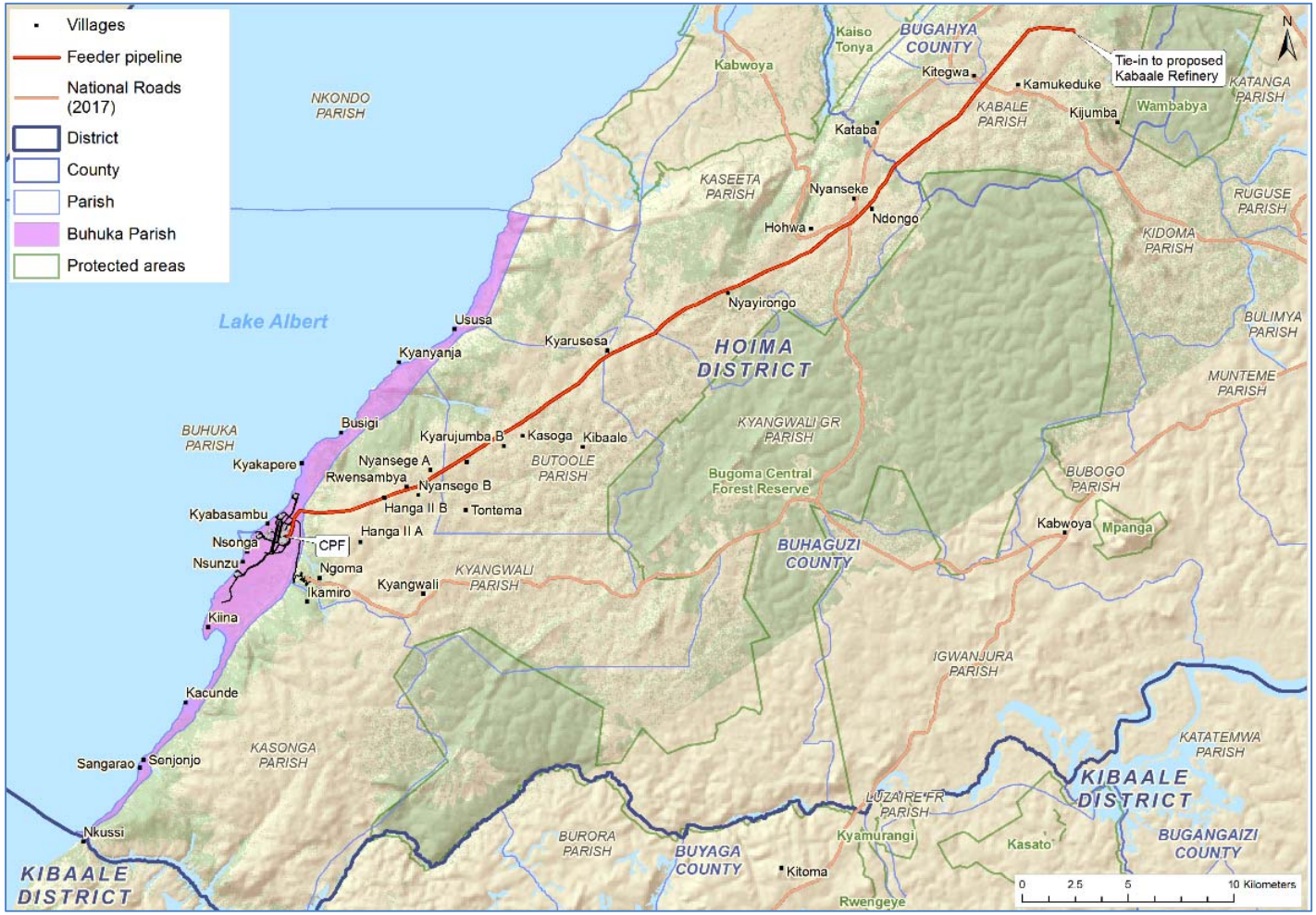

Figure 6-6: The Buhuka Parish lies along the Lake Albert shore, and covers 11 fishing villages

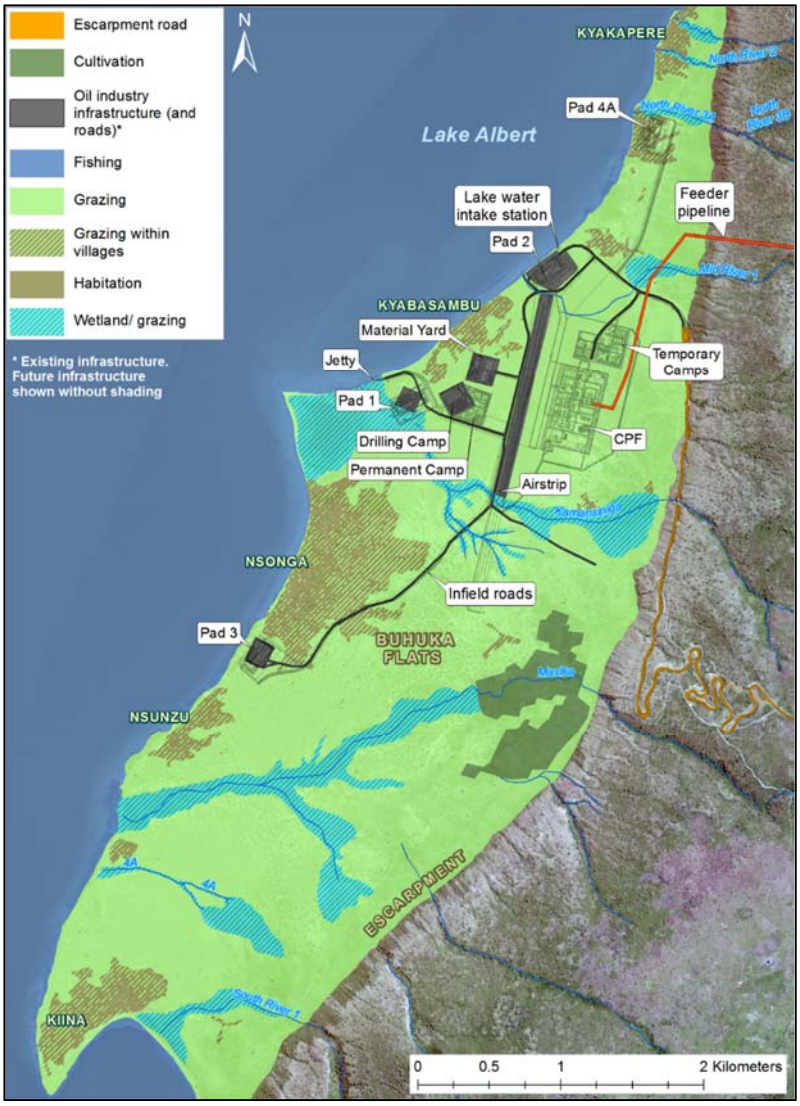

Figure 6-7: Land use on the Buhuka Flats and escarpment

Photograph 6-18: Household vegetable plots in Nsonga. The soil is heavy clay and vegetables struggle to survive long dry spells.

Household income and expenditure: Households earn between USD 28 and 139 per month, compared to an average *per capita* monthly income of USD23 for the Hoima District. Education and health-related needs account for the greatest share of household expenses. Nearly all households purchase their main food items from markets and shops.

Religion: Religious beliefs co-exist including Anglican, Catholic, Moslem, Pentecostal and other. There are also African traditional churches which include the Alur African Church (Lam the Kwaru), and Faith of Unity (Itambiro).

Photograph 6-19: Places of worship in Buhuka. The Kyabasumbu Church of Uganda in Kyabasumbu Village is on the right.

Health: Buhuka Health Centre II is the only health facility in the Parish supported by drug shops (see Photograph 6-20 and Photograph 6-21). The health centre has in-patient services but patients have to provide their own matrasses. Pregnant mothers cannot easily access the centre for antenatal care. There are no emergency services.

Common diseases in the Parish include diarrhoea and dysentery, typically related to poor water and sanitary conditions. There is a prevalence of HIV/AIDS due to commercial sex trade in the fishing villages. Nearly 63% of residents had lost relatives to HIV/AIDS, on average three per household.

Photograph 6-20: Buhuka Health Centre III

Photograph 6-21: A drug shop in Nsonga village

Nutrition and Food Security: Villages demonstrate poor food self-sufficiency with 59% of households having experienced hunger in the past six months, most from Kyakapere village (44%) followed by Kyabasumbu (30%). Food shortages are often related to weather conditions and resultant thermal stratification of the Lake increasing or decreasing fish catches. Lack of road infrastructure especially during heavy rains hinders food transportation and negatively affects the weekly food market days in Kyakapere and Nsonga. More than 20% of households get their food supplies from the top of the escarpment, including purchases, gifts/transfers, and food aid, with March and April the worst months for food supplies.

Education: On average, at least 4 household members can read and write. There is only one primary school in Buhuka Parish, located in Ngoma (Photograph 6-22), with 272 girls and 310 boys in 2013 and 73 pupils per teacher. The school is up to 16 km away from some households and has difficulty attracting teachers due to the remoteness. 41% of children in the fishing villages have never attended school, and 31% had dropped out. The reasons for drop-outs are expectations that children must marry young and have children, parents moving between landing sites to follow fish availability which obliges the children to move with them, poverty which forces families to draw their young children into fishing, and the need for cash income drawing young girls into the commercial sex trade.

The closest secondary school is in Kyangwali village, which until recently could only be reached by trekking up the 350 m high escarpment – a journey of more than an hour for adults. This situation is expected to improve now that the new escarpment road has been built, but it is still a long walk for most children.

Photograph 6-22: Buhuka Primary School

Water, sanitation and waste: Water sources (Photograph 6-23) include unprotected springs, boreholes, Lake water and tap water from the Gravity Flow Scheme that serves Kiina, Nsonga, Nsunzu, Kyabasumbu and Kyakapere villages, established by a previous oil company. Lake water is considered to be least safe, being shared with animals and birds. Villages along the escarpment obtain water from shallow hand pump boreholes, springs or streams. Due to poor sanitation, water from the gravity scheme and streams is contaminated with faecal matter.

Most households (81.1%) use pit latrines for disposal of human excrement (13.2% public and 67.9% privately owned - Photograph 6-24. Of the households with privately-owned pit latrines, 58% share it with other households. Organised domestic and human waste management does not exist and large amounts of waste, including faecal matter, end up in the Lake.

Photograph 6-23: Water sources in Buhuka Parish

Photograph 6-24: Pit latrine in Busigi village (left); domestic waste disposal along a swamp (middle) and cattle using the Lake as a source of drinking water

Energy: Most (78.4%) households use firewood and charcoal for cooking. Firewood is collected from the top of the escarpment and on the flats. Most households (41.4%) use natural light followed by paraffin (31.3%). Paraffin is expensive and must be transported down the escarpment.

Roads and Communication: Until 2017, when CNOOC completed a road down the escarpment, almost half of Buhuka residents used a steep 350-m footpath, a one-hour trek, up and down the escarpment to access medical and other services and shops to purchase food and firewood and sell fish on the top. Others used canoes or boats to reach services down-shore on the Lake. The lack of road access prevented development and poverty alleviation on the Flats. The newly constructed escarpment road has changed this situation.

Photograph 6-25: Primary means of transport in Buhuka Parish prior to the new escarpment road having been built, a footpath up and down the 350 m escarpment.

Social Order, Security and Crime: Social order and community safety are important values in the Buhuka Parish. The area is perceived to be a relative safe place to live. However, disputes do arise with the top two reasons being land ownership and alcohol abuse. The Local Council system is the most common means through which disputes and grievances are resolved.

Land tenure, housing and asset ownership: Houses are constructed from mud and wattle, with compacted earth floors (less than 1% of houses have cement floors). Roofs consist of thatch (75%) and corrugated iron (33%). Most houses have one room, some have two.

Three quarters own the house they live in. Among those who own their houses, 93% own the land as well, either purchased, acquired through customary laws or leased from the sub-county. Households enjoy primary access to land ordinarily through free land allocation by the LC1 chairmen where they enjoy use rights such as settlement and other poultry and livestock keeping. Normally, the total land area allocated to a household for settlement covers a few square meters but members have common access rights to graze livestock in the communal grazing areas or the lakeshores. However, transfer of use rights through sale of land developments such as houses without involvement and knowledge of LCs was found to be common. This is strongly influenced by increasing cases of in-migration and outmigration (Kingfisher 4 SIA).

This trend is similar to that previously reported in the Bugoma-Kingfisher road social baseline, which found that 47% of households have customary rights to land, 35% have leasehold agreements and 18% have freehold agreements. In most cases, in-migrants were reported to simply settle in the area in search of fishing opportunities and have no land titles.

The most commonly owned asset is a radio (62.4%) followed by fishing nets (52.6%), boats (51.2%), land (49%), buildings (44.5%) and a bicycle (14.8%).

Photograph 6-26: A grass-thatched house in Busigi constructed with mud and wattle

Community Needs: The four most preferred development needs expressed by people in the Buhuka Parish are roads, schools, health centres and piped water.

6.3.3 Feeder Pipeline - Local Study Area

There are 22 villages in proximity to the proposed pipeline route, indicated on Figure 6-8 together with the estimated population size of key villages. Most villages were established between 1920 and 1990.

Photograph 6-27: Hohwa Village, Kabakete Village, Hanga IIB village, Tontema Village along the pipeline route

Administration and Governance: All village governance is based on the same structure. The Local Council governs at a village level, elders hold a level of authority as well, and generally households are headed by males.

Land tenure: Land tenure consists of a mix of free hold, rental or whole ownership. Land on the escarpment is fertile, the reason most villagers settled there. Most villagers sell the use right to portions of their land for cash during the planting season to pay school fees. Land is most often sold to newcomers to the area.

Ethnicity and Citizenship: Villages along the pipeline route consist of a wide range of ethnic/tribal groups. Immigrants from Rwanda, DRC and elsewhere live in some villages. Some villagers complain about the influx of rich people into the area to claim land. They try to discourage the in-migration. In Nyamasoge, villagers said there are changes in traditional governance due to influx, disrupting leadership and having led to people leaving the village.

Economic activities: Most villages are involved in both commercial and subsistence agriculture, with commercial farming slightly more common and focusing mainly on cash crops such as cotton, tobacco and coffee. A wide range of other crops are produced, both for sale in the local markets, to traders and for subsistence consumption. Livestock consists mainly of cows, goats, pigs and sheep. Ducks and chickens are commonly kept around the household. Trade in fish occurs in many villages.

Many small businesses generate cash, including brick making, sand and stone quarrying, selling food, palm oil, paraffin, charcoal, locally brewed alcohol, clothing and household goods. Palm oil is sold and charcoal is manufactured and sold. Some villagers make ropes and baskets. Motor cycle and bicycle repair shops are found in several villages.


Photograph 6-28: Shops in Nyairongo Village and brick-making for building houses

Health: Health facilities are limited and are a central concern in the villages, only six of the 23 villages having a clinic or health care centre. One of these is a private facility.

Education: There are only two secondary schools along the pipeline route, with scholars having to travel long distances. Many villages however have either government or private primary schools (established by residents themselves), and some have nursery schools. Nine (39%) of the villages have no schools at all. The Nyaihira Primary School in Kamukeduke is located in the footprint of the proposed government industrial park and refinery.

Photograph 6-29: A school along the pipeline route

Photograph 6-30: As elsewhere in the District, local roads along the pipeline route are in need of repair

Water, sanitation and waste: Clean and reliable water supply is an issue in most villages. Supply is often erratic. Springs, wetlands and dams are shared with animals and are therefore likely to be polluted. Other sources are shallow wells and some boreholes.

Roads and Communication: Most people move about on foot or bicycles or use motorcycles as taxis to access social services. Bus transport is limited and only easily accessible to those located near larger roads. Those closer to Lake Albert use water transport, which has now been facilitated by the construction of the escarpment road. In Kataaba and Nyairongo, a few people own cars.

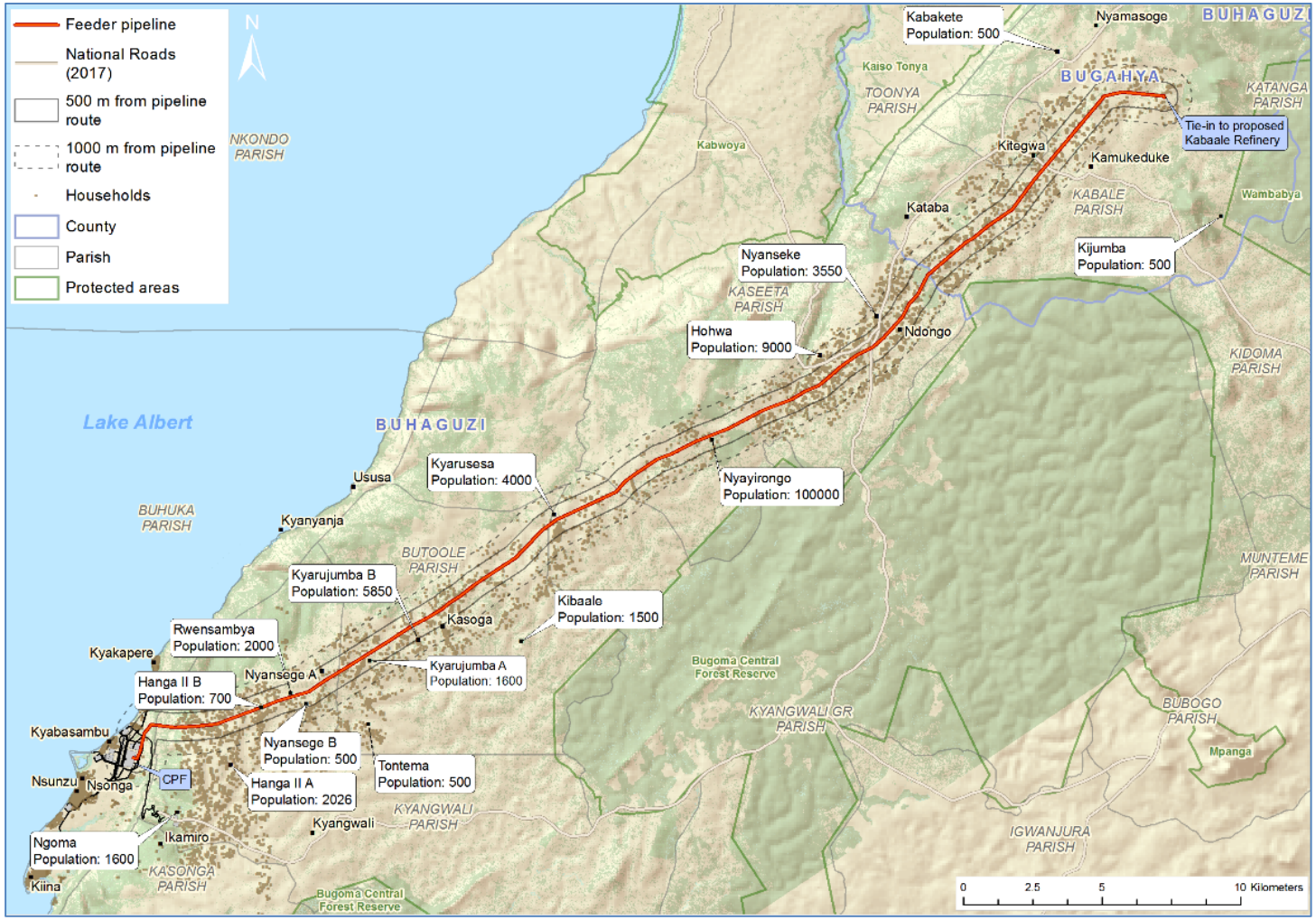

Figure 6-8: Location of villages and estimated village size along the feeder pipeline route

6.4 Archaeology and Cultural Heritage

A total of 358 tangible cultural heritage sites were identified in the Buhuka Parish and along the feeder pipeline route. Each was assigned a unique identification number. In addition, there is a range of intangible heritage activities in these areas. There remains potential for unrecorded sites throughout the area, and potentially within the development footprint.

6.4.1 Archaeological and Historic Sites

A total of 270 archaeological and historic sites were identified during the field survey for this study. Table 6-3 provides a high-level summary. Photographs 6-31 to 6-33 illustrate some of the finds.

Table 6-3: Overview of archaeological and historic sites

Period	Type	Location/s	Description
Neolithic and Stone Age Periods; Ugandan Neolithic (6000 to 5000 BC)	Kansyore pottery sherds (characterized by incised wavy lines)	300 m from the Escarpment Road route and at Kabaale (400 m from the proposed pipeline route).	Kansyore pottery is a significant indicator of early cultural interaction across the East African region. It has been identified in Sudan ('Khartoum Neolithic' pottery) and in Kenya and Tanzania.
Potentially pre-Neolithic / early Stone Age	Lithic artefacts - two Early Stone Age axes	Adjacent to the Escarpment Road	
	Typical Later Stone Age lithics	Along pipeline near Kyarushesha Village and within the footprint of the proposed Materials Yard	
	Concentrated lithic scatter	Within the footprint of the Airstrip Extension	Debitage potentially associated with bone fragments
Iron Age - Modern Periods (from 500 BC)	Pottery scatter	On the shore of Lake Albert, at Kiina Village in particular	Three Iron Age pottery traditions: • 'Urewe' (Early Iron Age, c. 500 – 700 AD) • 'Bourdine' (Middle Iron Age, undated) • 'Roulette' (Late Iron Age, undated). Significant indicator of extensive settlement and potential industry, particularly where concentrated pottery scatters were found associated with other artefacts.
	Pottery scatter associated with iron slag	Between Kabakete and Kitegwa, on the northern end of the proposed Pipeline Route	Potentially indicative of Iron Age activity. Likely representative of similar archaeological evidence in the wider vicinity.
	Iron slag and iron objects	At four locations (both on Flats and pipeline route)	Bangle fragment potentially indicative of an ancient burial (Photograph 6-33).
Historic sites	Ancient salt-making site	Close to Nsonga village	
	Abandoned settlement	250 m from the proposed Crusher Plant/Spoil Area A.	
	Stone-walled structure, possibly house foundations	Kyakapere Village	Particularly unusual site; may be links with Iron Age stone building in central

Period	Type	Location/s	Description
			and southern Africa (e.g., Zimbabwe enclosures).
	Historic (abandoned) quarry sites	200 m from the Escarpment Road route	may be representative of other quarrying and/or settlement activity in the wider escarpment area
	Faunal artefacts (i.e., bones and shells)	Throughout the study area. In association with pottery and/or other lithics in the vicinity of the proposed Materials Yard / Drilling Camp).	No fossilized bone was identified. May have archaeological potential particularly where found in association with pottery and/or lithics

Photograph 6-31: Concentrated lithic scatter and debitage within the footprint of the airstrip extension

Photograph 6-32: Late Iron Age 'roulette' pottery PO-52 (Nsunzu A Village)

Photograph 6-33: Metal bangle fragment (ME-04) associated with site LI-39, CPF / pipeline route

6.4.1.1 Cultural Sites

In total, 88 sites of cultural importance were identified. Many of these sites were disclosed by villagers in confidence and are considered secret and highly sensitive. Consequently, where appropriate, sacred sites are discussed with limited reference to their geographic location. Table 6-4 provides an overview.

Table 6-4: Sites of cultural importance

Types of cultural sites	Description	Number identified	Approximate location/s
Religious sites	Churches and mosques	28 churches 3 mosques	■ 12 within 250 m of infield road ■ 3 within 250 m of Pad 4-2 ■ 12 within 250 m of pipeline route ■ Tawehid Mosque potentially directly within pipeline servitude ■ Church at Kyakapere potentially directly adjacent to infield road
Cemeteries	Both traditional (spoil-heaped) and modern (cemented) graves (Photograph 6-34).	30	■ One within the Crusher Plant /Spoil Area A ■ One adjacent to the new road at Kyabasumbu ■ One adjacent to the new road at Kyakapere. ■
Ritual sites	Animist activity and areas set aside for traditional ceremonies tied to a particular natural place of	4	■ 200 from jetty: 'Luzira', a traditional place of worship at the pool and surrounding reed bed particularly for seasonal ceremonies related to fishing. Historic centre of cultural activity with many myths and taboos ■ Kasonga Beach, between the jetty and Nsonga/ Nsunzu, used for ceremonies for fish catches

Types of cultural sites	Description	Number identified	Approximate location/s
	cultural significance e.g. Lake Albert		■ Sacred Pool 250 m from the Escarpment Road, on the River Masika, a secret site of ritual activity used during cholera outbreaks ■ Family shrines within individual houses
Ritual objects	Stones used for worship	2	■ Adjacent to the eastern end of the Escarpment Road ■ 150 m from pipeline north of Kamwokya. ■ These sites are unlikely to be unique
Sacred rivers	River Masika	Areas on river bank particularly at Nsonga and Kiina	Ceremonies to improve fish catches (in February / March) and occasionally to cure sick children. Mouth of the river at Kiina is especially significant but since well pad 5 no longer required this river won't be crossed by a new road.
Sacred trees	Sacred trees	3	■ Sacred Tree 1, particularly sensitive, near the Lake shore. The tree is very important for the local village, revered and feared as a place 'where bad things happen'. It is associated with a number of myths and oral histories. Significant taboos (rules) related to this tree. ■ Sacred Tree 2, of cultural importance, near the Escarpment Road crossing the existing footpath. ■ Bark Cloth Tree
Cultural landscapes	Lake Albert and the Escarpment	2	Recognised with reference to the UNESCO definition of an 'associative cultural landscape': "…justifiable by virtue of the powerful religious, artistic or cultural associations of the natural element"

Photograph 6-34: Traditional burial ground at Kiina Village

Photograph 6-35: Kasonga Beach (RS-02)

Photograph 6-36: Traditional gourds for making ghee

6.4.1.2 Intangible Cultural Heritage

Intangible heritage is traditional practices, cultural norms and knowledge transmitted from one generation to the next, which communities or individuals recognise as part of their cultural heritage, and include:

- **Making Ghee**: as practiced by the Balalo pastoralist community
- **Animal Husbandry and Architecture**: Hand-built shelters for poultry and houses traditionally built without any man-made materials on the Buhuka Flats, representative of traditional lifestyles.
- **Revered Species**: Snakes, pythons in particular, revered by all lakeside communities, a giant good fortune snake, a fire-breathing snake in Lake Albert and a giant crocodile that can bring or take away fish as he chooses.

- **Beliefs associated with the Escarpment**: Particular 'no go' areas, white people or white smoke in the ravines and deep in the bush, an unlucky speed boat sound out on the lake, in the bush or up on the escarpment, and women carrying cassava flour down the escarpment having to take a fish back up.
- **Beliefs associated with Lake Albert**: Rituals and seasonal ceremonies to increase fish stocks, or to heal sick people. Traditionally taboo for women to fish or bathe in the Lake. Sounds of people drowning but rescuers can never find them.
- **Taboos:** Local taboos or rules associated with sacred sites
- **Traditional Religious Cults:** A traditional local religion called "*Lam-the-Kwar*", which has its roots in the Nebbi district (Northern Uganda), is led by a priest in Kyakapere.

7.0 IMPACTS OF THE PRODUCTION FACILITY DURING CONSTRUCTION AND OPERATION

This chapter summarises the potential impacts of construction and operation of the production facility, the wells and associated infrastructure. The impact rating methodology is described in Chapter 4. Only key mitigation measures are set out in this summary - see the main report for the full range.

7.1 The Physical Environment

7.1.1 Air Quality

Key air pollutants assessed were nitrogen dioxide (NO_2), sulphur oxides (SO_X), carbon monoxide (CO), and particulates (TSP, PM_{10}, $PM_{2.5}$ and dust fallout), amongst others. Conservatively, air quality impacts exceeding 25% of the IFC (2007) limit values were regarded as significant. Two impacts of importance are described below.

Construction Phase

Impact of Nitrogen Dioxide (NO_2): Key sources of NO_2 are the diesel generators driving the drilling rigs and at the CPF construction site. Drilling on three well pads during construction will take between 6 months and a year per well pad, with one drilling rig moving in sequence from well pad to well pad.

Figure 7-1 shows the expected NO_2 hourly concentrations at well pads 1-3. None of the closest residents to these well pads in Kyabasambu, Nsonga and Nsunzu, will experience maximum hourly or annual NO_2 concentrations exceeding 25% of the guideline value, i.e. 50 ug/m^3 and 10 ug/m^3 respectively. Impact significance will be **low**. Mitigation includes regular maintenance of generators to keep exhaust particulates and trace gases to a minimum, and use of low sulphur fuels to minimise SO_2 emissions. A monitoring network should be installed at the start of construction and be maintained through into the operational phase.

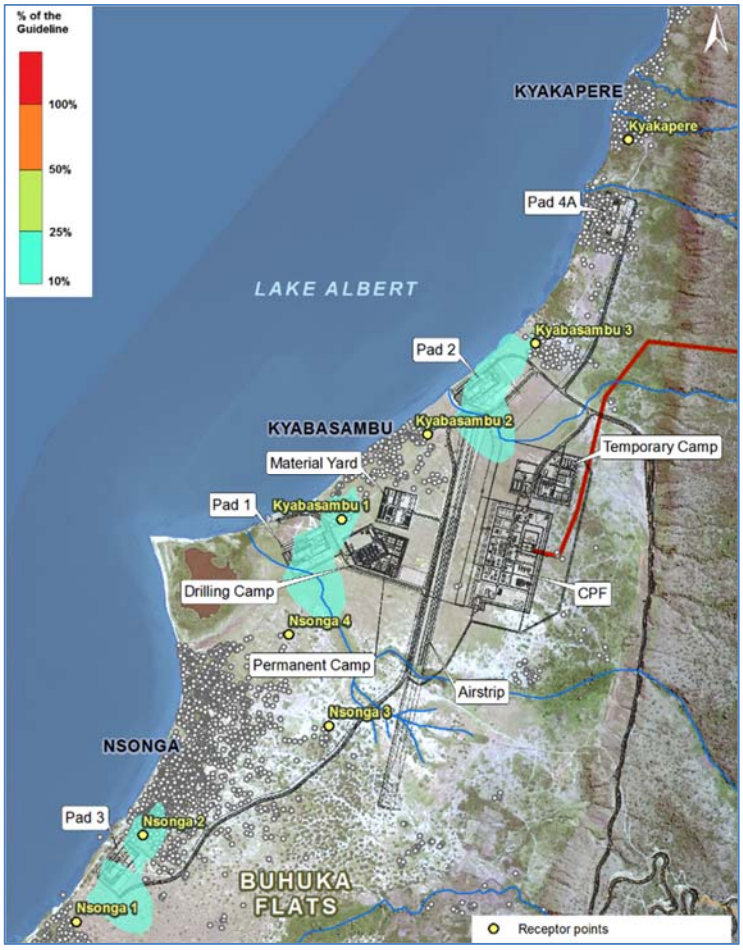

Figure 7-1: Consolidated map showing maximum hourly concentrations of NO_2 around well pads 1, 2 and 3 during the construction phase

Impact of particulates (PM_{10}, $PM_{2.5}$ and dust fallout): These will be generated by trucks, excavators, bulldozers and other large mechanical equipment during construction. Without mitigation, given the proximity of communities to the construction sites, these emissions are expected to exceed short-term IFC guideline limits at a number of households from time to time and impact significance will be **high medium**.

Mitigation includes wetting areas such as unpaved roads and cleared areas where dust is generated, to achieve 50% control efficiency or better. Stockpiles should be covered and disturbed areas should be

progressively re-vegetated. Vehicle speeds are to be controlled. Dust nuisance must be monitored continuously by visual inspection. Communication must be set up with the local communities to provide quick responses to complaints. Subject to compliance with these requirements, impact significance will be **low**.

Operational Phase

Impact of Nitrogen Dioxide (NO_2): None of the villages potentially affected by CPF production emissions will experience maximum hourly or annual NO_2 concentrations exceeding 25% of the IFC guideline value during operation. Impact significance will be **low**. Recommended mitigation includes the installation of low-NOx generators.

Impact of particulates (PM_{10}, $PM_{2.5}$ and dust fallout): Particulate concentrations at the CPF boundaries will be negligible. Fugitive particulate emissions will not be a significant factor during the operational phase and impact significance will be **low**. Nevertheless, the mitigation recommended for the construction phase should continue to be applied to minimise any occasional instances of high particulate emissions.

Impact of increased Domestic use of Fuel Wood and Charcoal: Continuing population increase on the Flats will increase domestic use of wood and charcoal, already evident due to the access provided by the escarpment road. Air quality impacts caused by cooking fires (PM_{10}, NO_2) could become significant. The resulting impacts will be of **high** significance. To mitigate this impact, implement the measures of the influx management plan, and plan to supply inhabitants on the Flats with basic services, including electricity (Government responsibility with CNOOC participation), in which case impact significance will be **low.**

7.1.2 Surface and Groundwater

Construction Phase

Impact on community water supply: Water for the project will be drawn from Lake Albert and not from local rivers or boreholes. Direct impact on community water supply will therefore not occur.

Impact of Domestic Wastewater Discharge: A membrane bioreactor (MBR) plant is proposed to treat raw sewerage and grey water from kitchens and bathrooms of the temporary construction camp which at peak construction will accommodate 800 personnel.

Activities during construction with potential impacts on surface and groundwater

- Impact on community water supply
- Domestic wastewater from personnel camps;
- Sanitation waste at work sites;
- Non-hazardous solid waste;
- Hazardous solid waste;
- Drilling waste

Photograph 7-1: River 1, a seasonal stream north of the CPF which discharges into Lake Albert south of Well Pad 2

Treated effluent will be discharged into the seasonal River 1 that drains into Lake Albert just south of Well Pad 2 (Photograph 7-1). This single point of discharge into the Lake could result in increased nutrient concentrations in the near-shore with the possibility of local algal blooms, affecting both lake biota and human use. Impacts will be of **low medium** significance.

As mitigation, CNOOC should ensure that its contractors select a treatment technology that provides the most consistent, reliable treatment for remote conditions, and that provision is made for sufficient redundancy (temporary storage or modular operation) for repairs and maintenance. Sewage effluent should be treated to meet the project release standard and re-used, where possible, on roads for dust damping, other working areas where dust control is required, and recreational areas (eg: soccer field) created for contract employees. Sanitary wastewater that meets the project standard but is not re-used is to be disposed into Drainage line 1, which enters the lake immediately south of well pad 2. This should reduce impact significance in Lake Albert to **low**.

Impact of Sanitation Waste: Portable field toilets will be provided for workers at construction sites. These toilets are often inadequate, being too few and poorly maintained, discouraging personnel from using them. Given the large numbers of construction workers, pollution of surface and groundwater is possible in these conditions, with a risk of increase in diseases such as cholera. The impact would be highly probable without mitigation, and impact significance will be **low medium.** As mitigation, installation of a sufficient number of ventilated chemical toilets is recommended within easy walking distance of any work site. Toilets must be kept clean, and workers trained to use them. Monitoring throughout the construction period will be required. This will reduce this impact to **low** significance.

Impact of Erosion and Sedimentation: Sediment generated during construction of the CPF itself and other onshore infrastructure will enter the Lake during storm flows during construction, peaking during site establishment when vegetation is being cleared and civil earthworks is ongoing. Soils of the Flats are dispersive and active soil erosion is evident in the LSA. Cleared areas will be prone to sheet flow and scour, and high sediment loads may be expected, particularly in River 1 which will receive drainage from the CPF earthworks and temporary camp Figure 7-2). The discharge of sediment in the Lake, detrimental to nutrient cycling in shoreline ecosystems, is likely to cause impacts of **low medium** significance.

Mitigation includes erosion protection measures are in place during construction to minimise runoff from disturbed areas into rivers and wetlands. This will reduce this impact to **low** significance.

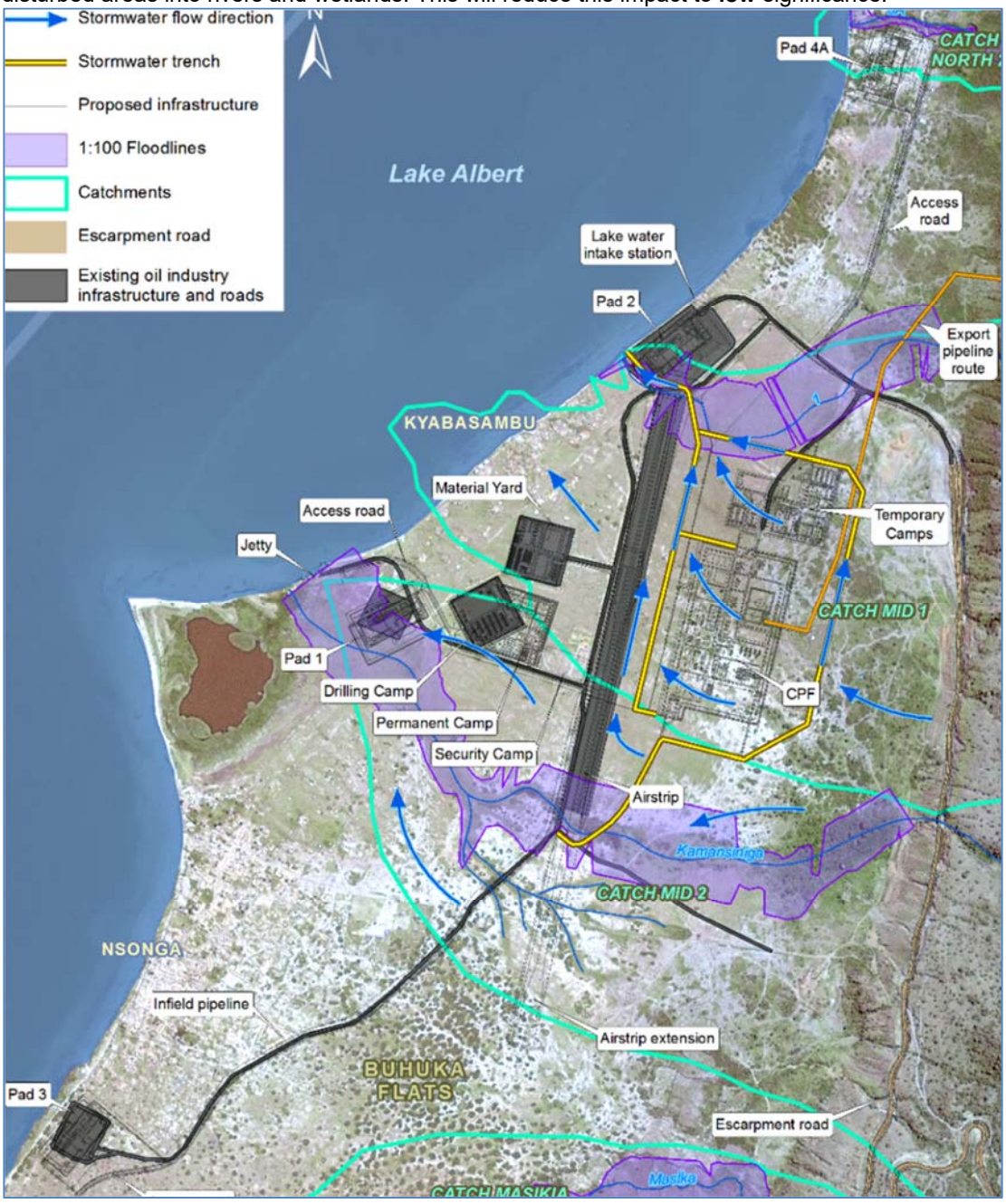

Figure 7-2: Direction of stormwater drainage from the production facility on the Flats. During construction, stormwater will carry sedimentation from earthworks and during operation, an increased risk of sediment into Lake Albert will be caused by erosion of drainage

Impact of Hazardous Waste (CPF Construction): The local study area is biologically and socially sensitive to impacts caused by spillages of hazardous products and wastes. Surrounding populations depend on the Lake for nutrition and income. The concentration of hydrocarbons in the wetlands and Lake is currently below levels that could cause harm in the natural environment and to the human populations that depend on them for a range of ecosystem services, including food security. This impact is assessed in the context of the sensitivity of the ecosystems on the Flats to oil and chemical contamination.

Table 7-1: Types of hazardous waste during construction, mostly from well pads

- Batteries, wet and dry
- Spent chemicals
- Contaminated containers e.g. oil drums
- Contaminated hydrotest water used for pressure testing equipment and pipelines.
- Personal protective equipment contaminated by chemicals or oils
- Scrap metal contaminated by chemicals or oils ectrical/electronic waste
- Foam as a drilling fluid
- Electrical/electronic waste
- Foam as a drilling fluid
- Medical waste
- Oil-contaminated soil
- Oily rags, filters etc
- Oily sludges (from the bottom of vessels)
- Completion and well work-over fluids
- Paint residue (solid and liquid)
- Pipe dope used for connecting pipes may contain lead
- Sewage solids
- Spent fluorescent tubes and lamps
- Spent welding rods, epoxy coatings, grinder wheels, visors, shot blast etc.
- Used aerosol cans
- Used fabrication material (e.g. paint, cement, insulation)
- Used lubricating / hydraulic oil, grease, solvents and absorbent materials

Much of the hazardous wastes generated during construction is regarded as petroleum waste as per the Ugandan Draft Petroleum Waste Act. Specialist sub-contractors will dispose it in hazardous waste sites registered with the Ugandan regulator (Figure 7-3). If construction contractors fully comply with the requirements of the Draft legislation, based on best practice management according to the waste hierarchy, then impacts will be of **low** significance. If waste spills escape on occasion during construction, contaminating local drainage lines and boreholes with chemicals or hydrocarbons, and potentially spreading to the Lake, impact significance would be of **high** significance. The ESIA rating of **high medium** significance is based on the judgement that the probability of occurrence is not definite, and the lower probability slightly reduces the impact score.

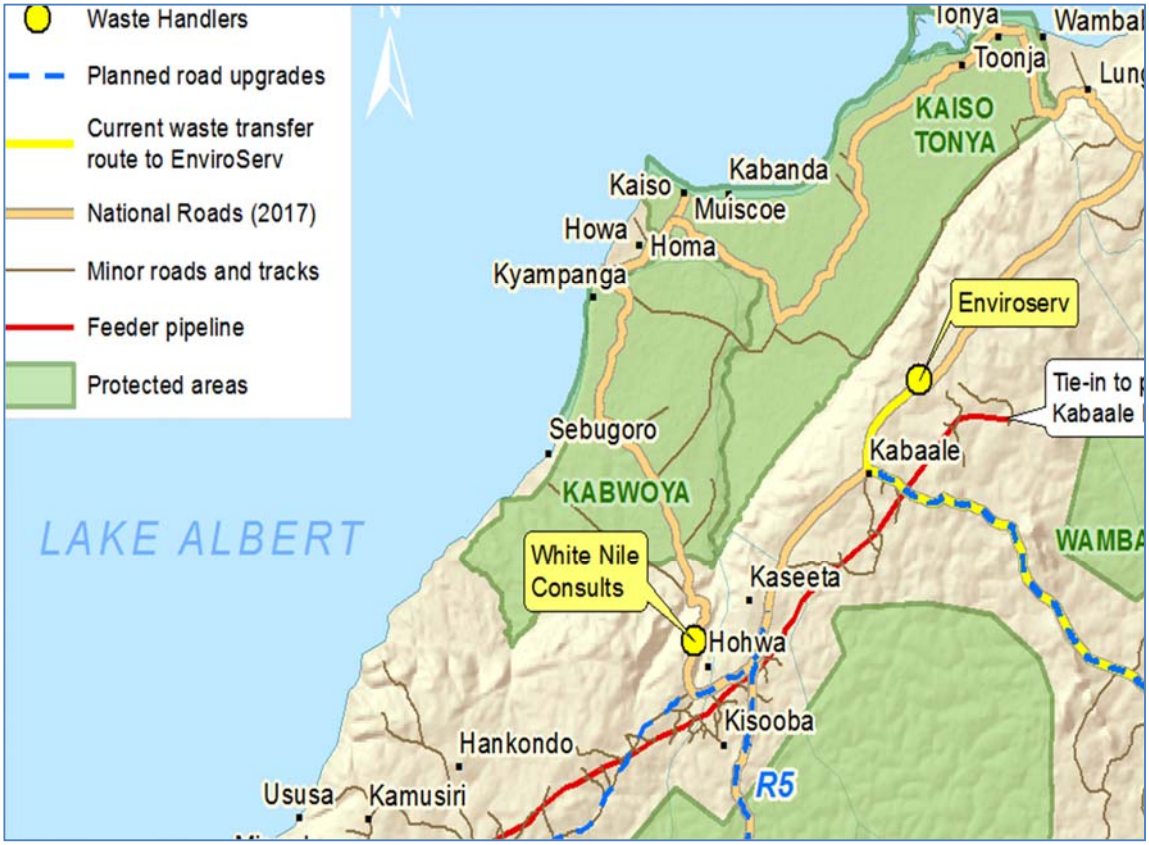

Figure 7-3: Location of third-party hazardous waste disposal sites

Mitigation requires the Contractor's full compliance with the waste management hierarchy. The Contractor is to prepare a method statement demonstrating that each potentially hazardous product and waste will be managed according to the principles of the hierarchy and the requirements of the Ugandan Waste Regulations. The method statement is to include details of storage of hazardous products and waste, with stringent pollution control measures in place, contracting with a registered specialist hazardous waste contractor for the transport and disposal of all hazardous waste and ensuring the waste is regularly collected and removed to minimise build-up on site. Vehicles and equipment may only be serviced in designated areas, equipment with lubricants containing PCBs may not be used and a rapid response capability to manage spills must be in place. Staff training and monitoring is to be ongoing throughout construction. If the above requirements are complied with, the significance of impact will be **low.**

Impact of Hazardous Waste (Drilling): In total, 31 wells will be drilled on the four well pads, starting during construction and continuing on well pad 4A during operation. Drilling wastes constitute by far the largest potentially hazardous waste stream. It is estimated that an average of 1158 m^3 of WBM (aqueous) and SBM (synthetic) drilling cuttings and liquid waste will be generated per well, together with 656 m^3 of other solids. This will occur throughout the construction phase and extend into the operational phase for a period of 5 years. Impacts on surface water or groundwater could arise from spillages on the well pads escaping into the environment, or (for groundwater) from inadequate sealing of the well bore where aquifers are intersected.

The well pads are designed to safely contain and store hazardous waste (Photograph 7-2) for collection by registered specialist waste contractors, and will have drains to collect spills and potentially contaminated stormwater, The performance of the drilling contractors during exploration has demonstrated that the prevention of oil contaminated releases from the well pads can be achieved, subject to appropriate management. Nevertheless, there is a very small buffer between the well pads and the Lake, and between well pad 1 and the Bugoma Lagoon. Drilling will be ongoing for eight years at the different well pads. This increases the risk of instances of non-compliance.

Photograph 7-2: Current arrangements for the temporary storage of drilling waste on the well pads. This design may be modified for the production wells to improve dewatering and re-use of drilling fluids.

Regarding groundwater pollution, the grouting of the well casing through near-surface aquifers is a standard, effective, practice and the likelihood of contamination of aquifers is small.

Overall, taking into consideration the high sensitivity of surrounding users and their proximity to the well pads, the biological sensitivity of the Lake, and the possibility of pollutants spreading beyond the local near-shore environment, unmitigated impact significance is considered to be **high medium,** emphasising the importance of the highest ongoing level of management control. While mitigation is already built into the design of the drilling operations, additional mitigation is proposed. As described under CPF-generated hazardous waste above, the ESIA recommends that the contractor prepare a detailed method statement that identifies and evaluates specific waste management risks and how they will be managed. Appropriate oversight and supervision will be a necessity. All mitigation listed for other hazardous wastes listed earlier also applies to drilling waste. Further, methods of enhancing recovery and re-use of fluids from the drilling cuttings should be implemented, so as to minimise disposal requirements, and ongoing removal of waste by the waste contractor must be implemented to minimise build-up of waste on site. Spill kits must be maintained on site and a rapid response protocol must be developed for the clean-up of any spills. Subject to compliance with these requirements, impact significance will be **low.**

Finally, it is recommended that the contractor's hazardous waste management performance is audited 6-monthly by an independent expert in hazardous waste management in the oil and gas sector.

Impact of Non-Hazardous Solid Waste: CNOOC has committed to fully comply with the requirements of the waste hierarchy, avoiding or reducing the generation of waste at source, and/or re-using or recycling waste before considering disposal options. Third-party contractors will remove recycleable /reusable materials and waste destined for disposal. No incineration will be permitted on site. With some assumed management limitations (at least initially during construction), impacts will be of **low medium** significance.

Mitigation includes strictly enforcing Ugandan legislation and the waste hierarchy through the EMP and drilling contract specifications, ongoing training and monitoring of performance, strict record-keeping, considering an industrial bailer to compact cardboard, paper and plastic wastes; and installing an industrial composter for the treatment of organic kitchen waste. Subject to compliance with these requirements, impact significance will be low**.**

Operational Phase

Impact on community water supply: Water for the project will be drawn from Lake Albert and not from local rivers or boreholes. Direct impact on communities will therefore not occur.

Impact on water level of Lake Albert: Even with other oil projects in the region drawing water from the Lake, the Lake water level will not be significantly affected (the total oil industry demand is not expected to

affect water levels across the whole Lake by more than 2 mm). Due to the regional scale this impact is rated of **low medium** significance.

Impact of domestic wastewater discharge: Sewage from the permanent personnel camp with about 135 personnel plus a contingency, as well as from the CPF, will be treated by the MBR plant mentioned earlier. Back-up sewage treatment capability will be provided by the sewage treatment plant built to supply the drilling camp, which has spare capacity for an additional 90 people. To minimise the risk of local eutrophication in the lake as a result of nutrients in treated sewage effluent, the available volumes should be used on the lawns and gardens at the camp and on any recreational facilities, such as football fields, that require water. Any excess could be irrigated around the CPF to support pasture grass for use by the local communities. Only when conditions are too wet for irrigation should the treated effluent be discharged directly into River 1, which enters the lake just south of pad 2 (Figure 7-4). As during construction, CNOOC proposes to release the treated effluent via River 1 to the Lake which could affect Lake biota and human use. Impacts will be of low **medium** significance.

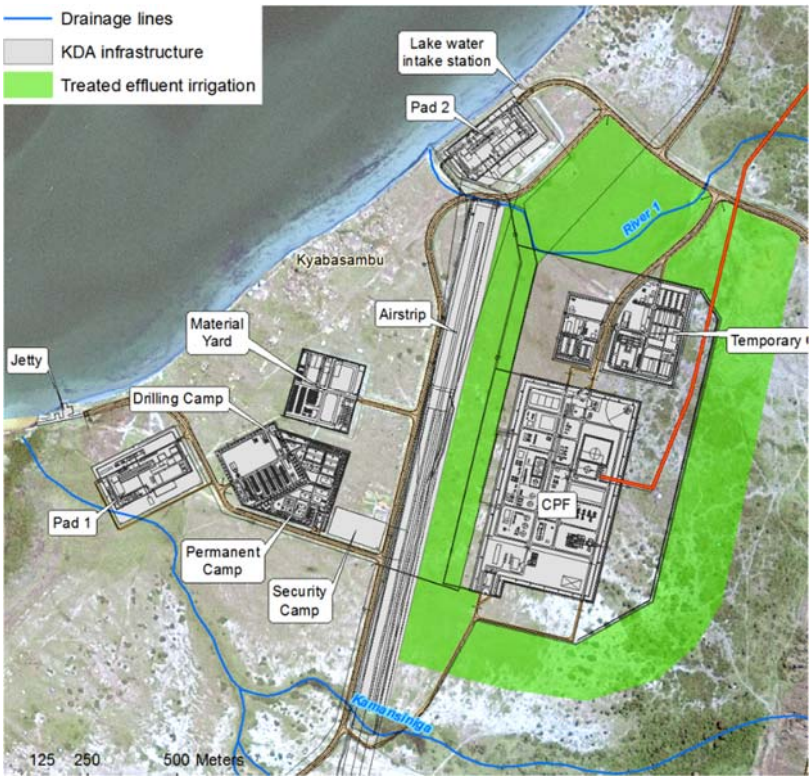

Figure 7-4: Suggested areas for irrigation of treated sewage effluent on pasture grasses

Mitigation is as for construction, i.e. to irrigate the treated effluent on the CPF and personnel camp lawns and gardens which will reduce impact significance to **low**. Another option is to create an artificial wetland with the effluent or use it to water a sustainably managed plantation. The selected treatment technology must also be reliable in remote conditions, and provide sufficient redundancy for repairs and maintenance. This will reduce this impact to **low** significance.

Impact of erosion and sedimentation: During operation, an increased risk of sediment into Lake Albert will be caused by erosion of drainage lines because of concentration of stormwater runoff from hard surfaced areas, causing measurable increased turbidity during and after storms. Active soil erosion is already evident on the Flats. The Kamansinig River may also experience increased stormwater flows, and a higher risk of channel erosion and sedimentation due to forced channelling of stormwater via the current single road

culvert. Already, villagers complain about the back up of water above the road culvert and increased areas of stagnant water. These impacts will be long term and of **medium** significance.

To mitigate this impact, adjust the final design of the canals channelling stormwater from the CPF to remain outside of seasonally wet areas. Canalise the flow to the Lake using open cross section (not concrete canalisation), reinforced if necessary and grassed. Finalise the canal design and align the stormwater drains with the assistance of a wetland ecologist. Prohibit access to operators of earth moving equipment and large vehicles outside of work sites, and provide ongoing training about the sensitivity of the local environment in respect of water pollution. This will reduce residual impact to **low** significance.

Impacts of oil and chemical pollution at the CPF during operation: The potential sources of pollution will be located at the well pads, where drilling will continue for the first 5 years of the operational phase, and at the CPF, where all of the production-related waste and effluent management will take place. Best practice pollution control measures form part of the design of the CPF to prevent release of process effluents such as produced water, which contains hydrocarbons, hydrocarbon sludges, potentially oil contaminated stormwater, or spillages in the hazardous areas of the CPF, into the natural environment. Any stormwater from potentially contaminated areas of the plant will be captured in a stormwater pond, tested and released into the environment, if it meets the discharge specification of 10 mg/l.

Despite these control systems, the small buffer between the CPF and the Lake and surrounding ecosystems, and the natural stormwater drainage towards these ecosystems, coupled with the large volumes of effluent and solid waste to be handled, increases the risk that hydrocarbon-contaminated drainage could occasionally escape into River 1 or the Kamansinig River and its wetlands, and/or reach the near-shore habitats of the Lake, in the absence of a very high level of control of day-to-day effluent and waste management activities.

In the absence of fail-safe mechanisms to prevent pollution, the probably of even an occasional event of a release of hydrocarbon-contaminated effluent into River 1, the Kamansinig River and / or Lake Albert at concentrations exceeding the project standard is considered ‘definite’, as a conservative estimate, resulting in **high** impact significance**.**

The most important mitigation to reduce the significance of the above impacts is rooted in highly competent environmental oversight during operation of the CPF, based on a robust liquid and solid waste management system with sufficient redundancy to accommodate all likely operational upsets, and an operational EMP with specific biological and social performance indicators. This must be complemented by enforcing a culture of zero tolerance for pollution, ongoing management and personnel training and stringent monitoring and record-keeping. An annual independent audit of compliance by an international expert is to be carried out. If failsafe measures to prevent oil and hydrocarbon pollution on the Flats can be certain, this potential impact will be reduced to **low** significance.

7.1.3 Noise

Construction Phase

Impact of CPF construction noise: Due to the short duration of construction noise, it is evaluated using different criteria to those that apply to long term noise. Details of the methodology are described in the ESIA and Specialist Study. CPF construction is set back from Kyabasambu and Nsonga, providing some noise buffering to these villages and will also be predominantly during the day. Nighttime work can be limited to hand tools only. A range of mitigation measures are set out in the ESIA to minimize CPF construction noise, as well as noise generated during well pad construction, including screening of noisy equipment, ongoing training of equipment operators to minimize unnecessary noise and (where practical), limiting the time of day when noisy activities are permitted. With these measures in place, residual impact significance will be **low**.

Impact of drilling noise: The most severe, ongoing, noise will be generated by drilling on well pads 1 – 3, one well pad at a time for over 200 days on each pad, throughout the day and night, causing a risk of both nuisance and sleep disturbance. For unmitigated drilling noise, the combined sources of all noisy equipment on the well pad was estimated to be 110 dBA. The predominant source will be the top drive of the drilling rig,

generating noise 45 m above the ground. Under these assumptions, the following impacts were estimated for nighttime (the worst case):

- **high** significance (>55 dBA): 972 people (216 building structures);
- **medium** significance (50-55 dBA): 2,556 people (568 building structures);
- **low** significance (45-50 dBA): 2,957 people (657 building structures).

CNOOC and its drilling contractors have estimated that, using various methods described in the ESIA, source noise could be attenuated by 10 dBA. Noise management measures will include placing the blower fans on the rig floor, and noise screening of the equipment on the rig floor. This will result in a residual (mitigated) noise level of 100 dBA, in which case the estimated number of people affected would be:

- **high** significance (>55 dBA): 5 people (1 building structure);
- **medium** significance (50-55 dBA): 189 people (42 building structures);
- **low** significance (45-50 dBA): 779 people (173 building structures).

All households above, including those in the 'low' significance category, will experience large noise increases, both during the day and at night, of 10 dBA to 20 dBA.

In addition to the proposed methods to reduce noise, two recommendations are made to manage this residual impact.

- CNOOC should negotiate the acceptability of the residual noise levels with NEMA. If the revised draft Ugandan noise regulations are still considered to provide an acceptable maximum noise limit for construction-related activities (a nighttime standard of 65 dBA), this could form the basis of a legal compliance requirement. Once an upper limit has been agreed with Government, CNOOC must actively monitor noise levels around the active well pads to ensure compliance and as a basis for action in the event of non-compliance,

- Government plans to develop services for the villages on the Buhuka Flats must be fast-tracked to provide affected people with the knowledge that the negative oil industry impacts are balanced by the benefits of development (these plans are discussed elsewhere in this Executive Summary).

With the above mitigation, the significance of residual noise impacts related to drilling will be **low.**

Operational Phase

During operation of the CPF, noise will be generated by the gas engines and other plant components. The daytime and nighttime limits of 55 dBA and 45 dBA respectively will not be exceeded at any households. Drilling will continue for five years on all four well pads, again with one drilling rig moving from one well pad to the other. The impact of drilling noise, possible mitigations measures, residual impacts and additional measures to be taken to reduce this impact are described under Construction Noise above.

7.1.4 Visual Aesthetics

Local people on the Flats will be sensitive to the aesthetic changes that the project will bring about, especially since they attach cultural and religious values to the landscape.

Photograph 7-3: The combination of the escarpment and the vast surface of the Flats and adjacent Lake creates a unique and highly recognisable character (CNOOC's drilling camp is in the middle ground)

Construction Phase

Kyakapere, Kyabasambu and Nsonga North and South will be affected. Overall, visual intrusion will be high **medium** in the daytime. Exposure to project infrastructure at other villages will be **low**.

The greatest visual intrusion is expected at night when the construction sites will be brightly lit (Figure 7-5) and visible over large distances. The significance of impact will be **high medium**.

Figure 7-5: Simulation of night lighting at the CPF construction site and a lit drilling rig

Mitigation of day-time visual impacts is to limit dust by wetting bare areas and rehabilitating disturbed areas with appropriate local vegetation as soon as possible. Also, keep a tidy site with designated areas for different activities, and repair erosion.

For night-time mitigation, down lighting with cut-off shielding for both glare and sky glow should be used as much as possible to avoid spillage of construction light into surrounding areas. Security and other lighting should be designed to send all of their light more or less downwards where the light is intended to be used, and not upward or sideways. In both cases, impact significance can be reduced to **low medium.** In the context of the proximity to the local populations, achieving low residual significance is considered to be unlikely.

Operational Phase

The mid-level of most CPF infrastructure is around 5 m above the ground but some infrastructure will be higher: production towers 20 m; oil storage tanks 18 m; drilling rigs 40 m. Views from Kyabasambu and Nsonga North will be most affected. However, people on the Flats are not restricted to their villages and they will be acutely aware of a large industrial facility operating nearby, with the associated industrial buildings and infrastructure, changes in site topography, loss of vegetation cover, ongoing traffic and many personnel on site.

The greatest degree of visual intrusion will be at night when the production facility will be brightly lit. The industrial lighting of the CPF and other infrastructure will be visible over large distances. Daytime visual intrusion will result in impacts of **high medium**, whereas the nighttime significance will be **high.**

Figure 7-6: Provisional location of tree screens to reduce visual impacts both during the day and at night

Mitigation to reduce visual impacts of the production facility are similar to those for construction, but with additional measures. These include adhering to strict technical specifications for low-impact night lighting, avoiding white, shiny or brightly coloured roofing and cladding material, and painting infrastructure in neutral colours, mimicking those of the natural environment. Further mitigation is to retain as many existing trees as possible, landscaping infrastructure with indigenous vegetation and creating tree screens (Figure 7-6) to interrupt views of the production facility and well pads along key view lines (Figure 7-7 and Figure 7-8). Fast-growing trees, preferably indigenous or non-invasive, should be planted at the start of construction to allow additional growing time. Earthen embankments and berms should not be used due to their geometric, linear, shapes. With this mitigation in place, impact significance will be **low medium.** In the context of the proximity to the local populations, achieving low residual significance is considered to be unlikely.

Figure 7-7: Simulation of daytime view of a tree screen viewed from the north-west back towards the CPF (screened CPF oil tanks in the far right)

Figure 7-8: Night time view of Drilling Rig 1, the permanent camp and the production facility after tree screening

7.2 The Biological Environment

A range of construction and operational activities will result in impacts on biodiversity, in some cases with high significance, or cumulatively of concern. Many of the impacts listed below have been dealt with earlier, particularly under surface water pollution, but are summarised and where necessary repeated here from the point of view of their specific impact on biodiversity.

7.2.1 Lake Albert Nearshore Environment

Construction Phase

Erosion and sedimentation: The main concerns associated with erosion and sedimentation during the construction phase are discussed in Section 7.1.2 above. The Lake ecosystem is highly sensitive, supporting many species of fish, threatened snails and migratory birds on its shoreline. About 0.12 km of open sandy shoreline will be physically lost or severely disturbed by constructing the water intake station and jetty upgrade. Additional sediment will also be contributed from the expansion of the well pads 2 and due to general construction activities associated with the CPF and the flowlines. This impact can be reduced from **low medium** to **low** significance by implementing the measures summarised in Section 7.1.2.

Treated sewage effluent: Treated sewage effluent discharged into River 1 and entering the Lake near well pad 2 could result in a proliferation of water hyacinth due to increased nutrient availability. This could materially impact on biodiversity in the nearshore environment, of low **medium** significance. As described in Section 7.1.2, irrigation of the treated effluent around work sites will reduce impact significance to **low**.

Impact of hazardous material spills: The concentration of hydrocarbons and other pollutants in Lake Albert is currently below levels that could cause harm to biota in the lake environment. The potential risks to surface water quality as a result of hydrocarbon or other hazardous chemical spills (not regarded as a major accident) is described in Section 7.1.2. The impact of major accidents is discussed in Chapter 10. Chemical and in particular oil (hydrocarbon) pollution in the Lake, even in small quantities, is a material risk to Lake biota, including juvenile fish and invertebrates and would result in impacts of **high** significance. Given the uncertainty surrounding the probability of such spills during construction, the methodology requires the use of the most conservative rating (a rating of '5', meaning 'definite') which results in a pre-mitigation impact significance of **high**. With impact mitigation, as described in Section 7.1.2, the probability of spills can be reduced to low levels, resulting in residual impacts of **low** significance.

Impact of introduction of aquatic weed: The Lake is already infested with water hyacinth, but could also be negatively affected by invasive species being carried on vehicle tyres or in materials. resulting in impacts of low **medium significance.** All machinery and vehicles should be inspected for aquatic weed propagules before entering the site, and any propagules killed with an approved biocide and clearance certificates issued. The residual impact significance under managed conditions will be **low**.

Impact on species of conservation concern: Impacts of **high** significance could affect the critically endangered and range-restricted Mud Snail (*Gabbiella candida*), likely to occur in Lake Albert nearshore habitats, in the event of oil/chemical contamination, or discharge of untreated hydrotest water containing biocides and corrosion inhibitors. As a precautionary measure prior to construction, a once off specialist survey for the mud snail is recommended at the sites where construction disturbance will occur. Subject to the species not being found at these sites, and by following the required mitigation measures for construction phase pollution prevention, the residual impact will be of **low** significance.

Operational Phase

Impacts on water quality: Operational impacts on water quality are a critical element of risk to the biota of Lake Albert. Whereas the impacts of physical construction will not manifest during operation, all other potential impacts listed above for construction will remain relevant to lesser or greater extent. The impacts during operation of sedimentation, discharge of treated sewerage effluent, the risk of spills of hazardous materials including large volumes of produced water and consequent pollution impacts, including those for drilling which will continue for five years during operation, and the risk of invasive species reaching Lake

Albert, are discussed in the section on Surface and Groundwater and biodiversity impact on Lake Albert. It is noted that apart from the discharge of treated sewage effluent and the release of stormwater from potentially oil-contaminated areas of the plant and well pads once it has been verified that it meets the project water quality standard, no discharges are planned from the production facility.

Impacts on sediment drift: Sediment drift is important in shoreline ecosystems, contributing to the nutrient cycling that supports phytoplankton, zooplankton and fish communities. The jetty will be upgraded but material changes to its dimensions are not planned. The proposed water intake station will extend a similar distance (~20 m) into the lake as the jetty but will be an open lattice structure which allows for the movement of sediment along the shore. The significance of impact on lakeshore species due to sediment drift is expected to be **Low-Medium**. Depending on the final design, which should minimise the effect of the structure on sediment movement, impacts can be reduced to low significance.

7.2.2 Wetlands

Construction Phase

Impact of habitat loss: Figure 7-9 shows areas of potential construction impact caused by access roads, flowlines and the extension of well pad 1 on wetlands and rivers on the Buhuka Flats. The long-term wetland loss due to construction of the production facility is 2.7% of the seasonal wetland area on the Flats. The wetland habitat loss that will be caused by the extension of well pad 1 is 1.6 ha**.**

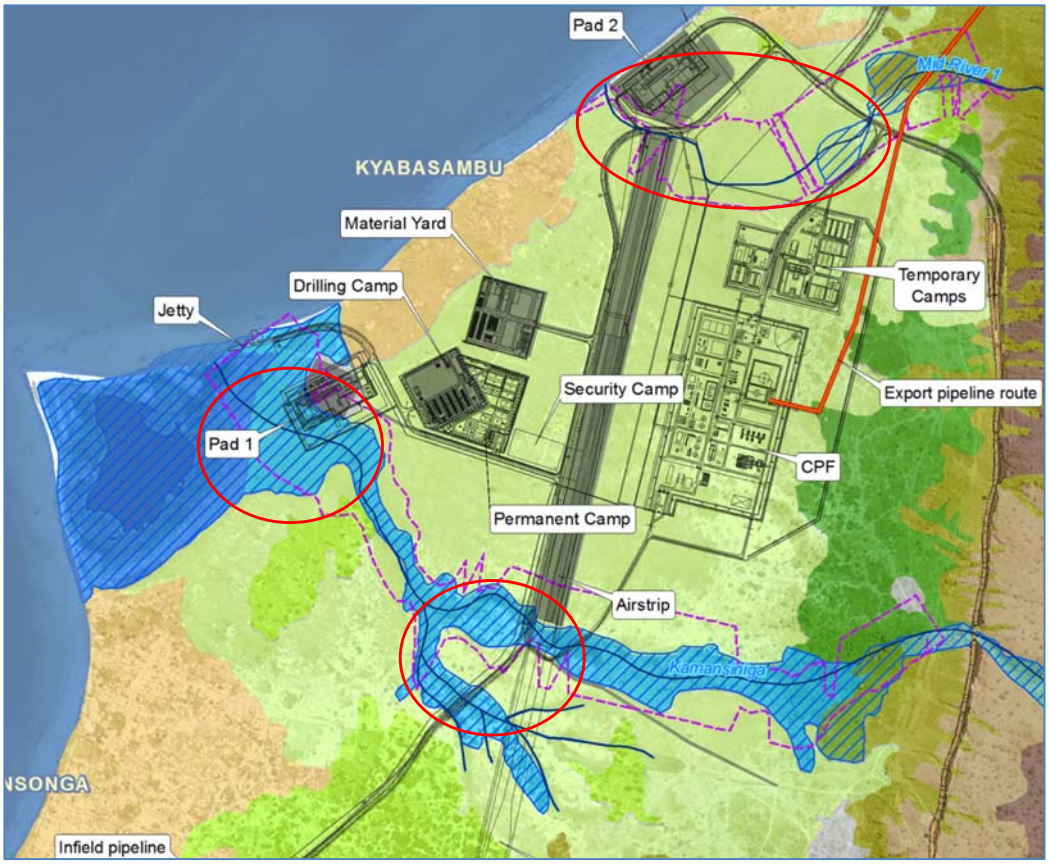

Figure 7-9: Wetlands and drainage lines directly impacted by construction of the production facility (red circles

The flowline impacts will be temporary and short term (subject to appropriate construction management) causing impacts of **low medium** significance. Proposed mitigation for the flowlines includes minimising wetland vegetation cleared for the Kamansinig flowline crossing to the smallest possible footprint,

demarcating the construction right of way across the Kamansinig wetland to prevent inadvertent damage outside of this footprint, preferably undertaking the flowline crossing across the Kamansinig wetland in the dry season and prohibiting access to personnel outside of the defined project work sites and access roads. Personnel are to be trained to understand the sensitivity of the local environment in induction and ongoing tool box talks. Project personnel are to be prohibited from access to the Bugoma swamp, which is a resource of exceptionally high ecological value and is part of the Kamansinig wetland system.

Impact of pollution: River 1 is likely to carry most of any stormwater and sewage effluent discharges during the construction of the CPF. This seasonal stream is already crossed by the main access road into the Buhuka Flats and by the road crossing to well pad 1 and the jetty. Pollution impacts on wetlands are discussed in the ESIA under the headings of erosion and sedimentation, hydrocarbon and chemical spills, discharge of hydrotest water and disposal of treated sewage effluent. The potential water quality risk and mitigation in this regard is set out under Section 7.1.2. Construction phase impacts will mainly affect River 1. Recommended mitigation includes adjusting the final design of the canals channelling stormwater and treated effluent from the CPF to remain outside of the seasonally wet areas associates with River 1 as far west as possible, crossing the river channel just upstream of the road culvert (see Figure 7-2 earlier) From the culvert onward it may be necessary to canalise the flow to the Lake. Use of open cross section swales for this purpose (not concrete canalisation) is recommended, reinforced if necessary and grassed. Finalise the canal design and the alignment of the stormwater drains with the assistance of a wetland ecologist.

Impact on species of conservation concern: A small population of the endangered Grey Crowned Crane, which favours seasonally flooded wetland habitat, occurs on the Flats. They will tolerate some human disturbance but how tolerant they may be to indirect disturbances during construction such as noise, light, vibration and edge effects, is not known. In the context of the endangered status of the cranes impacts will be of **low medium** significance.

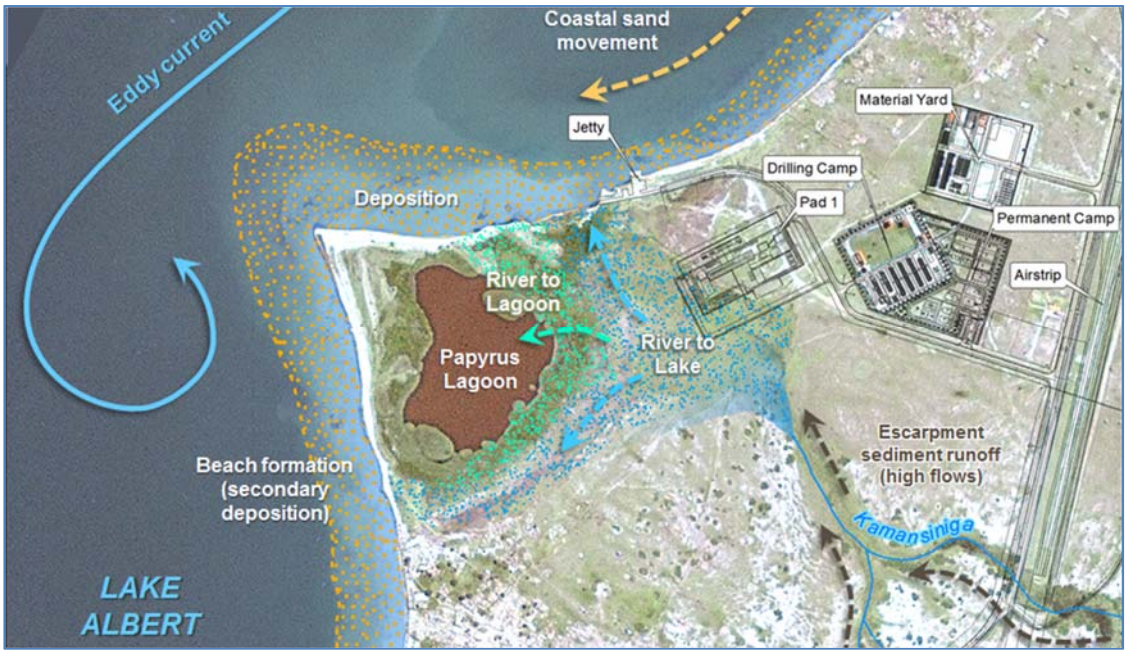

Figure 7-10: Details of well pad 1, showing its location within the lower reaches of the Kamansinig River wetlands and the expansion into the seasonal wetland

Operational Phase

Interruption of wetland flow: The extension of well pad 1 into the seasonally wet areas of the Kamansinig wetland (Figure 7-10) system raises the possibility of long term interference with subsurface flow and surface flow during floods. The vegetation within these seasonally flooded grasslands is adapted to seasonal inundation, and, therefore, is dependent upon the cycle of wet and dry for survival. The location is also contrary to Ugandan legislation (Uganda Wildlife Act, 2000), and other best practice standards and guidelines, such as IFC Performance Standard 6. However, most of the well pad already exists and there is, at this stage, no reasonable and practical alternative to the proposed extension, given the existing location.

Photograph 7-4: Impact of a poorly designed road crossing on the Kamansinig wetland; this needs to be rectified during the construction phase

Further potential disruption of wetland flows is the road crossing over the Kamansinig River, already constructed. While the road design and culverts intended to cater for floods, it effectively narrowed the floodplain to a single discharge point, likely to cause changes in wetland structure (Photograph 7-4). In turn this will cause changes in natural vegetation. Impact significance is **high**. Mitigation of this impact involves re-designing the culvert system for the road with additional culverts to re-instate wetland flow. Subject to this mitigation, long term impact on Kamansinig wetland flows will be of **low** significance.

Impact on water quality: Operational impacts on water quality are an important element of risk to the biota of the LSA wetlands. These impacts are described in Section 7.1.2 on Surface and Groundwater.

7.2.3 The Escarpment Vegetation Corridor

Construction and Operational Phases

On the escarpment, untransformed vegetation forms a corridor between large conservation areas to the north and south, making the escarpment an important corridor for the movement of species. The escarpment road will carry heavy construction and other traffic (one truck every 5 minutes estimated, including return traffic), which could result in road kills. Wildlife is however already severely depleted and the impact is considered to be of **low medium** significance. By limiting vehicle speeds, prohibiting night driving except in emergencies and training of drivers, impact significance is expected to be **low.** Operational traffic will be less frequent than construction traffic although the same mitigation will apply.

7.2.4 The Bugoma Central Forest Reserve

Impact on species of conservation concern: In the regional study area, Government will upgrade the P1 and R5 roads for use by the oil industry, mainly the Kingfisher project in this area, to link with the escarpment road (Figure 7-11). The R5 passes through the centre of the Bugoma Central Forest Reserve (Photograph 7-6), one of the last stands of tropical semi-deciduous forest in the region, globally recognised for its biodiversity value. Known populations of threatened and irreplaceable species occur in the Forest including Nahan's Francolin, Eastern Chimpanzee (one of the four largest Eastern Chimpanzee populations in Uganda), the Endangered Madagascar Pond Heron, elephants and others.

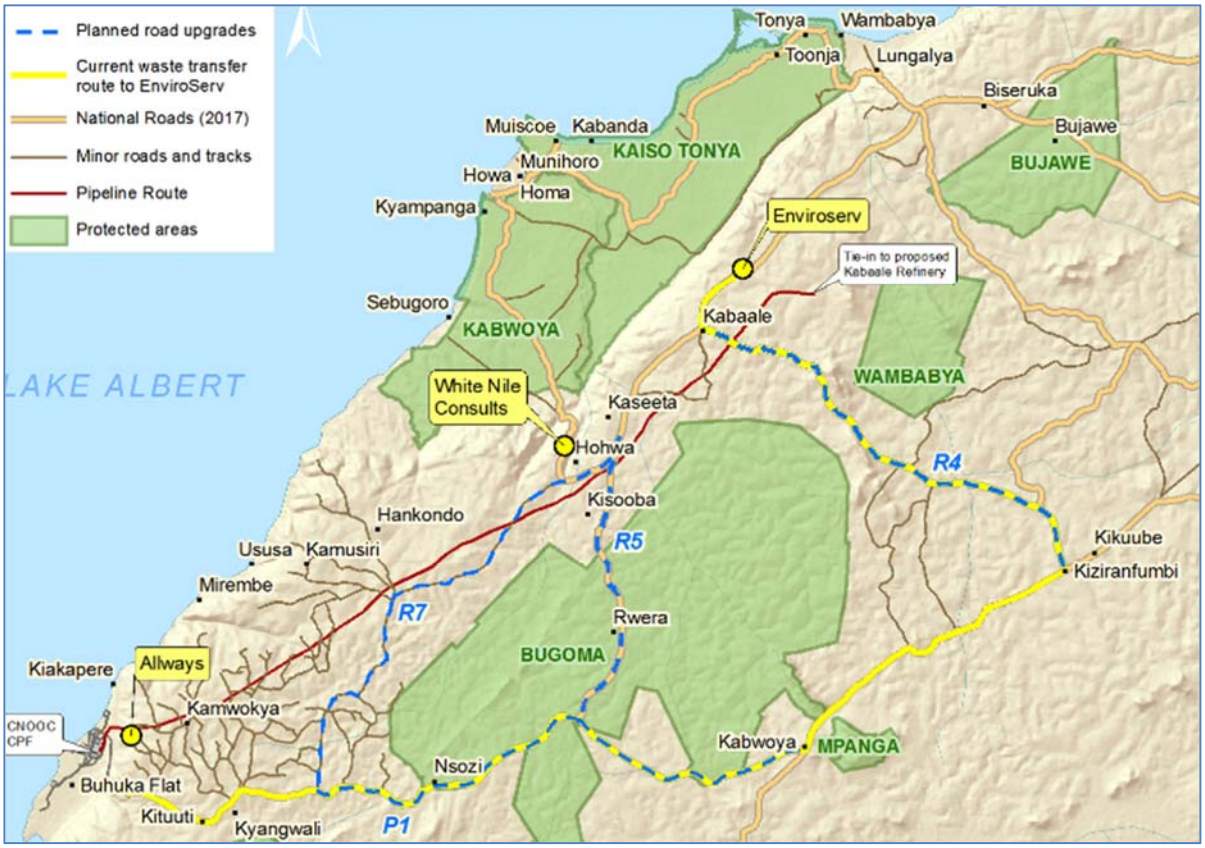

Figure 7-11: Proposed road upgrades in the regional study area

Widening the roads will result in loss of 29.7 ha of forest. High volumes of construction traffic will pass through the forest. Chimpanzees' vulnerability to disturbance is well known. While less is known about Nahan's Francolin, it is a shy forest species. Traffic could cause road kills and will affect movement of these and other species, their breeding sites and behaviour. This could lead to reduced breeding and thus reduced numbers of these important species.

Any incidence of mortality or injury to an endangered species should be considered unacceptable. In addition, the presence of the endangered and range restricted species of Eastern Chimpanzee and Nahan's Francolin triggers an IFC classification of 'Tier 1 Critical Habitat'. Tier 1 habitats are considered to be sites of exceptional conservation significance. Project components potentially affecting Critical Habitats are first and foremost to be avoided.

In summary, the widening of the P5 through the Bugoma Forest will affect biodiversity in an internationally recognised Tier 1 Critical Habitat, impacting, in particular, on Nahan's Francolin and the Eastern Chimpanzee, the latter being an endangered species to which a high emotive value is attached internationally. Reputational risks to CNOOC are certain. Impact significance will be **high**.

The key mitigation measure to reduce impacts on the Bugoma Forest Reserve is to delist the R5 from the proposed oil road upgrades and for CNOOC to use the P1 as the major haul road during the construction phase and, if upgraded in time, the R7. CNOOC has already agreed to these recommendations and government has been informed. In the case of the P1 road, it is recommended that widening is on the non-forest side to minimise habitat loss, and that strict speed limits are enforced and driving at night is prohibited. For the Nahan's Francolin and Eastern Chimpanzee populations, a long-term research and monitoring

programme should be developed and implemented to improve understanding of their behaviour and status. With these measures in place, impact significance can be reduced to **low** and **low medium**.

Impacts of population in-migration: All habitats, their ecosystem integrity and species of conservation concern are likely to be affected by an influx of population into the project area, already evident as a result of in-migration over the past 10 years with people seeking opportunities offered by fishing in Lake Albert and the general perception that development is increasing the potential for finding work in the District. The escarpment road further increased population influx. Impacts on biodiversity will result from settlement, planting, harvesting of fibre from wetlands, hunting, fishing, fuel wood collection, charcoal making and increased stock numbers. Around the Bugoma Forest, land has been largely transformed for subsistence agriculture, resulting in increasingly scarce natural resources, and people have illegally settled in the forest (now evicted). These pressures will increase with increasing settlement. Without mitigation, impacts caused by in-migration will be of **high** significance.

Photograph 7-5: The P5 road to be widened by Government crosses through the centre of the Bugoma Forest, a 'Tier 1 Critical Habitat' in terms of IFC Performance Standard 6.

Measures set out in the Influx Management Strategy and Framework Plan for the project should be implemented principally by Government with support from the oil industry. These include avoiding or reducing influx of work seekers to the project area and those seeking to take advantage of Project related economic opportunities, particularly those who cannot contribute to development and upliftment of local communities. Government should proactively attract skilled people such as teachers, health workers, and experienced traders and entrepreneurs and manage such undesired influx as cannot be avoided through planning and development of the Hoima District, and the protection of habitats and ecosystem integrity and species of conservation concern. Considerable effort is still required to set up the details of a working plan in this regard.

With respect to biodiversity, long-term monitoring plans must be developed for the valued environmental components potentially affected by in-migration, including the habitats of the Buhuka Flats, Escarpment Corridor and the Bugoma Central Forest Reserve, and all of the species of conservation concern. Monitoring of settlement around the Forest will be necessary to provide data in support of actions to minimise impacts on the forest habitat and the potentially affected threatened species within it.

7.3 The Socio-Economic Environment

7.3.1 Workforce Related Impacts

Construction Phase

The ESIA workforce impacts relating to employment include employment opportunities, skills development and training opportunities, layoff of casual labour and accommodation of the workforce.

Impact on Employment Opportunities: In the construction phase, job creation in the EPC (Engineering, Procurement and Construction) and drilling contracts will ramp up to between 1,000 and 2,000 at peak, tailing off towards the end of the 3-year construction period. Drilling jobs will continue into the operational phase of the project. Based on its agreements with the Ugandan Government, CNOOC will employ as many

local people as possible. CNOOC's casual labour policy reserves at least 60% of casual jobs for local communities in the areas of its operations. Employment will be provided through a selection process that includes all affected villages. In addition, CNOOC's EPC contractor may employ casual workers from the villages around the project for short-term work, like bush clearing. Even though short term, employment creation in the local area and wider region is therefore considered to be an important positive socio-economic impact of **medium** significance, which can be increased to **high** significance if emphasis is place on fair distribution of available jobs and hiring and training local people.

Impact of skills development: CNOOC skills development policy guides recruitment and employment. All contractors and sub-contractors are expected to comply. The policy aims to improve the skills of the local labour pool by investing in technical, managerial and administrative skills of the workforce. The impact will involve a relatively small number of people but in the context of the great need for skills development in Uganda will be of **medium high** significance.

Layoff of casual labour: Layoff of most of the local casual construction workers will accelerate as construction reaches an end. This could be between 1,000 and 1,500 temporary jobs. Most of these people will not find employment in the operational phase which has much fewer opportunities for casual workers. This may impact on food security among local families who have become dependent on the income from the lost jobs. Badly handled, this impact could be of **high medium** significance. Ensuring that workers fully understand their conditions of contract and training office bearers to work within their communities to minimise misunderstandings among job seekers will minimise the effects, although residual impacts of **low medium** significance are still likely to remain.

Impact of workforce accommodation: With quality, properly ventilated construction accommodation and catering, the living conditions of many employees are likely to be significantly improved providing a benefit of **high medium** significance.

The ESIA workforce impacts relating to health and safety include general construction safety, driver and mobile equipment safety, graft and exploitation, alcohol and drug abuse, vector related diseases, sexually transmitted diseases and sanitary and hygiene related diseases.

General construction and driver safety: Local Ugandan statistics for the causes of injury in the construction industry are not readily available. But they generally include physical hazards, chemical hazards (handling of hazardous products and wastes), biological hazards (leading to infections and parasitic diseases among workers) and general hazards, (including radiation, noise, vibration and extreme temperature). These hazards may all be aggravated by specific behaviours.

Any of the above hazards and behaviours may be exacerbated by the fact that a significant proportion of the workforce will be sourced from a low-skill labour pool and would potentially be unaware of workplace-based health and safety requirements, making them more prone to high risk behaviour and accidents. Ugandan labour laws, and disability management and appropriate compensation standards and regulations are limited and are not aligned with IFC and other international standards and requirements. There is also a limited emergency response system in the broader study area and the district.

Without a high degree of control, general construction and driver safety impacts may be very significant resulting in long-term or permanent disabilities. The impact significance rating is **high medium**. A wide range of mitigation is proposed in the ESIA, including a zero tolerance approach to transgressions, implementation of an ongoing safety training programme covering all relevant issues and provision of sufficient recreation for employee use. With strict implementation of a high standard of health and safety management and training, injuries can be reduced to minor non-disabling accidents which are short term and of **low** significance.

Graft and exploitation: Unsuspecting victims of graft and exploitation, particularly foreign workers, may be an issue as has been demonstrated in some past instances. Awareness of these issues will be important. Impact significance will be **low medium.**

Alcohol and drug abuse: Particularly in situations that involve dangerous equipment, locations, or duties, substance abuse can be cause permanent disability or mortality, and employees that abuse substances are

3.6 times more likely to be involved in workplace accidents than their co-workers. The significance of this impact, without mitigation, will be **high medium.**

Diseases: These include vector-related diseases (mainly malaria), sexually transmitted diseases, and sanitary and hygiene related diseases. Malaria case rates are described as being on the increase, and that the illness is commonly associated with misconceptions and poor prevention behaviour.

Sexually transmitted diseases are a critical problem on large construction worksites, where the presence of a large number of well-paid predominantly single males in construction camps encourages sex workers from local communities and further afield, with a resultant risk of the spread of HIV/AIDS and other STDs among construction workers due to unprotected sex, of **high** impact significance. Stringent management will reduce unsafe practices but is unlikely to that it can be fully controlled in the construction phase and the residual impact will remain low **medium.**

Sanitary and hygiene related diseases result from the difficulties of maintaining hygienic conditions in a large workforce unaccustomed to requirements in respect of sanitation and hygiene will require ongoing education and management. In addition to the provision of appropriate sanitary facilities for human and food wastes, personal hygiene must be taught and enforced. Impacts will be of **low medium** significance.

Operational Phase

Impact on employment and skills development: In the operational phase, around 120 full time jobs will be created at the production facility. Drilling jobs will continue for the first five years while the last wells are completed. Based on its agreements with the Ugandan Government, CNOOC will employ as many local people as possible and it is understood that at least 80% will be Ugandans from year 1 of production. Employment creation will be a positive socio-economic impact, although the local benefits and even benefits at District and National level will be limited by skill constraints. Initially, skilled Ugandan personnel are only expected to take up a small percentage of the jobs but taking into consideration the need for employment in Uganda, the impact significance will be high medium. With the implementation of the recommended measures to enhance operational employment impacts, the overall positive significance rating can be increased to **high**. Measures include collaborating with the Petroleum Authority of Uganda in relation to bursaries and scholarships, aligning training with critical skills shortages in the oil industry, consideration of promoting a process of Recognition of Prior Excellence and Learning, promoting STEM at school level and supporting initiatives that will promote and strengthen the levels of competence of master artisans and crafts persons within the Technical Vocational Education and Training (TVET) system.

7.3.2 Economic Impacts

Construction Phase

National and regional economic growth: The development of the oil and gas industry, through the CNOOC project, will have a beneficial impact in the region, limited only by its short duration, which will include revenue for the government, employment opportunities at local, regional and national level and a direct and indirect effect on business development. Increased household income and expenditure will result. The increase in work opportunities provided by the project will result in the short-term growth in the proportion of residents with higher incomes. Wages for skills needed in the oil industry are likely to increase. Employment in the oil industry will generate government revenue, deducted from salaries through Pay As You Earn (PAYE) as well as through Local Service Tax levied on income earners .

This economic impact will be positive with a **high medium** significance rating. Benefits can be increased with the implementation of the measures recommended in the ESIA to enhance good governance and investment in local infrastructure and services.

Local economic development: The construction of the project will stimulate demand for goods and services within the Hoima district, which in turn will have a direct and indirect impact on employment in the local and regional economy. While CNOOC has developed a local procurement policy to support further development of the business supply chain locally and regionally through appropriate purchasing and business development strategies, the overall benefits to local businesses (both direct as a result of local

project expenditure and indirect as a result of the growth of the informal business sector) will be of low magnitude and short duration (opportunities will dwindle once the cash injection from people employed on the contracts ends), resulting in positive impacts of **medium** significance.

Human capital development: Given the relatively short period envisaged for the construction phase, beneficial human capital development is likely to be limited, unless specific training programmes are put in place. Without enhancement this impact will be of **low** significance**.**

Impact retarding economic development: The construction phase is likely to exacerbate the current shortage of experienced labour at local and district level. Sourcing experienced workers from the district will drain available skills away from existing businesses, increasing scarcity and cost of labour.

The start of construction will also result in speculation for land, where individuals move into the area and claim land for themselves. According to villagers, these speculators sometimes have fraudulent title deeds. Despite Government action, it is reported that speculators continue to try to trade up local land prices.

Some people will also lose their only sources of livelihood including their access to small sections of land on which they practice subsistence agriculture. Whilst there will be compensation in respect of crops, individuals who have been in a position to use land by prior permission may find it extremely difficult to find affordable alternatives. This could, potentially, result in a disruption of livelihood-related activities or even their suspension, with associated increased levels of poverty, pending completion of the construction phase.

Negative impacts retarding economic development will be within the range of **medium** significance.

Operational Phase

Increase in government revenue: Direct oil and gas government revenue is derived from (i) royalties (based on the value of extracted resources); (ii) surface rentals (annual fees in respect of acreage held by oil companies); (iii) taxation (personal and business taxes as well as specific introduced taxes related to 'windfall gains', resource rent and the environment); (iv) bonuses (paid by the oil companies at defined stages during the exploration and production phases, as per their Profit Share Agreement); (v) what is termed 'Profit Oil" (income from excess oil production over that required to meet all cost recovery and payment requirements); and (vi) 'other fees' (contributions to training of government personnel and/or payments in cash *in lieu* this). As the sector develops, value chain operations such as refineries and the sale of petroleum products will provide additional opportunities for income from taxation.

The specific terms of agreement between CNOOC and the government have not been made public. Informed projections indicate that government revenues will remain low for a considerable period of time at current crude oil prices. Henstridge and Page (2012:28) estimate that it will take at least a decade from the start of production for cumulative oil revenues to climb to 5% of GDP, translating to approximately $9 billion. They see this climbing to $7.3 billion (41% of GDP) within the second decade, $14.9 billion (83% of GDP), and $19.8 billion (111% of GDP) by the end of the fourth decade of production (all based on 2012 $ oil prices).

The impact in terms of this indictor is expected to be positive, long term, national in coverage (benefitting all levels of Government) and of **high** significance.

National and regional economic growth: The expansion of the resource industry on the Flats will have a beneficial cumulative impact in the region, including the area above the escarpment where the proposed feeder pipeline will be situated. This will include revenue for the government, employment opportunities at local, regional and national level and a direct and indirect effect on business development. Increased household income and expenditure will result. These benefits will be long term. Significant economic multipliers will be generated. Research for other oil development projects has shown that economic multipliers of about 2.33 (Economy League of Southwestern Pennsylvania, 2008) for value added and between about 2.88 (Loren C Scott and Associates, Inc, 2014) and 3.03 for labour income (Macroeconomic Subgroup, 2011) apply. While these studies were undertaken for oil and gas developments in the USA, and the ratios do not necessarily hold true for developing economies, the general effect is clear.

The increase in work opportunities provided by the project will result in growth in the proportion of Ugandan citizens with higher incomes. Given the number of oil and gas projects under consideration in the sector, there is likely to be a continued and expanding demand for skilled labour. Wages for skills needed in the oil industry are likely to increase. Employment in the oil industry will generate government revenue, deducted from salaries through Pay As You Earn (PAYE).

At a regional scale, the magnitude of beneficial impacts will only be medium, but they will be long term, with **high medium** positive significance. With the implementation of the recommended measures to enhance good governance and investment in local infrastructure and services, the overall significance rating can be increased to that of a **high** positive impact.

Local economic development: The Kingfisher development will stimulate demand for goods and services in the area, which in turn will have a direct and indirect impact on employment in the local and regional economy. CNOOC has developed a local procurement policy to support further development of the business supply chain locally and regionally through appropriate purchasing and business development strategies. This will also support the District and central government initiatives intended to improve the social capital within the Hoima District.

The Buhuka area in general is experiencing rapid economic development. Since the opening of the escarpment road into the Flats, two large markets have developed, selling various goods and services, which attract an extensive daily clientele. The further development of the local economy will be a benefit derived from the presence of the project in the area. It is possible that local economic growth will increase the ability of households to earn a cash-based income. In this regard, CNOOC has indicated that it purchases in the order of 65% of its goods and services from suppliers and contractors in Uganda, which number more than 100 providers to date. The Company also trains local suppliers to meet oil and gas quality, safety and other standards and learn the tendering and bidding process.

In the absence of specific interventions from CNOOC to increase local purchasing and assist local businesses to improve their ability to compete in the market, the benefits will probably be of low magnitude. Nevertheless, they will be long term and of **medium** positive significance. This can be increased to **high** if CNOOC implements a full range of interventions to encourage local business development capability, and steadily increases project spend in the local economy.

7.3.3 Community Health

Construction Phase

Impact of sexually transmitted diseases: Contractors and workers are commonly perceived by local populations as being wealthy especially in rural settings such as the project area. These circumstances encourage cash-strapped people to sell sex as a commodity, to generate vital income. Adolescent girls are often the victims of these practices. The presence of large construction accommodation camps may also serve to attract sex workers from further afield, with an inevitable associated increased risk of the spread of sexually transmitted diseases.

Without a high degree of workforce behaviour management, the unmitigated impact in surrounding villages will be long term and of **high** significance. Specific measures are prescribed in the ESIA to manage this issue, including (among others) an HIV and STI management programme in the construction workforce, awareness and education, treatment services that link to the public health service, provision of free condoms, access to counselling, proper provisioning of the work camps to dissuade workers travelling into communities for entertainment, and support of family friendly accommodation in the camp.

Impact of soil and waterborne diseases: Water related diseases such as cholera and typhoid remain a constant problem within the study area. Construction teams will be provided with water and sanitation. The spread of infectious diseases by construction teams could therefore be caused only in the event that personnel defecate or urinate in the field, particularly in water courses. The impact significance is rated as **low medium**. Enforcing strict compliance to a code of behaviour is specified as mitigation, together with education of workers and adequate provision of clean mobile toilets in the field.

Impact of vector-based diseases: Malaria risks in communities may increase as a result of construction mainly due to the creation of areas where seasonal ponding can occur. Flooded or open trenches during construction, in particular during the rainy season, will create additional mosquito breeding grounds by providing habitats with reduced predation. However, malaria is already widespread in the area and impact will be of **low medium** significance. A fully integrated workplace malaria and vector control programme is recommended as mitigation of this impact.

Health service infrastructure and capacity: If communicable and non-communicable diseases increase as a result of the introduction of the project workforce, additional pressure will be placed on health care services resulting in decreased levels of service. Villagers are generally vulnerable to inadequate health care, with teenage girls highly sensitive to this impact, which will be **high medium** before mitigation. Mitigation involves minimising opportunities for fraternising between workers and members of the community, in particular young girls, supporting community sensitisation and youth counselling initiatives aimed at promoting risk-seeking behaviour amongst youth, and supporting community-based sensitisation regarding HIV/AIDS, STIs and risks related to early pregnancies;

Operational Phase

Diseases: Fewer personnel on site after construction will reduce the potential impact of the project on the local spread of STDs and other diseases. However, without specific management control, there is a continuing risk of the spread of project-related STDs, of **high** impact significance, but this can be reduced by applying the mitigation measures described above for the construction phase. Ongoing education and support in providing health service infrastructure could reduce impacts to **low medium** significance. CNOOC could also contribute positively to the control of malaria in the LSA.

7.3.4 Community Safety

Construction Phase

Traffic and pedestrian safety impacts: The risks of traffic accidents and injuries affecting communities will reduce during the operational phase, with vehicle traffic and project activity outside the working areas being far less than during construction. Nevertheless, Nsunzu, Nsonga, Kyabasambu and Kyakapere are close to ongoing project activity. Pedestrians and stock are likely to use the escarpment road and the infield roads. This will pose an ongoing risk to communities of **high** impact significance. A wide range of mitigation is proposed in the ESIA, including driver training and monitoring, enforcement of appropriate speed limits, using flag men where necessary, providing appropriate signage, developing and implementing road safety awareness for surrounding communities, particularly where construction traffic could affect schools, health facilities or other sensitive receptors, avoidance of night driving and other measures.

Violence and crime: There is a likelihood of some construction workers causing violent incidents in local communities, possibly fuelled by drug use or alcohol. Arrogant attitudes displayed by construction workers, who are generally wealthy compared with community members, may also spark violent confrontations. These issues can generally be managed by lack of tolerance to aggression and violence among construction workers by management, but in unmanaged conditions can be an important concern. Mitigation includes a zero tolerance management attitude to inappropriate behaviour among contract workers, ongoing education and training in this regard and partnering with the Ugandan Police Force Community Liaison Officers to allow sensitisation of communities on issues related to crime. Incidents are highly probable in the absence of mitigation, causing impacts of medium magnitude and **high medium** significance. With appropriate management, this impact can be minimised and will be of **low** significance.

Hazardous materials and waste: Hazardous materials likely to be used during construction are described in Chapters 2 and 7. The risk of occasional spillages of hazardous materials outside of controlled areas is high in the absence of stringent management control. In the context of the Buhuka Flats, where large numbers of people live around the construction sites, any spills would be likely to impact on them or their domestic animals. Without mitigation, even small spills may cause local impacts of **high medium** significance. These impacts can be reduced to low magnitude and **low** significance by appropriate construction management of hazardous materials and wastes, as described in Section 7.1.2.

Fires: Project teams doing hot work create a risk of fire which could escape into the surrounding environment. Disposal of cigarettes outside of controlled areas may also increase fire. Bush and grass fires on the Flats would be a major risk to anyone unable to escape. Housing is clustered and most homes have thatched roofs. Impacts will be of **low medium** significance reducing to **low** significance with appropriate management.

Operational Phase

Potential operational accidents and disasters, e.g. fire, explosion and spills could have a profoundly negative impact on a long-term basis. Economically disadvantaged populations are disproportionately affected by disasters. The poor are less likely to have the income or assets needed to prepare for a possible disaster or to recover after a disaster. These impacts are assessed under 'Unplanned Events' in Chapter 10.

7.3.5 Housing, Land and Resources

Impact of involuntary resettlement: A total of 31 residential structures will be displaced by the infrastructure on the Flats. Two other structures (a latrine and a dish rack) will be lost, as well as five graves. Two household gardens and trees at four households will also be affected. A Resettlement Action Plan (RAP) is being finalised with the specific aim of mitigating social as well as economic impacts caused by the proposed production facility, wells and associated infrastructure.

Photograph 7-6: Typical replacement house that will be built for resettled families on the Buhuka Flats

Cash compensation is a particular issue that arises in relation to physical resettlement. Ugandan law requires that CNOOC provide each project affected person (PAP) with the option of cash compensation instead of replacement of assets. This may have an especially adverse effect on women and children where they are excluded from the benefits of cash settlements. To mitigate irresponsible squandering of cash payments by the male head of household, Ugandan law requires that men are not able to negotiate cash settlements without their spouses being present in the negotiation and being in voluntary agreement. This is a progressive law but is having the unintended negative consequence of increased household violence against the women partner (confirmed by police and other Government reports).

Uncertainty about payment is a further issue raised by many PAPs, who are anxious that they have been consulted about asset inventories, but no final offer has been made to them, nor have they been informed about how and where they would be resettled. In the absence of mitigation, impacts will be negative and of **high** significance.

Recommended mitigation of resettlement impacts is to ensure that the RAP comprehensively addresses all aspects of physical and economic displacement experienced by impacted communities, in accordance with the IFC Performance Standard 5, which addresses the involuntary resettlement and compensation impacts in the project-affected communities. A process to identify all stakeholders (rights holders) must take place for any land take process. While this will mean engaging the individual who indicates that he/she is the rightful land owner, the identification process should consider information from as broad a consultation group as possible. Secondary PAPs, who may not have been immediately identified, but who have utilised the land in some way for a period of up to two decades and longer, must be included. This includes the loss of dwellings of secondary PAPs, loss of crops and assets such as mango trees and resultant loss of income.

A full investigation is to be undertaken of the allegations that PAPs have been forced to sign documentation and if any allegations are valid, they are to be addressed comprehensively. Subject to implementation of the

recommended mitigation, in line with IFC PS5, impacts on PAPs will be reversed and will be positive and of **high** significance.

Impact of land acquisition: Loss of land as a result of the Kingfisher project has been one of the most significant concerns of the Buhuka Parish community. CNOOC land take including all infrastructure will comprise just over 106 ha (7.4%) of the grazing area of 1,430 ha on the Flats. Roughly 76 ha will be returned to community use after construction.

Loss of land and produce as a result of project development has been raised as one of the most significant concerns by communities. It is clear from discussions with villagers that there is significant mistrust about land and lack of awareness regarding land rights, displacement and compensation procedures.

Considering the number of refugees residing in Uganda as well as the history of conflict in the region, land rights are a sensitive issue. Ugandan law also makes provision for PAPs to be offered cash compensation, which creates considerable additional risks for affected stakeholders, particularly in the present case, where land is intensively utilised and there is limited usable land readily available and in close proximity with which to compensate in kind. Without effective compensation and livelihood restoration, these impacts will be long term, of high magnitude and **high** significance.

However, if compensation is paid in full compliance with IFC PS5 and is combined with mechanisms to ensure effective livelihood restoration, it could improve the personal situations of affected landowners, providing income for landowners temporarily and permanently affected by the project. The mitigated impact could become positive and long term, and of **low medium** significance.

Impact of damages to property outside of the defined construction areas: There is a potential for damage to land, property and infrastructure outside of construction areas, e.g. clearing of land for which compensation has not been paid, vehicles or people straying outside working areas and causing damage to land, damage due to dust, and prevention of access at critical periods.

Without mitigation, these impacts have the potential to sour relationships between CNOOC and local communities and can be long term (in terms of damage to relationships), of **high medium** significance. Careful management, open communications and the transparent implementation of a fair grievance procedure should reduce the impacts to short duration and **low** significance.

Operational Phase

Land use restrictions: The CNOOC project is a hazardous installation, and the ESIA recommends that a buffer is established around the CPF and other infrastructure to prohibit further settlement or other built infrastructure (Figure 7-12). Other uses of land, including grazing, could continue as at present. Based on current settlement patterns, these additional restrictions on use rights will have little impact on present land use and the impact will be long term, of low magnitude and **low medium** significance.

7.3.6 Infrastructure and Community Services

Construction Phase

Impact of project use of community infrastructure and services: The project will not use the District health services or any other local or district services. The construction contractors will be required to provide a fully equipped clinic and trained staff, including a medical doctor. Local communities will not have access to this facility, but contract staff personnel will, so the impact on existing community infrastructure and services should have negligible magnitude and **low** significance**.**

Impact of access provided by regional road upgrades: Upgrading of the Hoima-Buhuka (P1) road and the extension of this road down the escarpment onto the Buhuka Flats has brought significant benefits to the Buhuka Flats villages in respect of access to community services. Where previously access to services involved a long journey on foot, the communities can now gain access by vehicle. Together with improvements in other regional roads (the R7 and R4), this is expected to facilitate a general improvement in the health and education in the local population resulting in an overall positive impact of **high** significance.

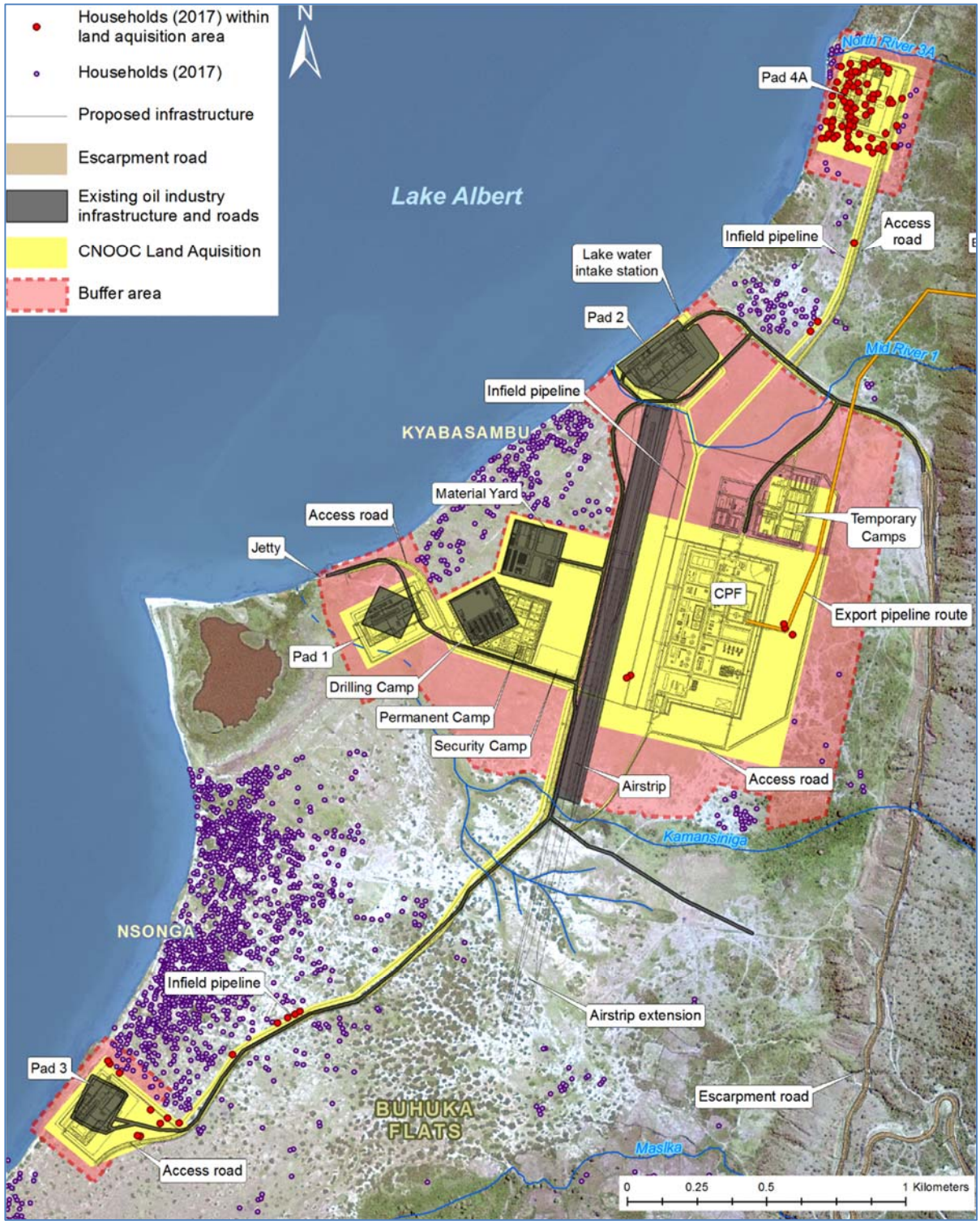

Figure 7-12: Proposed land-use restrictions around the CNOOC Production Facility as a buffer around project infrastructure for safety reasons

7.3.7 In-Migration

Construction Phase

The recent upgrade of a section of the Hoima-Buhuka road and the construction of the road down the escarpment onto the Flats has encouraged settlers in search of opportunities related to fishing to the Flats. Migrants appear to originate largely from the DRC (about 70%), as a large proportion of the trade in fish is across Lake Albert. Villages in the Buhuka Parish already house a multitude of ethnic groups, with the Alur tribe being the largest. While some people are benefitting financially, the in-migration is contributing to pressures on community infrastructure and services, including schooling, health and welfare services, emergency services and water supply.

Construction is likely to result in a further wave of in-migration. This will stimulate economic growth in the area, which in turn is expected to attract more people. Considering this, the impacts may be both positive and negative. Additional population will bring new skills and expertise and result in economic growth, but will also increase the strain on social services, amenities and infrastructure for existing inhabitants.

Overall, in the absence of Government and CNOOC interventions, the impact of in-migration is likely to overwhelm the capability of the infrastructure and community services. Negative impacts are also likely to be experienced by the poorest members of the communities, who will be less able to take advantage of economic opportunities but will experience the negative effects of burgeoning growth. Other negative effects include dilution of local Government influence, as newcomers into the area are typically unfamiliar (or indifferent about) local Government rules and leadership structure. Also, the price of rented accommodation is likely to rise sharply. While this will benefit the owners of accommodation, it will make rental costs for existing tenants (particularly poor tenants) unaffordable. Impacts are likely to be of sub-regional geographic extent, long term and potentially high magnitude resulting in **high** significance.

Mitigation is to implement the strategy for minimising in-migration defined in the Influx Management Strategy and Framework Plan. This will need a combined effort by Government and all oil industry partners.

Operational Phase

There may be a decline in the rate of influx after construction, but there is still expected to be ongoing long-term population growth around the production facility on the Flats, and in the LSA in general, by people migrating into the area in pursuit of CNOOC-related employment and business opportunities. Overcrowding may result in some people leaving the Flats and settling above the escarpment. Over the longer duration of the operations phase, the population demographics may change as the child population enters adulthood and enters the labour market. Assuming interventions by Government to minimise in-migration impacts, residual impacts are still likely to be negative, but reducing to **low medium** significance.

7.4 The Socio-Cultural Environment

Locations of cultural heritage sites
In some instances, the locations of sites are confidential and are not identified in the ESIA reports. Locations will be made available to the Ugandan environmental regulator and CNOOC to manage impacts.

Construction activities that will cause direct impact on cultural heritage resources will include the use of heavy machinery for ground clearance, levelling and compaction, excavation and laying of foundations, laying of flowlines and construction of access roads. Construction in locations where archaeological and cultural/sacred sites exist will result in their destruction and, therefore, their material value. Indirect impacts may result from dust, noise, and visual impacts associated with construction; changing the atmosphere of the site, affecting intangible practices associated with it and hence the value of the site to communities.

7.4.1 Impact on Tangible Cultural Heritage

Thirty-two archaeological / historic sites lie within the proposed project footprint plus a 15 m buffer. Figure 7-13 shows these sites with colour coding indicating the type of site and its rated sensitivity. The sites that will be lost due to construction, with impact significance ranging from **high medium** to **high** in the

absence of mitigation, include two 'BO' (bone) sites, six 'LI' (lithic archaeological sites from the Stone Age), an 'ME' site (metal) where a bangle fragment was found, and 29 'PO' sites (undated pottery scatter). The latter includes 19 sites of Roulette tradition (late Iron Age) pottery scatter, including decorated pottery. This is the most important pottery found on the Buhuka Flats. Most of these sites have national research potential.

Mitigation includes *preservation in situ* (preferred) and *preservation by record*, i.e. when destruction of the site cannot be avoided, follow a prescribed process of archaeological excavation and recording and removing the objects to the National Museum. A programme of pre-construction mitigation is to implemented as a matter of urgency due to activities already taking place on site (this will eliminate risks of archaeologically-induced delays during construction). A qualified and licensed archaeologist is to undertake the survey. An archaeologist needs to be present when earthworks are done to keep a watching brief for further sites or objects, and a Chance Finds Procedure developed in accordance with the law and as a component of a detailed Cultural Heritage Management Plan as required by IFC PS 8. Impact significance will reduce to **low** or **low medium** if sites and objects can be preserved as described and other recommended mitigation put in place.

7.4.2 Impact on Intangible Cultural Heritage

Intangible heritage – or living heritage – is defined as the traditional practices, cultural norms and knowledge transmitted from one generation to the next, which communities or individuals recognise as part of their cultural heritage. These elements are recognised by Uganda's Cultural Policy (2006).

Seventeen cultural sites lie within the proposed project footprint plus a 15 m buffer. A further 36 sites are in close proximity, within 250 m of project infrastructure. Figure 7-14 shows these sites with colour coding indicating the type of site and its rated sensitivity.

The sites that will be lost due to construction (directly affected), on indirectly affected by dust, noise and other nuisances, with impact significance ranging from **high medium** to **high** in the absence of mitigation, include 11 'CE' sites (cemeteries), six 'RS' sites (ritual sites) with high sensitivity, one within 15 m of infrastructure and therefore vulnerable to damage or destruction during construction. The other RI sites include the Afrocreed Swamp for the extraction of holy water, and sites within 250 m of infrastructure that could be impacted by dust, noise and other construction-related nuisance namely the Eye of the Lake (Luzira) on the Bugoma lagoon, Kasonga beach sites and two others. These sites are considered to be 'non-replicable' (and potentially immovable) cultural heritage as defined by IFC PS 8. Also of **high** significance is the SR (sacred) site associated with the Kamansinig River close to well pad 1 which will be indirectly affected by nuisance. Twenty-three 'CH' sites (churches) are within 250 m of infrastructure and would be indirectly affected by nuisance. Since they can be rebuilt in another location, impact significance is **low medium.**

Three 'CL' sites (cultural landscapes in terms of the UNESCO definition), namely Lake Albert, the escarpment and the viewpoint on the escarpment road, are iconic features of the natural landscape, defining the local (communal) sense of place and traditional cultural associations with the natural environment (rivers, lakes, trees). Indirect impacts rated as of **high** significance.

Lastly, particularly sensitive sites but further than 250 m from infrastructure are the sacred River Masika and the Nsunzu Sacred Tree with its many associated myths and taboos.

With mitigation, impact significance will be reduced to **low** or **low medium**, and include preparation of a Cultural Heritage Management Plan with which to educate personnel and contractors and which will determine where signage is to be placed to avoid sensitive areas. Where avoidance of damage to cemeteries is not possible, develop a mitigation strategy in conjunction with affected communities, and during construction maintain ongoing contact and consult with and obtain the cooperation of community members to avoid impacts to sites of intangible cultural heritage.

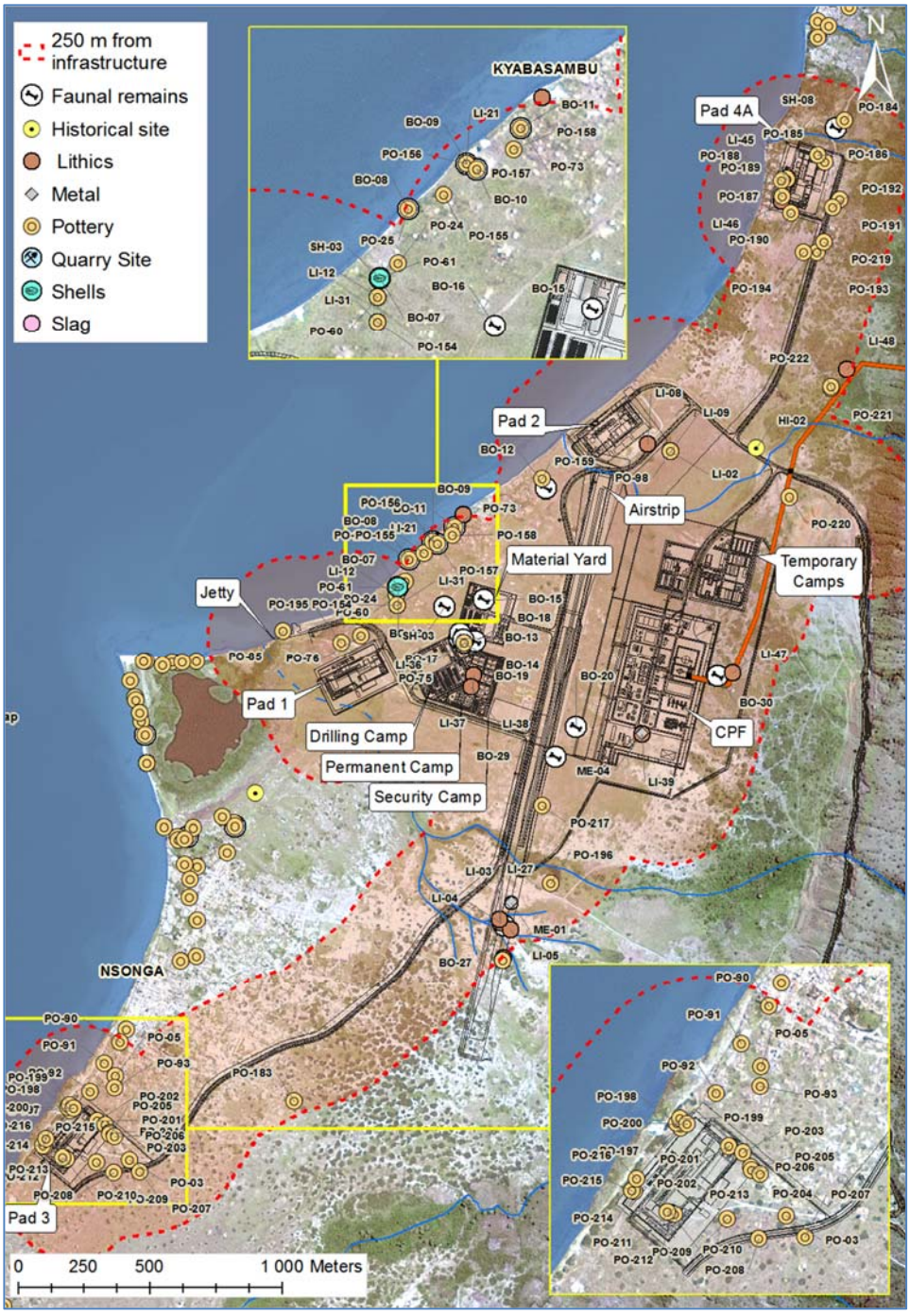

Figure 7-13: Archaeological heritage sites directly affected or potentially affected

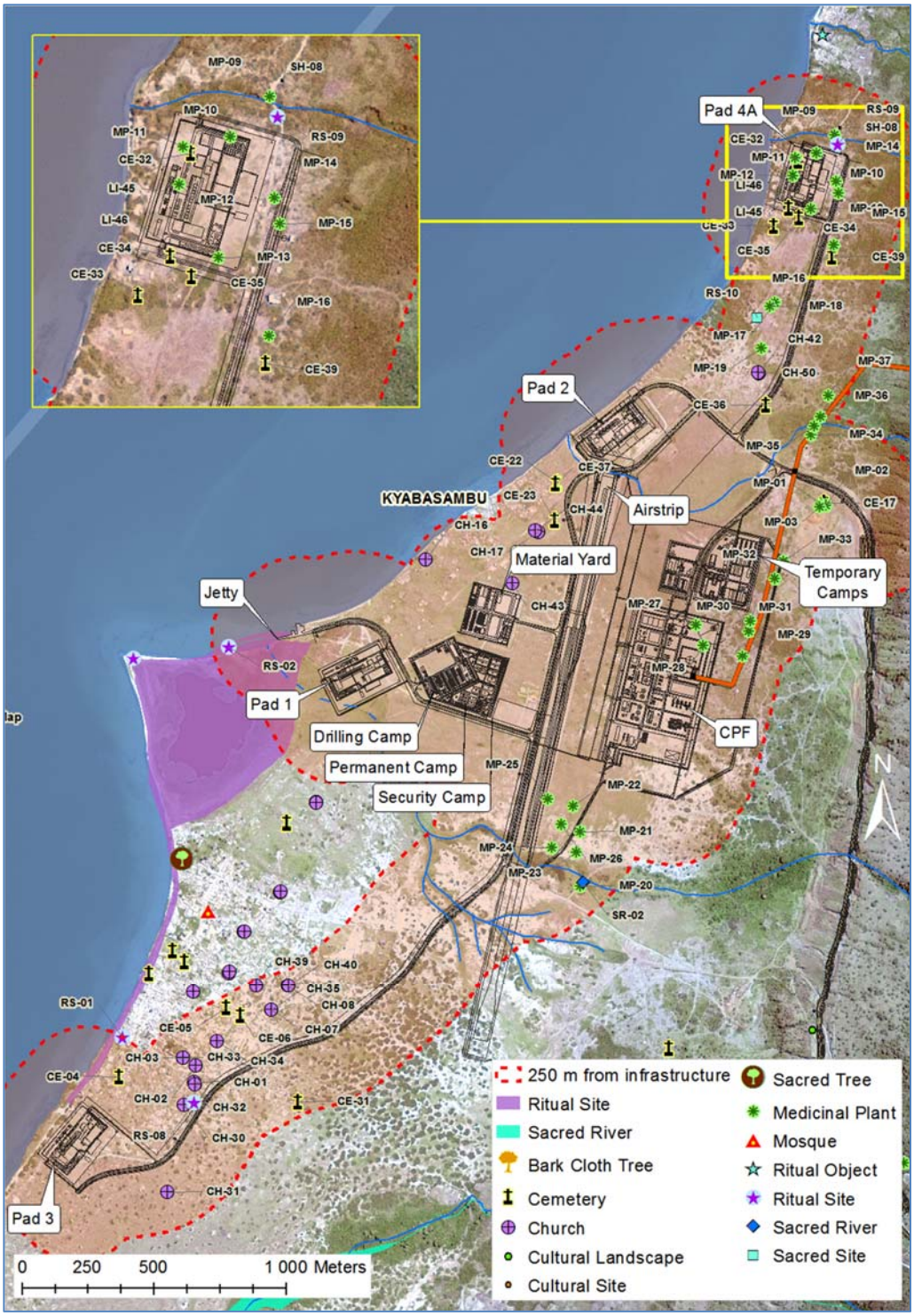

Figure 7-14: Intangible cultural heritage sites directly affected or potentially affected within 250 m of the project footprint

8.0 IMPACTS OF THE FEEDER PIPELINE

This chapter summarises the potential impacts of construction and operation of the feeder pipeline. Each potential impact was rated to assess significance, described in Chapter 4. Mitigation measures are recommended accordingly. Key mitigation measures are shown in this summary, see the main report for the full range.

8.1 The Physical Environment

8.1.1 Air Quality

Construction Phase

Impacts of particulates (PM_{10}, $PM_{2.5}$ and dust fallout): The main air quality impact caused by construction of the feeder pipeline will be dust generated by heavy vehicles delivering personnel, pipes and other supplies and equipment to the work sites, and activities at the work sites. There are 19 building structures within 100 m of the pipeline route. For these people, particularly those adjacent to the construction right of way (within 20 m), air quality impacts will exceed the Ugandan 24-hour standard of 70µg/m^3 from time to time. Without mitigation, impact significance will be **high medium.**

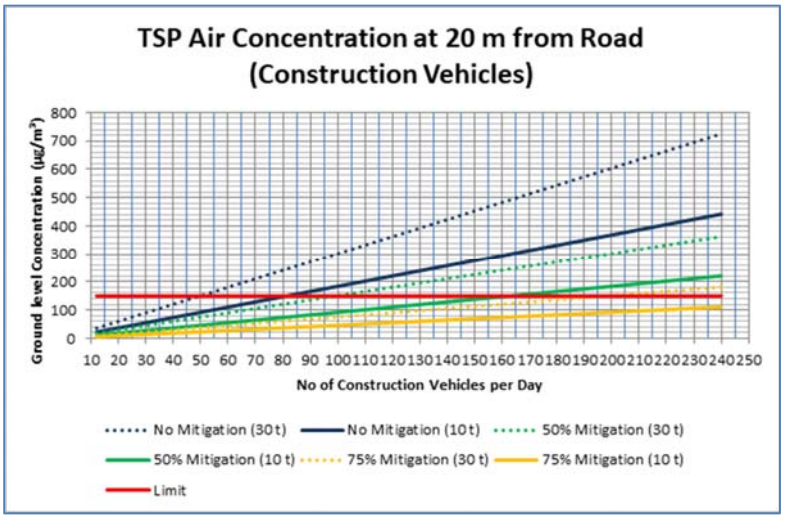

Figure 8-1: Predicted highest daily average TSP ground level concentrations for a range of traffic volumes and emission controls along construction access roads (after Burger, 2016)

Mitigation is feasible using water carts which can achieve in excess of 70% efficiency. With sufficient watering capacity maintained on site, and the areas where watering is required prioritised on a daily basis, residual impact significance will be **low.**

Operational Phase

There will be no air emissions from the pipeline during normal operations and **no significant impacts** on air quality are expected under normal operating conditions.

8.1.2 Groundwater Supply and Quality

Construction Phase

Loss of or damage to community borehole supply: One borehole (Kyarujumba) will be potentially lost, located within the pipeline right of way. Without mitigation, the impact on the affected community will be of **high** significance. Except for the section of the pipeline over the escarpment, blasting is not expected to be necessary and blasting impacts on borehole supply will not occur.

Damage to escarpment water supply: Over the escarpment, the pipeline passes within 400 m of the seep supplying water to the Buhuka Flats. The distance exceeds that within which blasting impacts would typically be likely (impact significance **low medium** as a precautionary rating), but subject to blast management and monitoring of any trench blasts nearest to this facility, the residual impacts will have **low** significance.

Groundwater contamination due to camp treated sewage discharge: The personnel camp will treat camp sewage effluent to Ugandan national standards and release it into a soakaway. Soils in the area are

clay loams that are suitable for this purpose. Impact on groundwater and groundwater users is expected to be of **low** significance – there are no community boreholes within 2.3 km of the personnel camp.

Operational Phase

Under normal operating conditions, there will be no releases from the pipeline to the environment. The pipeline is sealed along its entire length, and its integrity will be monitored continuously at the CPF. Small spillages are possible during maintenance activities at valve stations, during pigging and in the case of pipe dig-ups to repair damaged pipe or suspect welds. In the case of pigging, the management of oily wastes will be necessary, but this will be done within a controlled environment at the pig launchers and receivers, where containment of spills is catered for in the design. The greater risks lie in areas along the pipeline route, outside of controlled areas, where there is no provision for managing spills and where any work to repair the pipeline could result in the release of oil into the environment, potentially contaminating surface and groundwater (this excludes accidents where greater volumes of oil could be lost into the environment, which is discussed in 'Unplanned Events' in Chapter 10).

Maintenance activities could result in long-term or permanent effects if clean-up is not prompt and effective. In such a case, impact significance could be high **medium**, reducing to **low** if appropriate pollution management protocols are complied with.

8.1.3 Surface Water Quality

Construction Phase

The feeder pipeline crosses a number of small seasonal drainage lines. Depending on the time of year that construction takes place, these may be flowing or dry. The typical method of construction across small drainage lines is to import fill material as bedding to provide a sound footing across the channel, insert flume pipes through the fill to accommodate the drainage, or divert the drainage around the construction area, and excavate the trench for the pipeline through the centre of the bedding fill, in dry conditions. The fill is then removed and the drainage reinstated.

Surface water pollution due to sediment generation: Most sediment generation occurs during initial excavation and when the fill is laid and compacted and when the fill and flume pipes are removed. Over a short period, there is potential to generate significant sediment downstream, affecting ecosystems, stock and other human domestic use. Without mitigation, impact significance will be **high medium.**

Surface water pollution due to fuel and oil spillages: Small spillages happen occasionally during construction but are typically limited in scale. Impact magnitude could be high in the local area. Spills are not probable under normal construction conditions and in these circumstances, impact significance will **low medium**.

Operational Phase

Refer to groundwater above.

8.1.4 Noise

Construction Phase

There are considerable differences in the target values applicable in different noise standards. The IFC guidelines are not specifically related to construction impacts and do not account for the short period of time over which construction typically takes place. Other standards, including the selected standard for this project, rate construction noise weighted according to length of the construction period. Construction was assumed to be between 1 and 6 months for communities impacted along the pipeline route and longer than 6 months for communities around the personnel camp.

Noise generation during construction of the feeder pipeline was predicted using a combination of construction equipment noise from vehicles and other equipment operating at once. This included

bulldozers, dump trucks, pipe trucks, pipe layers, overburden screening plant and excavators. Construction noise will be limited to daytime only.

Predicted noise levels show that a total of 11 buildings (roughly 50 people) will be affected by noise greater than 65 dBA. In terms of the construction impact rating scale for noise, these impacts will be of **low** significance. While the noise generated by vehicles bringing materials along the pipeline right of way may extend for periods of up to six months, the noise generated by construction teams working on the welding and laying of the pipeline would, in most cases, will be considerably shorter than this, and would progress quickly past any household, extending the distance of the main noise sources from any receiver daily.

The ESIA proposes a number of measures to reduce noise nuisance for affected families, including good communication about construction schedules and training of personnel (particularly equipment operators) to minimise unnecessary noise generation. If any cases exist in which highly sensitive receptors (churches, clinics, schools) are located within 200 m of the construction right of way, these locations are to be flagged and additional measures taken to minimise impact, including scheduling of noisy work to minimise impacts of high sensitivity. It is further recommended that CNOOC and its contractor encourage interest in the construction, which will never have been observed by most inhabitants in the area, so that children, in particular, can learn about how a large pipeline is built. This will help build relationships with local people and reduce the intrusiveness of any short-term noise.

Operational Phase

There will be no significant noise generated by the operation of the pipeline other than noise from the export pumps at the CPF. The pipeline will not be manned and maintenance checks of CP posts and other infrastructure will be done using a light delivery vehicle from time to time. Repairs (such as dig-ups of the pipe) are typically infrequent and unlikely to occur more than a few times during the life of the project. Impact significance would be **low medium**. Subject to appropriate communication with local people and, if necessary, the shielding of noise sources, particularly if operating at night, the impact significance will be reduced to **low.**

8.2 The Biological Environment

8.2.1 Habitats and Ecosystem Integrity

Construction Phase

Impact on Lake Albert water quality: This ecosystem is highly sensitive, supporting many species of fish, threatened snails and migratory birds on its shoreline. The main potential impact of the construction of the feeder pipeline on Lake Albert will be due to the release of hydrotest water. This involves cleaning of debris and mill scale from the inside of the pipe during commissioning, followed by pressure testing with water (hydrotesting), and may include the use of corrosion inhibitors and biocides which can be extremely toxic in the aquatic environment. Best practice is to minimize the residence time of the water in the pipe in order to avoid the need for corrosion inhibitors and biocides to prevent corrosion, but this is not always possible and may not be specified for the CNOOC project, although the intention to minimize toxicity of the discharges is specified. After cleaning and hydrotesting, the water will be tested to confirm it complies with the Ugandan effluent standard, passed through sand filters in order to remove solids, and disposed back into Lake Albert. The solids, together with the filter sand, will be disposed to a certified waste disposal site.

To ensure that the requirements for managing the hydrotest waste water are captured in the management and monitoring recommendations, it is assumed that the use of corrosion inhibitors and biocides remains a possibility, notwithstanding the intention expressed in the project description. If not correctly treated, the discharge of these fluids directly to Lake Albert during pipeline construction could result in local impacts of **high medium** significance**.** With effective management, preferably by limiting the residence time of water in the pipeline which will preclude the need for toxic additives, impact significance will be **low.** The ESIA recommends bioassay testing of the final effluent before release in order to guarantee that it is not toxic in the aquatic environment.

Impact on the escarpment vegetation corridor: The total area of escarpment vegetation that will be lost due to the direct impact of construction of the feeder pipeline up the escarpment will be 4.1 ha, in a total area of escarpment vegetation in the RSA of 2 233.8 ha. This amounts to 0.18% of the vegetation in the escarpment corridor in the RSA, and a minute fraction of the vegetation within the escarpment corridor at a regional scale. The impact is expected to be medium to long term; while rehabilitation of the affected pipeline corridor will occur immediately after construction is completed, the steep and rocky slopes make it unlikely that habitat recovery by plants other than pioneer species will occur in the short term. Whether there is relatively complete habitat recovery will depend largely on the effectiveness of the rehabilitation strategy. If normal construction management methods are used (without a high degree of specialist rehabilitation intervention), full recovery is unlikely.

Impacts on representativeness, ecosystem composition and ecosystem configuration will be within the range of a **medium** significance rating, which can be reduced to **low** significance with appropriate mitigation. A wide range of mitigation measures are proposed in the ESIA, including restrictions on access, requirements for trench breakers, blasting restrictions and management, topsoil stripping and stockpiling, drainage control berms and other erosion control measures.

Impact on other habitats along the pipeline RoW: The ESIA further considers a range of measures required for the general environmental management of the pipeline corridor as a whole. From a biodiversity point of view the significance of the habitat losses is **low** – most of the pipeline route is either within cultivated areas or within secondary vegetation which has been cleared for cultivation in the past and is presently fallow (Figure 8-2). Nevertheless, a wide range of construction management measures are set out in the ESIA to minimise unnecessary harm and to ensure rapid and effective recovery of the construction footprint.

Figure 8-2: Typical intensive cultivation and secondary vegetation along the feeder pipeline route

Impact on wetlands and drainage lines: The RSA supports approximately 1 157.9 ha of wetlands of which 85.3 ha are classified as seasonal. In addition, 840 ha is associated with drainage lines and riparian areas. Approximately 2.6 ha of wetlands, seasonal wetlands and riparian habitat along drainage lines will be directly affected by pipeline construction, which is 0.13% of the total area of similar wetland and riparian habitat in the RSA. This will have a minor effect on wetland representativeness.

The risk to wetland structure and function will be mainly due to the disruption of wetland vegetation and soils by heavy machinery during construction, particularly when tracked vehicles are used that have greater impact on soil structure and the soil profile is overturned due to careless construction management. Disruption of flows and ecosystem composition may also occur if fill material is imported into the wetland to provide stability for excavators and pipe layers, and is not completely removed and replaced with the natural soils after construction, causing long-term changes in wetland structure.

Pollution risks during construction are described earlier. Without mitigation, high concentrations of sediment may be expected downstream for short periods while the wetland crossing is being constructed. Similarly, small spills of oil or fuel may occur if management of equipment does not consider appropriate controls.

Construction through the small wetlands and drainage lines along the pipeline route may also act as a barrier to the movement of wetland and aquatic species. This impact will be localized and short term, subject to the avoidance of permanent structural damage at the crossing points.

Overall, taking into consideration the very localized geographic extent of construction through the wetlands and small drainage lines and the intensive cultivation in all of the surrounding areas, as well as the fact that the pipeline will be buried, the potential construction impact without mitigation will be within the medium significance range. Recommended mitigation considers a range of interventions and controls that will reduce the project footprint through the wetlands, control sediment, prevent oil and fuel spillages and ensure that the wetland soil profiles are returned in a manner which encourages rapid recovery.

Operational Phase

Operational phase impacts on the biological environment concern the effects of the feeder pipeline on habitats and ecosystem integrity of the valued environmental components along the route, which include the escarpment vegetation corridors and the drainage lines and wetlands. Operational impact assessment under normal operating conditions considers the effect of heating of the pipeline on soils and habitat above the pipe, and the effect of the presence of the pipeline on sub-surface flow of water in wetlands. The assessment is not concerned with major accidents, such as the failure of a pipe weld and loss of large volumes of product into the environment. This is considered under 'Unplanned Events' in Chapter 10.

Impact on soils and habitat caused by heating of the pipeline: The pipeline will be buried to approximately 1.0 m depth and will be heated to 80°C. While the pipeline will be insulated, there may still be some radiative heat losses which will warm the soil above it, with the potential to dry out the soils and influence the dominant type of flora species in the grass/herbaceous layer on the surface. Drought-tolerant or xerophytic species may dominate over species that require seasonally-cooler periods for dormancy, or species that require more moisture, affecting the ecosystem composition of vegetation communities and associated fauna (e.g. invertebrates). Taking into consideration the steep slopes and harsher growing conditions, this could result in a deterioration in vegetation cover and increasing levels of erosion over the trench in the escarpment corridor. This impact is expected to be long term but very localized, affecting only vegetation over the pipeline trench with impact significance of **low medium.** In the absence of more specific information about heat losses through the pipeline insulation and heat transfer through the soils, the impacts are uncertain. Drought tolerant species should be included in the seed mix for the escarpment rehabilitation programme and the effects of temperature on recovery over the pipeline should be monitored.

Impact on wetland structure: The presence of linear infrastructure, such as pipelines, through wetlands is known to have detrimental impacts on the functioning, processes and species composition of these communities. Buried pipelines passing through wetlands may result in losses of biodiversity at local and downstream scales largely due to changes in geomorphological properties and interruption of sub-surface hydrology. Given the depth of burial (>1 m through wetland areas and stream crossings) and the small drainage lines and areas of seasonal wetland affected along the route (approximately 333 m in total), this impact is considered to be relatively minor. Impact duration will be long term, and impact significance will be **low medium**. Ensuring that the design makes provision for the pipeline to be buried through rivers and wetlands at a depth that minimises any material interruption of subsurface flow should reduce the impact significance to **low**.

8.2.2 Critical Habitats and Species of Conservation Concern

Construction Phase

Impact on the bugoma central forest reserve: This Reserve is one of the last stands of tropical semi-deciduous forest in the region, supporting known populations of the Endangered Eastern Chimpanzee and range-restricted Nahan's Francolin, potential non-breeding habitat for the Endangered Madagascar Pond

Heron (see Section 6.2), as well as elephants and other important species. As indicated in Section 6.2, the Reserve is surrounded by intensive rural farming and is threatened by increasing human pressures, including incursions into the forest by illegal hunters, cutting down of forest trees for firewood and charcoal and land invasions by settlers.

At its nearest point, the feeder pipeline will be 1,8 km from the forest boundary. Drainage is north westward toward the escarpment. Direct construction impacts on forest habitats or endangered forest species are not expected. The principal concern is the potential for the influx of people in search of oil industry and other associated work. The scale of this impact is uncertain but in relation to the feeder pipeline (as opposed to the whole production facility) is fairly small. Some heightened risk to the Forest is likely, due to both increased incursions into the forest reserve for wood harvesting and hunting and encroachment by new settlers, particularly in the area of the personnel camp. The magnitude of the impact is considered to be low, but it would be long term and largely irreversible, which together with the high sensitivity of the natural resource, and the international scale of concerns about the species it supports, impacts are rated of **high medium** significance.

Impact on the Grey Crowned Crane: It is possible that the foraging range of the Grey Crowned Crane could be affected by the nuisance caused by pipeline construction, but given the small areas involved and the short construction period, this impact is not thought to be significant.

Impact on the Mud Snail: In addition to the general aquatic impacts in Lake Albert caused by the discharge of hydrotest water after pressure testing of the pipeline, there are specific concerns about impacts on the Critically Endangered Mud Snail, *Gabbiella candida.* The presence of this snail in the local study area is uncertain, but it is conservatively assumed to occur, since it has been found in general area and suitable beach habitats for it exist along the lake shore of the Bugoma Flats. Aquatic snails are highly sensitive to chemical pollutants, and could be severely affected by the toxic compounds associated with biocides and corrosion inhibitors. If these compounds were used in the hydrotest water, without appropriate controls, impact significance would be **high.** Mitigation is as specified above under impact on Lake Albert water quality.

Operational Phase

Outside of the escarpment corridor and small wetlands and riparian areas affected along the route, no other areas of conservation significance exist along the pipeline route. Under normal operating conditions, the pipeline will have no impacts on species of conservation concern. Similarly, the important indirect biodiversity impacts associated with the migration of people into the region in search of work, encouraged by perceptions about opportunities in the oil industry and associated development, is covered in the assessment of the production facility. The pipeline is unlikely to significantly add to these impacts, since it involves no permanently manned facilities outside of the battery limits of the CPF and will not encourage job seekers, other than in the general sense of being a part of a large industrial project that could create opportunities. Section 7.3.7 contains an assessment of the significance of migration into the area in relation to the operation of the project as a whole.

8.3 The Socio-Economic Environment

8.3.1 Workforce Related Impacts

Construction Phase

The ESIA workforce impacts relating to employment include employment opportunities, skills development and training opportunities, layoff of casual labour and accommodation of the workforce.

Impact on employment opportunities: Approximately 180 temporary unskilled and semi-skilled jobs will be created for Ugandan nationals during the pipeline construction phase. Twenty skilled positions will be filled by foreign pipeline construction management and technical experts. Employment will be provided through a selection process that includes all affected villages. In addition, CNOOC's EPC contractor may employ casual workers from the villages around the project for short-term work, like bush clearing. Even

though short term, employment creation in the local area and wider region is therefore considered to be an important positive socio-economic impact of **medium** significance, which can be increased to **high** significance if emphasis is place on fair distribution of available jobs and hiring and training local people along the pipeline route.

Impact of skills development: CNOOC has developed a policy which guides the recruitment and employment process and all contractors and sub-contractors are expected to comply with this policy. CNOOC aims to implement a skills development strategy for their employees to improve the skills of the local labour pool by investing in technical, managerial and administrative skills of the workforce. The impact will involve a relatively small number of people but in the context of the great need for skills development in Uganda will be of **high** significance.

Layoff of casual labour: Layoff of most of the local casual workers hired during construction will accelerate as the construction phase reaches an end. This could be around 180 casual jobs. Most of these people will not find employment in the operational phase which has much fewer opportunities for casual workers. This may impact on food security among local families who have become dependent on the income from the lost jobs. Badly handled, this impact can be of **high medium** significance. Ensuring that workers fully understand their conditions of contract and training office bearers to work within their communities to minimise misunderstandings among job seekers will minimise the effects, although residual impacts of **low medium** significance are still likely to remain.

Impact of workforce accommodation: With quality, properly ventilated construction accommodation and catering, the living conditions of many employees are likely to be significantly improved providing a benefit of **high medium** significance.

The ESIA workforce impacts relating to **health and safety** include general construction safety, driver and mobile equipment safety, graft and exploitation, alcohol and drug abuse, vector related diseases, sexually transmitted diseases and sanitary and hygiene related diseases.

General construction and driver safety: Local Ugandan statistics for the causes of injury in the construction industry are not readily available. But they generally include physical hazards, chemical hazards (handling of hazardous products and wastes), biological hazards (leading to infections and parasitic diseases among workers) and general hazards, (including radiation, noise, vibration and extreme temperature). These hazards may all be aggravated by specific behaviours.

Any of the above hazards and behaviours may be exacerbated by the fact that a significant proportion of the workforce will be sourced from a low-skill labour pool and would potentially be unaware of workplace-based health and safety requirements, making them more prone to high-risk behaviour and accidents. Ugandan labour laws, and disability management and appropriate compensation standards and regulations are limited and are not aligned with IFC and other international standards and requirements. There is also a limited emergency response system in the broader study area and the district.

Without a high degree of control, general construction and driver safety impacts may be very significant resulting in long-term or permanent disabilities. The impact significance rating is **high medium**. A wide range of mitigation is proposed in the ESIA, including a zero tolerance approach to transgressions, implementation of an ongoing safety training programme covering all relevant issues and provision of sufficient recreation for employee use. With strict implementation of a high standard of health and safety management and training, injuries can be reduced to minor non-disabling accidents which are short term and of **low** significance.

Graft and exploitation: Unsuspecting victims of graft and exploitation, particularly foreign workers, may be an issue as has been demonstrated in some past instances. Awareness of these issues will be important. Impact significance will be **low medium.**

Alcohol and drug abuse: Particularly in situations that involve dangerous equipment, locations, or duties, substance abuse can be deadly. Employees that abuse substances are 3.6 times more likely to be involved in workplace accidents than their co-workers. The significance of this impact, without mitigation, will be **high medium.** Mitigation includes implementing the CNOOC policy of prohibiting the possession and use of drugs

and alcohol at all camps and worksites and those of its contractors, of routine searching of vehicles and bags and an education program about non-communicable diseases related to the use of drugs and alcohol.

Vector-related diseases: Malaria case rates are described as being on the increase, and that the illness is commonly associated with misconceptions and poor prevention behaviour. There is limited capacity within the proposed pipeline area for the support of malaria and vector control preventive initiatives. The magnitude of malaria impacts on the workforce, without appropriate interventions, will be potentially high, permanent (potentially life threatening), local and of **high medium** significance. A full integrated workplace malaria and vector control programme is recommended as mitigation of this impact.

Sexually transmitted diseases: Typically, the presence of a large number of well-paid predominantly single males in construction camps encourages sex workers from local communities and further afield, with a resultant risk of the spread of HIV/AIDS and other STDs among construction workers due to unprotected sex. Without a high degree of management, this workforce impact will be long term and of **high** significance. Specific measures are prescribed in the ESIA to manage this issue, including (among others) an HIV and STI management programme in the construction workforce, to include awareness and education, treatment services that link to the public health service, provision of free condoms, access to counselling, proper provisioning of the work camps to dissuade workers travelling into communities for entertainment and support of family friendly accommodation in the camp.

Sanitary and hygiene-related diseases: Maintaining hygienic conditions in a large workforce unaccustomed to requirements in respect of sanitation and hygiene will require ongoing education and management. In addition to the provision of appropriate sanitary facilities for human and food wastes, personal hygiene must be taught and enforced. Impacts will be of **low medium** significance.

Operational Phase

Impact on employment and skills development: There will be limited employment and skills development opportunities during the operational phase. Employment, specifically in respect of the operation and maintenance of the pipeline itself, will require specialist skills that will be acquired by CNOOC in line with its Labour Force Management Plan. It is uncertain what number of skilled personnel will be required to operate and maintain the pipeline, but it is probably not more than 10 permanent staff. The maintenance of the right of way will require unskilled labour for cutting of grass and removal of woody vegetation – this task will probably be contracted out to a local firm. Specialist maintenance tasks, such as pigging or dig-ups may also be done by contractors. These tasks will generate relatively small long-term employment opportunities for local unskilled labour and contracted staff. The impact will be positive but of **low medium** significance.

8.3.2 Economic Impacts

Construction Phase

National and regional economic growth: The development of the oil and gas industry, through the CNOOC project, will have a major beneficial impact in the region (limited only by its short duration), which will include revenue for the government, employment opportunities at local, regional and national level and a direct and indirect effect on business development. Increased household income and expenditure will result. The increase in work opportunities provided by the project will result in the short-term growth in the proportion of residents with higher incomes. Wages for skills needed in the oil industry are likely to increase. Employment in the oil industry will generate government revenue, deducted from salaries through Pay As You Earn (PAYE) as well as through Local Service Tax levied on income earners residing in the area.

This economic impact will be positive with a **high medium** significance rating. Benefits can be increased with the implementation of the measures recommended in the ESIA to enhance good governance and investment in local infrastructure and services.

Local economic development: The construction of the pipeline will stimulate demand for goods and services within the Hoima district, which in turn will have a direct and indirect impact on employment in the local and regional economy. While CNOOC has developed a local procurement policy to support further development of the business supply chain locally and regionally through appropriate purchasing and

business development strategies, the overall benefits to local businesses (both direct as a result of local project expenditure and indirect as a result of the growth of the informal business sector) will be of low magnitude and short duration (opportunities will dwindle once the cash injection from people employed on the contracts ends), resulting in positive impacts of **medium** significance.

Human capital development: Given the relatively short period envisaged for the construction phase of the project, beneficial human capital development is likely to be limited, unless specific training programmes are put in place, without enhancement will be of **low** significance**.**

Impact retarding economic development: The construction phase of the project is likely to exacerbate the current shortage of experienced labour at local and district level. Sourcing experienced workers from the district will drain available skills away from existing businesses, increasing scarcity and cost of labour.

The start of the construction phase of the project will also result in speculation for land, where individuals move into the area and claim land for themselves. According to villagers along the pipeline route, these speculators sometimes have fraudulent title deeds. Despite Government action in this regard, it is reported that speculators continue to try to trade up the price of land in the local area.

Some people will also lose their only sources of livelihood including their access to small sections of land on which subsistence agriculture is practiced. Whilst there will be compensation in respect of crops, individuals who have been in a position to use land by prior permission may find it extremely difficult to source affordable alternatives. This could, potentially, result in a disruption of livelihood-related activities or even their suspension, with associated increased levels of poverty, pending completion of the construction phase. Negative impacts retarding economic development will be within the range of **medium** significance.

Operational Phase

It is not possible to separate the overall economic benefit of the feeder pipeline from the remainder of the CNOOC Kingfisher project. The benefits will be long term, providing large increases in Government revenues, stimulating national, regional and local economic growth and developing human capital. Similar risks that could retard economic development, particularly at local level, will also apply. In this regard, efforts that are made to facilitate coordinated, sustainable development on the Buhuka Flats may be seen by people living along the pipeline right of way to be unfair, unless Government (with assistance from CNOOC) specifically targets development along the feeder pipeline as well. Section 7.3.2 contains a summary of expected long-term economic impacts of the project.

8.3.3 Community Health

Construction Phase

Impact of sexually transmitted diseases: Contractors and workers are commonly perceived as being wealthy by the local population, especially in rural settings such as the escarpment villages along the proposed pipeline route. These circumstances encourage cash-strapped people to sell sex as a commodity, to generate vital income. Adolescent girls are often the victims of these practices. The presence of large construction accommodation camps may also serve to attract sex workers from further afield, with an inevitable associated increased risk of the spread of sexually transmitted diseases.

Without a high degree of workforce behaviour management, the unmitigated impact in surrounding villages will be long term and of **high** significance. Specific measures are prescribed in the ESIA to manage this issue, including (among others) an HIV and STI management programme in the construction workforce, to include awareness and education, treatment services that link to the public health service, provision of free condoms, access to counselling, proper provisioning of the work camps to dissuade workers travelling into communities for entertainment and support of family friendly accommodation in the camp.

Impact of soil and waterborne diseases: Water related diseases such as cholera and typhoid remain a constant problem within the study area. Construction teams will be provided with water and sanitation. The spread of infectious diseases by construction teams could therefore be caused only in the event that personnel defecate or urinate in the field, particularly in water courses. The impact significance is rated as

low medium. Enforcing strict compliance to a code of behaviour is specified as mitigation, together with education of workers and adequate provision of clean mobile toilets in the field.

Impact of vector-based diseases: Malaria risks in communities near the pipeline may increase as a result of construction mainly due to the creation of areas where seasonal ponding can occur. Flooded or open trenches during construction, in particular during the rainy season, will create additional mosquito breeding grounds. Impact will be of **low medium** significance. A full integrated workplace malaria and vector control programme is recommended as mitigation of this impact.

Health service infrastructure and capacity: If communicable and non-communicable diseases increase as a result of the introduction of the project workforce, additional pressure that will be placed on health care systems is likely to result in decreased levels of service. Villagers are generally vulnerable to inadequate health care, with teenage girls highly sensitive to this impact, which will be **high medium** before mitigation. Mitigation involves minimising opportunities for fraternising between workers and members of the community, in particular young girls, supporting community sensitisation and youth counselling initiatives aimed at promoting risk-seeking behaviour amongst youth and supporting community-based sensitisation regarding HIV/AIDS, STIs and risks related to early pregnancies;

Operational Phase

Community nuisance and disruption: Once construction is completed and the pipeline is commissioned, there will be a decrease in potential risks and associated community health, safety and security related impacts emanating from traffic on the primary, secondary and tertiary road system. It is possible that a small maintenance track will be maintained along the pipeline (although this is not presently planned). Traffic along the pipeline will be very occasional. The pipeline right of way will not be fenced and there will be no restrictions affecting pedestrian movement across the pipeline corridor.

Notwithstanding the limited activity along the pipeline corridor, necessary for maintenance purposes, there is still the potential for impact on surrounding landowners and users that could result in nuisance or grievances. Typical grievances (events that could result in a need for compensation) could include erosion caused by the project affecting a landowner's fields, mortality of poultry or stock due a collision with maintenance vehicles or the spread of weeds from the pipeline right of way. In cases where dig-ups are necessary, there could be more significant disruption of surrounding landowners within the local area.

Without mitigation, impacts will have low to medium magnitude, will be short term and local in geographic extent, causing impacts of **low medium** significance. Mitigation will involve a range of measures, including (among others), good communication to build trust with local landowners and users, providing advance notification of any significant activity along the pipeline in relation to maintenance, establishment of community forums where issues can be discussed and grievances raised, the provision to all stakeholders of contact details for emergencies and a preference for maintaining grass along the right of way by slashing rather than burning.

8.3.4 Community Safety

Traffic and pedestrian safety impacts: Regular travel of construction vehicles, particularly on the dirt roads along the pipeline route, is likely to increase safety risks for pedestrians and other vehicles. Construction traffic to and from the personnel camp and the worksites along the pipeline will be mainly along dirt roads near the pipeline and along the construction right of way itself. Children, women and elderly people are often at higher risk of traffic-related accidents. Children are typically curious about large construction sites, and pipeline construction will be something they have not seen before. Access requirements have not yet been fully assessed, but where they exist, pedestrians will be at risk when crossing the working areas. Where the pipeline trench is open they will be unable to cross safely unless provision is made for crossing points.

Overall, without a high level of management, construction traffic accidents could lead to damages, injuries and even fatalities in local communities. The impact will have very high magnitude (causing severe nuisance or injury), could be long term (in the case of injuries or fatalities), local, and of **high medium** significance. A wide range of mitigation is proposed in the ESIA, including driver training and monitoring, enforcement of appropriate speed limits, using flag men where necessary, providing appropriate signage, developing and

implementing road safety awareness campaigns for surrounding communities, particularly where construction traffic could affect schools, health facilities or other sensitive receptors, avoidance of night driving and other measures.

Violence and crime: There is a likelihood of some construction workers causing violent incidents in local communities, possibly fuelled by drug use or alcohol. This is more likely to be an issue in Howha, which is the village closest to the construction accommodation camp, but cannot be discounted in any other villages where construction activities will be nearby. Arrogant attitudes displayed by construction workers, who are generally wealthy compared with community members, may also spark violent confrontations. These issues can generally be managed by lack of tolerance to aggression and violence among construction workers by management, but in unmanaged conditions can be an important concern. Incidents are probable in the absence of mitigation, and given the vulnerability of local communities, will cause impacts of high magnitude (both in terms of injury to third parties and the effect on CNOOC's social license to operate), with residual effects possibly extending beyond the short term, and **high medium** significance**.** Mitigation includes a zero tolerance management attitude to inappropriate behaviour among contract workers, ongoing education and training in this regard and partnering with the Ugandan Police Force Community Liaison Officers to allow sensitisation of communities on issues related to crime.

Hazardous materials and waste: Given extensive rural settlement near the pipeline route and the likely use of the pipeline right of way for grazing, after construction teams leave, the sensitivity to potentially hazardous industrial waste along the servitude, if not properly cleaned up, is high. Without mitigation, the magnitude of this impact will be high, extending beyond the construction phase. Impact significance will be **high medium.** Mitigation includes ensuring that no waste whatsoever, including construction waste is dumped in watercourses or at any site that impacts on villagers or their land use.

Fires: Welding and other hot work on the pipeline could increase the risk of accidental fires escaping from the project working areas onto community land, particularly in windy conditions. Bush and grass fires on the Buhuka Flats and above the escarpment to Kabaale would be a major risk to people and stock unable to escape. Without mitigation, the probability of such an incident occurring is medium, resulting in **low medium** impact significance. With appropriate management and emergency preparedness, this impact can be reduced to **low** significance.

Operational Phase

Potential operational related accidents and disasters, e.g. fire, explosion and spills could have a profoundly negative impact on a long-term basis. Economically disadvantaged populations are disproportionately affected by disasters. The poor are less likely to have the income or assets needed to prepare for a possible disaster or to recover after a disaster. These impacts are assessed under 'Unplanned Events' in Chapter 10.

8.3.5 Housing, Land and Resources

Impact of involuntary resettlement: A total of 38 households will be displaced by the pipeline, being within the 30 m wide construction right of way. Thirty-three other structures (including kitchens, bath shelters, pit latrines and barns) will be lost. The temporary construction camp will not affect any homesteads or other structures.

Cash compensation is a particular issue that arises in relation to physical resettlement. Ugandan law requires that CNOOC provide each project affected person (PAP) with the option of cash compensation instead of replacement of assets. This may have an especially adverse effect on women and children where they are excluded from the benefits of cash settlements. To mitigate irresponsible squandering of cash payments by the male head of household, Ugandan law requires that men are not able to negotiate cash settlements without their spouses being present in the negotiation and being in voluntary agreement. This is a progressive law but is having the unintended negative consequence of increased household violence against the women partner (confirmed by police and other Government reports).

Uncertainty about payment is a further issue raised by many PAPs, who are anxious that they have been consulted about asset inventories, but no final offer has been made to them, nor have they been informed about how and where they would be resettled.

Recommended mitigation of resettlement impacts is to ensure that the RAP comprehensively addresses all aspects of physical and economic displacement experienced by impacted communities, in accordance with the IFC Performance Standard 5, which addresses the involuntary resettlement and compensation impacts in the project-affected communities. Ensure that there is a process to identify all stakeholders (rights holders) of any land take process. While this will mean engaging the individual who indicates that he/she is the rightful land owner, the identification process should consider information from as broad a consultation group as possible. Secondary PAPs, who may not have been immediately identified, but who have utilised the land in some way for a period of up to two decades and longer, must also be considered. This includes the loss of dwellings of secondary PAPs, loss of crops and assets such as mango trees and resultant loss of income.

A full investigation is to be undertaken of the allegations that PAPs have been forced to sign documentation and if any allegations are valid, they are to be addressed comprehensively

Photograph 8-1: Compensation needs to be paid for loss of grazing land and loss of crops and trees with typical examples shown here along the pipeline route

Impact of land acquisition: Land utilisation by the project along the pipeline route will be both temporary and permanent. The construction phase will require a temporary 30 m-wide corridor (called the construction right of way) over which crops and infrastructure will be lost. This will amount to around 106 ha of ploughed agricultural land, in a total land take of 138.6 ha, although not all of it will be cultivated at the time of construction, since significant areas of subsistence land lie fallow at any one time. Approximately 510 landowners and 170 land users will be temporarily affected by clearing for construction. In addition, approximately 3.6 ha of land will be needed for the construction personnel camp near Hohwa. This land is a part of a 49 ha property owned by a single individual who rents land parcels to tenants.

Two thirds of the agricultural land affected by pipeline construction and all of the land affected by the construction personnel camp will be returned to the owners, for continued cultivation once construction is complete. In the areas that are temporarily affected by construction, owners will be compensated for crop losses, fruit trees and any other lost resources and infrastructure. In the permanent right of way (10 m wide), owners will be compensated for the value of the loss of the land, calculated at market prices as determined by an independent survey. The permanent servitude will be maintained as a grassed corridor where the natural return of forest species will be prevented, and agricultural use will be prohibited. Free access across the pipeline permanent right of way will be permitted.

Loss of land and produce as a result of project development has been raised as one of the most significant concerns by communities along the pipeline. Recent displacement caused by other developments near the project area have made local people very aware of displacement-related impacts. It is clear from discussions with villagers that there is a significant degree of mistrust about land and lack of awareness regarding land rights, displacement and the associated compensation procedures.

Considering the number of refugees residing in Uganda as well as the history of conflict in the region, land rights are a sensitive issue. Ugandan law also makes provision for PAPs to be offered cash compensation, which creates considerable additional risks for affected stakeholders, particularly in the present case, where land is heavily utilised and there is limited usable land readily available and in close proximity with which to compensate in kind. Without effective compensation and livelihood restoration, these impacts will be long term, of high magnitude and **high** significance.

However, if compensation is paid in full compliance with IFC PS5 and is combined with mechanisms to ensure effective livelihood restoration, it could improve the personal situations of affected landowners, providing income for landowners temporarily and permanently affected by the project. The mitigated impact could become positive and long term, and of **low medium** significance.

Impact of damages to property outside of the RoW: There is a potential for damage to land, property and infrastructure outside of the ROW, involving amongst other things clearing of land beyond the project working areas for which compensation has not been paid, vehicles or people straying outside working areas and causing damage to land and crops, damage due to dust, and prevention of access at critical periods.

Without mitigation, these impacts have the potential to sour relationships between CNOOC and local communities and can be long term (in terms of damage to relationships) and of **high medium** significance. Careful management, open communications and the transparent implementation of a fair grievance procedure should reduce the impacts to short duration and **low** significance.

Operational Phase

Land use restrictions: Following construction, some restrictions will apply to land use, specifically related to the permanent right of way which will be 10 m wide. There will be no permanent access road (except perhaps for a small maintenance track, although this is not presently planned). Only building infrastructure will be prohibited on this land. Apart from this, the right of way will not be fenced and will have no impact on the continued daily movement of communities. People will be able to cross the pipeline freely without constraint. Impact magnitude will be negligible and impact significance is expected to be **low.**

Loss of agricultural productivity: The construction of the pipeline, with the continual movement of heavy vehicles and equipment along the RoW, will compact subsoils. Notwithstanding rehabilitation, reduced agricultural capability on the land affected in the temporary right of way may result as well as infestation by alien plants, affecting the use of the land during the operational phase. Landowners will have only been compensated for the temporary disruption caused by the loss of crops and any losses of fruit trees or other natural resources. Depending on the loss of productivity, the magnitude of this impact could be high, and long term, resulting in local impacts to landowners of **high medium** significance. A range of mitigation is proposed in the ESIA for this impact, including the monitoring of crop production to verify that livelihoods on the temporarily affected land have been fully re-established and, if not, that compensation settlements are revised.

8.3.6 Infrastructure and Community Services

Construction Phase

Impact of project use of community infrastructure and services: Construction workers will be served by a fully provisioned clinic, with trained medical staff, to cater for any injuries, emergencies or general health issues. Families and children will not accompany construction workers and no additional services in respect of education will be needed. The EPC will provide their own emergency services for smaller incidents. Rescue equipment will be available for general rescue and emergency management. Impact significance will be **low.**

Impact of project use of local roads: The construction teams will make use of the construction right of way to provide access to the working areas as much as possible. Nevertheless, it is likely that there will be use of local roads to gain access to the pipeline right of way. Heavy articulated pipe carriers and other multiple axle vehicles will quickly damage the small murram roads that crisscross the local area, causing rutting and erosion. Without mitigation, the impact is likely to be of high magnitude, local, and in the absence of repair, long term, resulting in impacts of **high medium** significance. Management involves monitoring of pre-

construction and post-construction road conditions, to verify absence of damage, and the possibility of assisting local communities by upgrading roads that are presently in a poor condition. In this case, residual impact significance will be **low or positive**.

Impact of access provided by regional road upgrades: The improved road infrastructure to villages will allow villagers to capitalise and build on the opportunities created by the recent upgrade of a section of the Hoima-Buhuka road (the P1), as well as upgrades of the R7 and the R4. Poor road infrastructure has been cited as a key impediment to small-scale farmers in getting their produce to market. It can therefore be expected that increased accessibility to markets will stimulate economic growth, resulting in positive long term impacts of **high** significance.

Operational Phase

Project use of local infrastructure and services will be negligible during the operational phase and impact significance will be **low.**

8.3.7 In-Migration

Construction Phase

Migrants may impact on the livelihoods of the local people, on housing and land resources, on community health and safety, on local infrastructure and services. Based on information obtained during the consultation process, the Hoima Land Office as well as local councillors (LC1s) and villagers have indicated that there has been a significant influx of migrants into the sub-counties across which the proposed pipeline will run. According to the Hoima District Land Board, applications for purchase of land have primarily been for the purpose of large-scale agriculture, although there have also been applications for the establishment of villages (‘towns’). The major increase in land speculation in the area is said by villagers to be largely driven by politicians and high-level officials directly attributed to knowledge about the suite of developments that have been proposed for the area which includes the oil pipeline construction, a proposed oil refinery, an international airport, petro-chemical industries, waste management facilities an ammonia fertilizer plant as well as housing for refinery workers (World Bank, 2015:43).

There has been a further influx of people seeking employment and business opportunities that has been facilitated by the improved access to the area brought about by the road network being developed. Experience shows that it is highly likely that additional people will be attracted to the area once pipeline construction activities commence, seeking to sell goods and services ranging from food to prostitution, predominantly around Hohwa where the construction accommodation camp will be situated. This could cause tension with local communities, limit opportunities for local businesses, increase competition for public services and resources, and increase the potential for the spread of diseases and illegal activities including drugs use. Land prices are likely to continue to rise due to further speculation. Government influence may be diluted, as newcomers into the area are typically unfamiliar (or indifferent about) local Government rules and leadership structure. This has already started causing tension within and between communities and this trend will be aggravated by further migrants.

In the absence of mitigation, impacts are likely to be negative, of sub-regional geographic extent, long term and of potentially **high** significance.

Operational Phase

It is expected that the operations phase impacts will show a decline in the opportunistic influx of individuals who are pursuing CNOOC related employment opportunities. Over the longer duration of the operations phase, however, the population demographics may change as the child population enters adulthood and enters the labour market. In this regard, UBOS projects that there will be a 168% growth in population in the Hoima District in the period that started in 2014 to 2050.

However, as infrastructure and social services such as health and education improve, there will be increasing in-ward migration to the various villages by individuals wanting to take advantage of both the improved services as well as the additional economic opportunities that may be created. As discussed in the

previous subsection, it is difficult to distinguish pipeline-related impacts in this regard from the impacts of the project as a whole but given the fact that there is no ongoing presence of staff along the pipeline it is not considered to be a major attractant of migrants on its own, and the significant in-migration issues are discussed under the operational phase of the production facility. For the purposes of this assessment, pipeline-related in-migration is considered to be of **low** significance.

8.4 The Socio-Cultural Environment

Construction Phase

Locations of cultural heritage sites
In some instances, the locations of sites are confidential and are not identified in the ESIA reports. Locations will be made available to the Ugandan environmental regulator and CNOOC to manage impacts.

The construction of the pipeline will involve clearing of the 30 m wide construction right of way and excavation of the trench for laying the pipeline. All surface or near surface heritage material is likely to be destroyed as a result of bush clearing. In the case of the trenching, more deeply buried materials may be affected. Only very preliminary work has been done along the pipeline route and the findings of the study are provisional. More detailed assessment will be necessary prior to clearing of the pipeline right of way to determine the occurrence of any additional heritage resources and to mitigate impacts.

Impact on lithic sites: These are archaeological sites from the Stone Age. Four sites are directly affected by the pipeline footprint and will be destroyed. These sites have high sensitivity and their loss will result impacts of **high** significance. The surface scatter along the escarpment is potentially indicative of increased sub-surface archaeological potential in the vicinity.

Impact on cemeteries: Cemetery sites are highly sensitive to disturbance. One site is within 250 m of the pipeline right of way. Impact significance is judged to be **high medium.**

Impact on medicinal plants: Five medicinal plant sites have been identified that are likely to be destroyed while a further six sites have been identified within 100 m of the pipeline route. These sites are likely to be indicative of others in the immediate vicinity and elsewhere along the pipeline route where searches have not yet been undertaken. The loss of these plants would result in impacts of **low medium** significance.

It is difficult to predict how and when changes to intangible heritage will occur during construction of the pipeline. Some cultural change is inevitable. Determining the severity of this impact is subjective with deviation from the local cultural norm perceived as either positive or negative by different people. An influx of migrants may either strengthen or weaken local cultural practices. If impacts were to occur they could in some instances by of **high** significance.

Operational Phase

With limited activity along the pipeline's permanent right of way during normal operations, no material ongoing impact on cultural heritage is expected. Changes in cultural heritage in the long term are more closely related to the effect of the project as a whole, development in the District and in-migration, all of which will affect both tangible and intangible cultural heritage.

9.0 ALTERNATIVES

Consideration of alternatives is an important part of the ESIA process. The search for environmentally better alternatives is the first step in the impact management hierarchy, which involves impact avoidance as a preferred solution ahead of impact minimisation.

The EISA has considered alternatives at two levels (Table 9-1): substantive alternatives which could involve major changes to the project, and incremental alternatives, which are those that are more limited modifications of an existing proposal. Given the long history of the project, a number of these alternatives have not been specific recommendations of the ESIA, but are supported from an environmental point of view.

Table 9-1: Discussion of alternatives

Aspect	Discussion
Water Supply	Various investigations have been undertaken to determine the impact of abstraction of water from Lake Albert for oil industry purposes (Tullow, 2017; JDIH, 2009; Atkins, 2010 a&b). All of these studies have considered the cumulative impacts of water abstraction by the oil industry as a whole. The three studies concur that the total volumes required will represent an insignificant fraction of the outflow from Lake Albert, being between 0,02% and 0,04%. The abstraction represents a level change of about 2.2 mm across the surface of the lake. Atkins (2010a) considered three alternatives - directly from Lake Albert, from the Lake Albert Nile (a river intake, distributed to the oil developments along the lake shore by pipeline), and a groundwater supply – against a range of criteria including topography, geology, hydrogeology, geomorphology, hydrology, environmental impacts, social impacts, health and safety, regulatory and permitting requirements, and the political context). All studies concluded that abstraction from Lake Albert was the preferred alternative.
CPF Location	Petrofac (2012) examined two options for the location of the Kingfisher CPF – a location on the Buhuka Flats and a location on top of the escarpment. The study was prepared on the basis of high-level screening, where the details of specific locations were not required. Parameters included technical factors (flash floods, seismic activity, water levels, land slips, foundations and fluid transfer), execution factors (including land acquisition, equipment transportation and CPF construction), operational factors, socio-economic security and CSR factors and cost. Subject to appropriate management, the risks associated with the management of waste and prevention of pollution in Lake Albert were not considered to result in a material preference for a location above the escarpment. Most of the waste management issues were considered to be associated with the wells, which will in any event be on the lake shore. Taking all factors into account, the study found that the Buhuka Flats options was significantly better than the plateau option. Operational issues were a major consideration in favour of the location on the Flats, where all facilities associated with the project can be situated in the same place. These outweighed the smaller factors in favour of the plateau.
Produced Water Disposal	Very large volumes of produced water will be generated, rising from around 3,000 m^3/d in year 3 to nearly 18,000 m^3/d in year 25. In line with best industry practice, CNOOC proposes to treat the water to meet a project standard which is higher than the Ugandan effluent standards, and then dispose of it, supplemented by Lake water, into the oil reservoir as a means of maintaining reservoir pressure. Sludges generated by produced water treatment will be captured at the CPF and disposed of by a third party hazardous waste contractor, in accordance with Ugandan legal requirements. Alternative ways of treating produced water and disposing of it into the environment are not favoured as alternatives to reinjection.
Transport of Supplies, Equipment and Materials	The proposed 'priority oil industry roads' set out by Government include the R5 (upgraded through the centre of the Bugoma Central Forest Reserve), the P1 (upgraded along the southern margin of the Bugoma Central Forest Reserve) and the R7, a new road which roughly follows the route of existing tracks north-west of the Bugoma Central Forest Reserve. The ESIA has shown that the upgrading of the R5 is likely to have a significant impact on the integrity of the Bugoma Forest, placing endangered populations of Eastern Chimpanzees at greater risk, together with other species such as Nahan's Francolin. Construction and operational traffic will impact on these populations in various ways, including an effective loss of habitat, barrier effects and increased collision risks. CNOOC has confirmed that it does not require the R5, either for construction or operational access, and has officially confirmed this with the Ugandan Government. The ESIA therefore proposes that this road be de-listed from the group of priority oil roads.

Aspect	Discussion
	All materials, equipment and supplies required by the production facility, both during the construction and operational phases, can be transported via the P2 and R7 roads.
Location of the Well Pads	Well Pad 4 has been moved by CNOOC in order to minimise geotechnical risks. No reasonable alternatives to the location of the other well pads has been found (and hence residual noise impacts of drilling, in particular, remain a problem which must be mitigated). Relocation of well pad 3, which impacts on seasonally wet grasslands in the Kamansinig wetland system, cannot be moved without other significant impacts. Impact is not expected to be high, but there is some uncertainty about the long term effect- the existing well pad has already been permitted and it is recommended that the Kamansinig system is monitored to verify impacts and determine any long-term management requirements.
Produced Water Treatment Options	Various options were considered for the technology required to treat produced water. Options were considered mainly in relation to reliability, which is an important environmental consideration. Technology selection determined a three-stage treatment solution which will provide the most consistent and reliable results. Tertiary treatment is designed to reduce hydrocarbons in the water to concentrations of around 11mg/l. Waste sludges will be contained and transported off site by a hazardous waste contractor.
Oil Storage	Various technologies are available for the storage of oil prior to delivery into the feeder pipeline. Storage tanks that minimise the venting of gasses that accumulate above the stored liquids are designed with a floating roof. The roof rises and falls with the liquid level in the tank. Wherever possible, these are the environmentally preferred technology. CNOOC has selected floating roof tanks for the main oil storage at the CPF.
Air Emissions	CNOOC proposes to use gas separated from the well fluids to drive gas turbines, which will supply the project with electrical power and heat. Nitrogen dioxide (NOx) is a principal combustion product of gas engines. In the present case, sulphur dioxide emissions will not be significant due to the low sulphur content of the crude. The project will use low NOx burners in all turbines. These modern burners generate significantly less NOx than traditional burners.
Emergency Pressure Relief on the Well Pads	Overpressure protection is necessary to accommodate fluctuating natural pressures from the wells. This can be provided in a number of ways. CNOOC investigated 5 options. The environmentally preferred option involves avoidance of burn pits at the wells pads to accommodate emergency flaring or venting during production, by maintaining the pressure rating of the flowlines to the CPF. Under this option, flaring will only occur during well testing prior to commissioning
Drilling Waste Management	Various waste management options are possible. CNOOC has selected the environmentally preferred option which involves dewatering of drilling waste on site and recycling of as much drilling fluid as possible (in accordance with the waste hierarchy), followed by collection and disposal by a NEMA-certified waste contractor at an approved waste disposal site above the escarpment. The choice of supplier is still to be made. Waste will also be handled in a manner which minimises residence time on the site so as to limit risks in the case of an unplanned event.
Sewage Effluent Disposal	CNOOC proposes to dispose of treated sewage effluent during the construction and operational phases by releasing it into the drainage line north of the CPF, which discharges into Lake Albert immediately south of well pad 2. The ESIA proposes that treated sewage effluent is irrigated onto pastures around the CPF, as a means of minimising the risks of local eutrophication in Lake Albert. This alternative has been accepted by CNOOC.
Stormwater Drainage	The ESIA proposes protection of the Kamansinig catchment and wetlands by minimising stormwater disposal into this system. It is recommended that to the greatest extent possible, stormwater from the CPF and other production facility components is retained

Aspect	Discussion
	in the catchment of River 1 (a small seasonal stream which drains into Lake Albert south of well pad 2). Channel reinforcement will be required to minimise erosion risks.
Disposal of Organic Waste	The ESIA recommends composting of all organic waste produced in the camp kitchens for use on the camp lawns and gardens and possibly (in the longer term) to improve local soils as a basis for support of vegetable farming to supply the CPF.
Airfield Alternatives	The initial proposal for the extension of the airfield across the Kamansinig River has been rejected. This minimises risks of potentially catastrophic consequences of an accident involving an aircraft crashing into the production facility and also avoids damage to the Kamansinig river system. A helicopter pad will be developed (location still to be determined) to facilitate access to the production facility by air.

10.0 UNPLANNED EVENTS

The risk of unplanned events is the single greatest issue affecting the CNOOC Kingfisher project. There is little buffer between the project and Lake Albert and major accidents would have severe biodiversity and social negative consequences if oil spills were to reach the lake. International repercussions would result.

Taking into account the available information provided in a number of risk and safety-related assessments prepared by CNOOC, and a knowledge of the receiving environment, the ESIA concludes the following in respect of unplanned events.

- Receptor vulnerability is extremely high around the production facility, with multiple receptors immediately beyond the boundaries of the areas of potential hazard at the CPF and on the well pads. These include households, wetlands, valuable grazing land and the Lake Albert fishery. The consequence of a major accident spreading outside of the boundaries of the facility would be grave.
- Given this vulnerability, CNOOC must ensure that the probability of an accident occurring is extremely low – and in the event of it occurring, that the risk of it reaching sensitive receptors is very small. All future design planning must work towards this goal.
- Modelling of the reasonably likely worst-case spill scenarios has shown that the containment provided in the design of the CPF and on the well pads would be sufficient to prevent the escape of oil into the surrounding environment.
- Modelling of the reasonably likely worst-case fires or explosions has resulted in several recommendations, including:
  - An explosion-proof control room
  - De-listing of the airstrip (ongoing aircraft hazard too close to the CPF).
- None of the fire and explosion hazard scenarios modelled in the reported studies show any major effect on surrounding communities or habitats. However, there has been no assessment of potentially cascading events resulting in failures that are cumulatively more significant than single events on their own. The possibility of such knock-on effects must be considered in further risk management planning during the detailed design.
- As recommended in the geohazard studies, the verification of seismic risk at the CPF, and any necessary design response to this risk, must be undertaken before the detailed design is finalised. This should include a final review of the risks associated with the two faults, F1 and F2, and protection of vital infrastructure against an earthquake-induced tsunami or maximum flood.
- All of the recommendations for ongoing management, maintenance, monitoring and emergency response capability made in the reports described in the ESIA must be implemented.

- The staff responsible for the management of major hazards at the production facility must be highly trained and capable. Continuous monitoring must be included in the design as a part of the Facility Status Management System, as recommended by Bureau Veritas (2017).
- To ensure that there are the necessary safeguards to manage critical safety issues continuously and effectively, and to minimise risk to surrounding receptors to levels that are as low as reasonably possible; in addition to the ongoing internal monitoring and auditing of safety performance in respect of major hazards, a six-monthly audit must be undertaken by external major hazard specialists in the oil industry, with findings to be promptly disclosed to NEMA.
- A buffer area around the CPF should be created within which no settlement or other building construction is permitted. This will minimise the risk to communities in the event of a catastrophic accident and provide the necessary space for CNOOC to manage the event without direct risk to inhabitants. The buffer does not need to be fenced and normal agricultural activity can continue within it. Legislation which prohibits settlement within the buffer (the responsibility of the Ugandan Government) would help to ensure that the restrictions can be enforced. Compensation will need to be considered for the partial loss of use rights. Communities must be well-briefed and marker beacons would be advisable to provide a visible boundary of the restricted area.
- Notwithstanding the above conclusions, for the purposes of due diligence, it is recommended that CNOOC commissions an independent expert review of all previous risk-related work before the completion of the final design. It must be demonstrated (and summarized in simple lay terms) that in the context of the exceptionally high environmental and social sensitivity of the project area, the risk of unplanned hydrocarbon releases into Lake Albert is reduced to an acceptably low level. The work should include a review of the potential triggers of accidents, including seismic events, flooding, fires and explosions, as well as any other reasonably credible causes.
- It is also recommended that the Emergency Response Plan is finalized and reviewed by independent experts, taking into consideration the sensitivities in the project area and the need for very rapid response times in the event of an accident.
- Finally, it is recommended that CNOOC's safety management systems and risk management performance in respect of accidents is reviewed annually by external auditors with extensive experience of hazard management and best safety practices in oil industry facilities.

11.0 CONCLUSIONS AND KEY RECOMMENDATIONS

11.1 Social Impacts

CNOOC'S Kingfisher project will transform the lives of people on the Buhuka Flats and to an extent on top of the escarpment in the villages approaching the decent to the escarpment road, and where people from the Flats have their gardens. Some of this will be the result of the direct impact of the construction and operation of the production facility itself, but much will be due to other factors, related to the perceived and real opportunities that good access and the presence of a large industrial facility will bring about.

Changes are already evident, wrought by speculation about future opportunities and by the access that the new escarpment road provides. Populations on the Flats have escalated at a rate far above the predicted average for the Hoima District. Commerce associated with the new road access to the fishery on Lake Albert has boomed, being driven mostly by commercial enterprises in Kampala and foreign interests, exporting to the DRC and elsewhere. Controls are ineffective and the local fishery is at risk, with fisherman on the Flats finding it more and more difficult to secure catches of harvestable size for their families' food security.

The Kingfisher project will contribute both positively and negatively to this milieu. The construction phase of the project will provide between 1,000 and 2,000 jobs at different times in the 3-year construction period, many of which will be unskilled and sourced from the Flats and the District. While it is unlikely that much of the money spent on equipment, goods and services will be to the benefit of people in the immediate area, the informal economy that will develop around the facility, feeding off the cash injection provided by the

employment of local people on the construction project, could benefit many local families. The escarpment road too, which has been financed and built by the Government to support the project, has created benefits for local people who previously had an onerous 350 m climb taking an adult at least an hour just to access a road to District health and other services.

The Ugandan Government plans to drive national development through oil industry growth and, over the long term, the principal benefit of the project will be to generate Government revenue in support of national development goals. CNOOC will also contribute to employment, with some 200 personnel required to operate the production facility once all drilling is completed. While this is not a large figure in relation to national needs, it will be accompanied by training to increase the capability of Ugandan citizens. Ongoing operating expenditure will also be significant, and although much of the value of this is likely to leak to international suppliers, there will be benefits to Ugandan firms and subsidiaries that will provide many downstream opportunities.

At local level, the benefits are less certain. Much will depend on CNOOCs willingness to encourage and nurture local suppliers for support services and products that could be provided locally. However, most of the local benefit of the project is likely to be driven by Government initiatives to create a functional municipality around the production facility on the Buhuka Flats. Draft proposals in this regard have already been tabled and while these need thorough stakeholder review, they demonstrate Government intent to implement a structured process of development on the Flats. At present, the plan shows controlled settlement and the provision of a wide range of municipal services.

This process will be the key to the management of local social impacts associated with the project. While there are many direct impacts described in the ESIA that CNOOC will need to mitigate, from land loss to nuisance issues, STDs, community safety and loss of heritage sites, among others, the greatest concern will be the uncontrolled influx of people, and the potential for a free-for-all around the production facility. While to the benefit of some, if unmanaged this is likely to impact severely on the current inhabitants; causing a breakdown of the fabric of the communities, increasing violence and vandalism, an escalation of alcohol and drug use and spread of STDs and many other social pathologies. There is already evidence of factionalism developing on the Flats, with demands being made of CNOOC accompanied by the implied underlying threat. To minimise these risks, and to offset the negative changes that the transformation of the area will bring to local communities, there must direct and visible accompanying benefits through the provision of services.

11.2 Key Social Recommendations

Normal Operational Conditions

- The Kingfisher Project will require the highest standards of social impact management. Develop a zero tolerance management approach to non-compliance in all phases of project development.
- Develop social management plans in accordance with IFC Performance Standards.
- Maintain strict control over the project footprint to stay within the designated areas and minimise grazing loss.
- Take all reasonable, practical, measures to minimise noise during all phases of the project, with particular reference to night noise and the control of noise from drilling operations. Where residual impacts as a result of drilling are still above the defined limits, temporarily accommodate affected people elsewhere on the Flats until the drilling in their area is completed.
- Minimise light pollution through the use of tree screens, strategically located to intercept the line of site to the main areas of the plant, and by the use of downlighting that minimises light spillage into surrounding areas.
- Ensure that hazardous materials and wastes are never left outside of controlled areas where public access is possible.

- Provide walkways for pedestrians between villages on the Buhuka Flats so as to minimise the risks of pedestrian injuries on the project roads. An ongoing driver and community safety campaign will be needed to minimise the risk to both people and domestic animals.
- Maintain a buffer around the production facility where settlement is not permitted, both as a means of managing safety and nuisance. Normal community use of the land for grazing should be unhindered.
- Implement the recommendations under Biodiversity for assisting in the management of the fishery and ecosystem services from wetlands – this will have both social and environmental benefits.
- Retain skilled and highly experienced social personnel on staff throughout the project's lifetime, specifically tasked with the management of CNOOC's relationship with local communities and local Government. Provide them with sufficient budget and mandate to do this as thoroughly as any other part of CNOOC's business. Develop community forums for open discussions with local people and regularly use these forums to maintain good relationships with the project's neighbours.
- Continue to implement the Community Relations Strategy (CRS) and strengthen the work of the Oil and Gas Activities Monitoring Committees at Parish level. In this process, consider the need to support a more regular and formalised communication process at village level. Ensure regular meetings at local level, hosted by CNOOC, aimed at:
  - communicating with stakeholders to build understanding and demonstrate transparency and accountability.
  - strengthening channels for the provision of further information that may be needed.
  - promoting mechanisms for understanding real issues and concerns related to the project and impacts being experienced from direct (unmitigated), indirect and cumulative impacts.
  - publicly and transparently debating options for sharing out benefits at local level that will take account of the negative impacts experienced locally, including the costs and benefits of different options, their management implications and their role in supporting wider economic development.
- Ensure the ongoing functionality and accessibility of the grievance procedure that is being implemented for the local community. Monitor and ensure that complaints related to CNOOC contractor or employee behaviour that infringes on the health, safety or security of community members that are lodged or brought to the attention of CNOOC are responded to quickly and fairly, with an appeals process adjudicated in consultation with key stakeholders nominated by local people themselves.
- Strictly control the behaviour of project personnel in their day-to-day interactions with local communities. The production facility will be integrated among inhabitants on the Flats and daily interactions will be inevitable. Permanent and contract staff must be trained to comply with a code of conduct that protects communities and CNOOCs reputation. The attitudes which CNOOC site management and their staff display in their relationships with local people will strongly influence perceptions about the project. CNOOC must become a trusted and influential neighbour and member of the Buhuka community as a basis for a social license to operate.
- Place particular emphasis on STD's and the management of HIV Aids, which is a scourge around large industrial projects in developing countries, since project personnel disproportionately have money and power, attracting sex workers into the area, and often enticing underage local girls to sell sex in exchange for cash income.
- Ensure that all CNOOC service requirements for water, waste and health are independently supplied by the project and do not impact on the limited capacity of the community services. Minimise project impact on communities (such as STD's and pregnancies through sexual relationships with local people) to prevent additional burdens on these services.

- Aim CSR projects at supporting the local community who are potentially most affected by the negative changes brought about by the Kingfisher development. They require capacity building in a wide range of life and livelihood skills. Assisting in the development of cage fishing projects, other protein projects such as chickens, nutritional gardening in difficult soils and teaching local people about hygiene and health risks, such as malaria, would be typical projects, as would how to deal with cash and the necessity for saving schemes, among others. CSR methodology should follow a structured process and outcomes should be independently monitored and annually reviewed.
- Ensure that all direct and indirect actions and activities undertaken by CNOOC, its contractors and sub-contractors meet the most stringent Human Rights requirements, that there is a zero tolerance to such occurrences and that any reports of such transgressions are immediately scrutinised, diligently investigated and followed by decisive action.
- Preferentially hire local people, in accordance with CNOOC policies and agreements with Government. Advertise employment opportunities within the local fishing villages (local labour market) so that as many people as possible are employed who can continue to live with their families as they offer their services to the project.
- Ensure extensive sensitisation of communities regarding CNOOCs policies, programmes and procedures in a manner that will ensure that they are alert to situations where they may become the victims of crime or targets for corrupt practices.
- Ensure that worker rights to freedom of movement or of association are balanced with the need to prevent detrimental workforce related impacts on the general well-being and health, safety and security of settlements in proximity to the workforce accommodation services.
- Develop and implement training and skills development programmes, where feasible, to expand the human capital available within the local, district and national economy.
- Align the CNOOC Education and Training related support initiatives as well as in-house training and competency development of Ugandan nationals with the critical and scarce skills requirements of the oil and gas sector.
- Consider promoting a process of Recognition of Prior Experience (RPE) and Recognition of Prior Learning (RPL) in collaboration with tertiary technical training institutions that will allow the accrual of credit for informal and non-formal skills development into the formal skills development sector for unskilled but experienced workforce.
- Ensure comprehensive implementation of the Community Health, Safety and Security as well as the Community Development plans, with a particular focus on promoting measures to assist groups that are particularly at risk (the aged, female and child-headed households).

Indirect and Induced Impacts Management

- Engage aspects such as service, development initiatives and Corporate Social Responsibility in a structured manner and in partnership with key stakeholder groups, including representatives of Civil Society Organisations, district and local government role-players, Community-Based Organisations and representatives of various interest groups including NGOs.
- Develop clear statements regarding the specific activities that will form part of the process for mitigation and what activities will form part of the CNOOC Corporate Social Responsibility programme.
- Supply support to the establishment and facilitation of a coordinating development platform in a targeted and strategic way which best meets the needs of local communities while lessening the risk that CNOOC become the *de facto* service provider.
- Implement the recommendations of the Influx Management Strategy and Framework Plan to minimise the social risks of in-migration.

- Contribute to Government's efforts to foster structured development around the production facility on the Buhuka Flats, assisting wherever possible with resources and expertise and actively participating in all community development planning and implementation.

11.3 Biodiversity Impacts

The biodiversity and biogeography of the Lake Albert Basin are unique. It is part of the Eastern Afromontane Biodiversity Hotspot, an Endemic Bird Area, an IUCN Key Biodiversity Area, a 'Global-200' priority eco-region and part of three globally important ecoregions.

In the study area for the CNOOC Kingfisher project, the area within 500 m of the Lake shore contains diverse habitats, water depths and temperature regimes important for the life cycle of flora and fauna including commercial and other fish species. The Lake supports the most diverse commercial fishery in Uganda. The Bugoma Lagoon is an important habitat for fish and is one of only six such environments on the Lake. The escarpment forms a natural corridor between the Semliki/Toro Wildlife Reserve in the south, to the Budongo–Bugoma–Kagombe–Itwara Forest Reserves, through to the Murchison Falls National Park, in the north, and plays an important role in maintaining evolutionary processes.

The regional study area supports around 323 ha of permanent and seasonally flooded wetlands, important habitats for many species. On the Flats, the Masika River forms permanent wetlands and the Kamansinig River seasonally flooded grasslands, providing habitats for wetland species. Many permanent wetlands along the feeder pipeline route connect to those in the Bugoma Forest Reserve.

In the regional study area, the Bugoma Central Forest Reserve (401 km^2) supports populations of Eastern Chimpanzee, African Elephant, Nahan's Francolin and a variety of endemic birds and butterflies. It is also the source of numerous rivers in the region, and an Important Bird Area. Species include 257 tree and shrub species, seven of which are Albertine Rift endemics, 12 are globally threatened and 14 are on the IUCN Red list. It has been identified in the ESIA as an area of Critical Habitat in terms of the criteria defined in IFC Performance Standard 6, Biodiversity Conservation.

All these ecosystems could be directly or indirectly affected by the Kingfisher project.

The project is located on the shores of Lake Albert where the ecological consequences of oil pollution would be extremely high. While there are some areas of habitat loss and other biodiversity issues, the most important concerns are related to the risks of pollution. Even small quantities of oil entering the lake (that may not be classified as a 'major accident') would be likely to impact materially on the local fishery and would have a major effect on CNOOCs social license to operate. A large spill could have regional effects, spreading across large parts of the Lake and impacting on critically sensitive Lake and lakeshore habitats and many fishing communities.

The project is designed to minimize the risk of pollution hazards through two key strategies. Firstly, all hazardous petroleum waste will be contained within controlled areas of the works and removed from site by independent certified waste contractors to one of several oil industry waste management facilities above the escarpment. This minimizes the on-site risks near Lake Albert, where the environmental sensitivity is particularly high and where the consequences of accidents would be most severe. The risks of temporary storage, handling and transport of the wastes will remain, but if these activities are carefully controlled and the inventory maintained on site is limited, the risk of accidents involving large quantities of petroleum waste is significantly reduced. This is particularly applicable to drilling cuttings, waste drilling liquids and oily sludges produced at the CPF.

Secondly, the management of produced water is in line with best industry practice. It is proposed that this water is cleaned at the CPF and reinjected into the oil formations via reinjection wells on the well pads. Sludges that result from the cleaning process will be collected at the CPF, dewatered, and removed from site by the certified waste contractor. Provision is not made for any treated process water or water from the closed drainage systems at the plant to be released into the environment, even after treatment. All of this water will be routed to the produced water system, and disposed down the reinjection wells or, in the case where laboratory chemicals or other hazardous chemicals are involved, separately collected and disposed to

the hazardous waste disposal site. Only uncontaminated storm water from the plant will be released into the environment.

Under normal operating conditions, these measures will minimize the risk of oil contamination in Lake Albert. In the pre-FEED and FEED studies, CNOOC has investigated the risk of accidents under upset conditions, and under various accident conditions.

11.4 Key Biodiversity Recommendations

Normal Operating Conditions – Direct Impact Management

- Develop a zero tolerance management approach to non-compliance in all phases of project development
- Develop environmental management systems and plans in accordance with IFC Performance Standards, including supervision responsibilities. These need to be approved by an internationally recognised specialist in hazardous waste management in the oil and gas sector.
- Reducing the significance of impacts is rooted in highly competent environmental oversight during operation, based on a robust liquid and solid waste management system and an operational EMP with specific biological and social performance indicators, signed off by an internationally experienced waste management expert. This must be complemented by enforcing a culture of zero tolerance for pollution, ongoing management and personnel training and stringent monitoring and record-keeping. An annual independent audit of compliance by an international expert is to be carried out.
- Maintain strict control over the project footprint to stay within the designated areas and minimise habitat loss
- Minimise impacts on the southern wetland systems on the Flats (Kamansinig, Masika) by ensuring that project drainage from the CPF is predominantly northward into River 1.
- Re-construct the road drainage across the Kamanasinig River to reinstate wetland flows
- Develop a high level of management control over all wastes and effluents from the start of construction (all potentially contaminated stormwater discharges to be contained and tested against the project standard before release and all hazardous waste, including drilling waste, to be removed to a certified disposal site).
- Consider a regular rotational system of drilling waste removal in order to minimise the inventory of waste kept on site at any time.
- Irrigate treated sewage effluent onto the lawns and gardens at the camp sites to minimise eutrophication risks in Lake Albert. In the event of excess effluent being available, use this to irrigate pastures around the CPF.
- Develop on-site monitoring capability as a basis for rapid and responsive management control (particularly water quality testing).
- Develop and implement a long-term grazing and water quality monitoring programme at specified onshore locations on the Flats and in Lake Albert
- Develop an ESMS which operationalises, in particular, the management of potentially oil-contaminated water at the CPF and on the well pads.

Indirect and Induced Impact Management

- Prepare and implement a long-term development plan for the populations on the Flats, including water, power and sanitary services.

- De-list the proposed R5 oil industry road upgrade through the Bugoma Forest Reserve. Close the road to external traffic - permit its use only for forest management.
- Construct the R7 as an alternative road to the north.
- Implement the recommendations of the Influx Management Strategy and Framework Plan to minimise the biodiversity risks of in-migration.
- Develop a Biodiversity Management Plan for the Bugoma Central Forest Reserve. This should include:
  - Long-term monitoring of the Eastern Chimpanzee and Nahan's Francolin
  - monitoring of settlement around the forest
  - reforestation plans for areas recently deforested due to population influx pressure.
- Consider sustainable community managed woodlot development on the Flats and above the escarpment to offset the demands for firewood and charcoal by growing migrant populations.

Offsets and Conservation Initiatives

- Develop landscape/basin wide biodiversity offsetting schemes across the three partners (Tullow, Total, CNOOC) for common valued ecosystem components – near-shore habitats of Lake Albert, wetlands, escarpment vegetation corridors, the Bugoma Forest, Eastern Chimpanzee, and Nahan's Francolin.
- Offsetting schemes to be aligned with the other partner proposals outlined in their respective biodiversity conservation opportunity reports (AECOM, 2013; TBC, 2017) and implemented via participation in a regional environmental forum.
- CNOOC to drive project-specific offsetting components for Mud Snail, Grey Crowned Crane, Wetlands, Escarpment Vegetation Corridors, and Lake Albert near-shore habitats which are more specific to the Kingfisher project residual impact.
- CNOOC to support initiatives such as Bugoma CFR conservation and reforestation, and current/proposed chimpanzee corridor restoration/reforestation projects between the Bugoma and Wambabya Forest Reserves.

Fisheries: CNOOC to support and/or fund Beach Management Units in conducting appropriate fishery monitoring and patrols. Use of destructive fishing gear needs to be firmly controlled by fisheries administration (MEMD, 2013).