

8 IMPACT IDENTIFICATION AND EVALUATION – NORMAL CONSTRUCTION AND OPERATIONS

8.1 Introduction

8.1.1 Scope

This section describes and assesses the potential changes to the baseline biological, physical, socio-economic and health conditions of each valued environmental and social component (VEC) that are considered likely to be caused by the EACOP project planned activities described in Section 2.1 to 2.5.

The methodology used to identify and evaluate potential project impacts is described in Section 5; specifically, Section 5.5 describes the process used to identify potential impacts and, Section 5.6.2.5 describes the methodology used to determine significance of each potential impact in terms of magnitude, duration, extent and the sensitivity of the VEC. Project effects that were considered likely to result in adverse or beneficial impacts have been evaluated; this process was informed by professional, industry specific experience and the characteristics of the AOI.

Where appropriate, such as for air quality and acoustic environment VECs, PES have been used to inform the evaluation of impacts; PES is fully described in Appendix F in terms of Ugandan, East African and international standards.

This section also addresses potential impacts of minor unplanned events; e.g., spills from refuelling vehicles and leaks from hydraulic hoses. Potential impacts associated with abnormal and unplanned events (e.g., traffic accidents, leaks) during construction and operations are described in Section 9.

This section includes:

- VEC-specific assessments of project and cumulative impacts and mitigations (Section 8.2 to 8.20)
- a summary of ecosystem services impacts (Section 8.21)
- a climate impact assessment (Section 8.22)
- decommissioning of the pipeline (Section 8.23)
- a summary of the key impacts of the associated facilities (Section 8.24).

The methodology for defining project-related impacts, determining their significance before and after mitigation and assessing cumulative impacts is provided in Section 5. The approach used for describing impacts in this section is provided in Section 8.1.2. This section is best reviewed side by side with Section 5.6.2.5 for definitions of duration and extent, and Appendix D for magnitude and sensitivity grading for each VEC.

8.1.2 Approach

The approach to most VEC and other assessments, climate, decommissioning and associated facilities is described in this section including:

- key baseline condition sensitivities and considerations
- potential project impacts
- mitigation measures
- residual impacts and significance summary
- transboundary impacts
- cumulative impacts
- transboundary cumulative impacts
- ecosystem services.

Key Baseline Condition Sensitivities and Considerations

The key baseline conditions sensitivities and considerations section summarises the baseline condition, key sensitive VECs and receptors and ecosystem services provided by the VEC.

Potential Project Impacts

Potential generic and location-specific impacts (see Section 5.5.2.1) on VECs are identified and described by aspect and project phase (construction or operation).

The impact type is identified (see Section 5.5.2.2), as are impacts affecting human rights and ecosystem services provided, where applicable, by the VEC. Impacts associated with a high level of stakeholder concern are also identified.

The impacts are designated either not significant or significant based the methodology described in Section 5.5.2.5. At this stage impact significance is determined before the proposed application of mitigation.

Project aspects are listed in Appendix E1 and the aspects, impacts and significance determination before mitigation are summarised in Appendix E2 for generic impacts and E3 for location-specific impacts.

Mitigation Measures

Impact mitigation methodology is described in Section 5.5.2.4. Mitigation measures to reduce impacts on a VEC are summarised by project phase (construction or operation) and referenced to the relevant management plan that will be developed to manage implementation.

The mitigation measures are listed in Appendix E2 and E3 and the master commitments register (Appendix E4) and are summarised in the ESMP (see Section 10 and Appendix J).

Impact significance is determined again, summarised and described after the proposed mitigation is applied.

Residual Impacts and Significance Summary

This section summarises the residual impacts and includes the residual impact significance scoring presented in tables. The tables summarise the generic impacts table in Appendix E2 and the location-specific impacts in Appendix E3 for the VEC. Associated impacts on ecosystem services are also summarised.

Transboundary Project Impacts

Transboundary project impacts that extend or occur across a national boundary are identified, assessed and described as part of the project's impact assessment process described above.

Cumulative Impacts

This section describes the potential cumulative impacts on VECs from the EACOP project, associated facilities and third-party developments that have been screened-in to the CIA.

The screening of associated facilities and third party developments and identifying where cumulative impacts may occur is described in Section 5.5.2.3. Associated facilities and screened-in third party developments are listed in Section 2.5. A description of the screened-in associated facilities and third party developments, maps and the interactions between EACOP VECs and the screened-in developments are provided in Appendix H, Sections H1, H2 and H3, respectively.

Where a high risk of a cumulative impact between screened-in developments and EACOP is identified in Appendix H3 (Category 1 and 2¹), the potential impacts on the VEC are summarised and described in the CIA section based on the information available. When information is limited, professional judgement is used to predict the likely impacts of the screened-in development.

The criterion for qualitatively determining cumulative impact significance is either the preferred condition of the VEC, a threshold or the limit of acceptable change as recommended in IFC (2013), see Section 5.5.2.3. Additional mitigation measures are proposed to avoid or reduce significant cumulative impacts, see Section 5.5.2.4.

Transboundary Cumulative Impacts

Cumulative impacts may also be transboundary. Transboundary impacts are identified and assessed as an integral part of the VEC-specific cumulative impact assessments described above.

8.1.2.1 Ecosystem Services

Consideration of ecosystem services is provided on a VEC-specific basis, so are fully integrated into each VEC impact assessment. Section 8.21:

- guides the reader to the sections of the VEC impact assessments that describe impacts on ecosystem services

¹ Category 1: High risk of potential cumulative impacts and the EACOP project is an important contributor to the cumulative impacts on a VEC.

Category 2: High risk of potential cumulative impacts but the EACOP project is a small contributor to the cumulative impacts on a VEC.

- includes a high-level assessment of significant ecosystem services dependencies, i.e., where the project is dependent on an ecosystem service and summarises project resource use efficiency measures.

8.1.2.2 Climate

Section 8.22 considers the greenhouse gas (GHG) emissions associated with the project and includes:

- quantification of the project's main direct GHG emissions (direct emissions are those that occur from sources owned or controlled by the project)
- comparison of project emissions against national total emissions and associated reduction commitments, as described in Section 6.4.3.17
- description of the key mitigation measures used to reduce GHG emissions.

The impact of GHGs are placed in context rather than as a determination of significance because:

- No specific impact location or magnitude can be attributed to a particular GHG emission. Climate scientists have developed models that predict macro-scale effects based on particular global emission scenarios, but it is not advised to attempt to allocate impacts to a specific emission.
- GHG emissions are a source of the same cumulative, transboundary impact (climate change) on the same VEC (the global climate).

The section also describes the potential impacts of climate change on the EACOP project and how these have been considered in project design and implementation.

8.1.2.3 Pipeline and AGI Decommissioning

Section 8.23 provides an overview of the impacts and mitigation measures when the pipeline is decommissioned as described in Section 2.4.6.2 and 2.4.6.3.

8.1.2.4 Associated Facilities

Section 8.24 summarises the significant impacts of the upstream AFs.

8.2 Biodiversity: Habitats of Conservation Importance

This section describes potential impacts on habitats of conservation importance during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.2.1 Key Sensitivities and Considerations

The habitats of conservation importance baseline conditions are described in Section 6.3.1, as well as:

- their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the habitats of conservation importance.

The sensitivity ranking of habitats of conservation importance ranges from low to very high.

The key aquatic habitats are the four permanent rivers (Kafu River, Nabakazi River, Katonga River and Kibale River) and their associated wetlands crossed by the pipeline. The permanent rivers and associated wetlands have high sensitivity rankings. All potential impacts on aquatic habitats are considered generic because of the nature of the impacts (in terms of magnitude, duration and extent) and the corresponding mitigation measures are all the same.

The following habitats and vegetation types are of conservation importance, either because of the flora and fauna species they support or the status of the habitat itself and are considered sensitive VECs:

- Guineo–Congolian semi-evergreen forest within and adjacent to Wambabya Forest Reserve (FR) (KP0–11)
- wetland forests: riverine (KP12.3) and swamp forests (KP106.0)
- ponds developed from borrow pits on a disused airstrip at KP289 valleys throughout the southern portion of the area of influence (AOI).

Ecosystem Services

Ecosystem services associated with habitats of conservation importance are listed here and potential impacts to ecosystem services are described in Section 8.2.2.

Provisioning services include:

- collecting wood, including for fuel and charcoal manufacture
- hunting, gathering and foraging for food
- collection of medicinal products
- trapping of wildlife for the live trade market.

Regulating services include:

- climate change amelioration through carbon sequestration
- local climate regulation in terms of micro-climate
- local water and air purification – through waste assimilation, and water and air filtration
- water regulation and erosion control (i.e., water catchment protection) – vegetation helping to maintain higher flows in rivers for longer, reduce flood surges, and reduce erosion of steep slopes and river banks and sedimentation

Cultural services include:

- ethical and biodiversity 'non-use' values, particularly through maintaining populations of endangered and endemic species and the appreciation of these species
- sense of place and way of life. These locations are likely to provide value to local people who live close to and use the areas in terms of their way of life and special connection with such areas
- ecotourism, particularly in protected areas
- aspects of these locations which may provide spiritual, sacred or religious values, inspiration for culture and design, and cognitive development.

Habitat and species support includes:

- habitat that provide important refuge, feeding, watering, breeding and nursery areas

Other supporting services include:

- habitats and species that provide photosynthesis, seed propagation, pollinating services and water, carbon and nutrient cycling, which are values typically accounted for in other ecosystem services.

8.2.2 Potential Project Impacts

8.2.2.1 Introduction

The assessment of potential impacts from the aboveground installations (AGI) has been included in the description of generic impacts because these facilities are in modified habitats of low sensitivity. The nature of impacts (in terms of magnitude, duration and extent) will be the same for each of these facilities and, therefore, the proposed mitigation measures will also be the same. A similar approach has been taken for the construction facilities.

Where the pipeline traverses agricultural land, this will be converted to natural grassland on completion of construction. This represents a considerable biodiversity enhancement of approximately 225 ha.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operational impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on biodiversity, habitats of conservation importance, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

Potential impacts to ecosystem services have been addressed throughout this section where relevant. Ecosystem services impacts have not been scored in the same way as other impacts, but an indication of the likely significance of the ecosystem service impact has been provided in each case.

8.2.2.2 Construction Phase

Generic Impacts

Soil Compaction

Impact: Impaired re-establishment of vegetation after construction

Soil compaction from inappropriate soil storage and management can restrict the root penetration required for vegetation reinstatement. Soil types that are likely to be more susceptible to compaction (i.e., high silt and clay content) were identified along the right of way (RoW), including at KP0, KP80 and KP260. However, the pre-mitigation impact of soil compaction during construction was found to be not

significant (see Section 8.5.2); as the habitats found at the construction sites are typically easy to reinstate, the potential impact of soil compaction on vegetation re-establishment is also considered not significant.

Soil Erosion

Impact: Loss of topsoil through erosion by wind or water causing impaired reinstatement

Soil storage will be managed based on the best construction practices to ensure soil will not be eroded by wind or water causing diminished topsoil quality and quantity. The loss of topsoil could impair vegetation growth after reinstatement. This impact is considered not significant as, in the unlikely event of erosion, the effects will be limited to the work site and the magnitude will be medium.

Impact: Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, and degradation of spawning habitat

Soil compaction and erosion can produce indirect impacts through increased run-off and siltation of aquatic habitats. The latter has potential to reduce the structural complexity of habitats (see Walker et al. 2013). Soil erosion may impair re-establishment of vegetation and the recovery of aquatic habitats. It can also have direct impacts on turbidity which can cause smothering and degradation of habitats. This may indirectly impact primary productivity rates and degrade aquatic habitats (e.g., alter biochemistry), including functional habitats such as fish spawning and foraging habitats. As the rivers along the pipeline route generally show high turbidity and the duration would be transient, this impact is considered not significant.

Loss of Soil Structure, Fertility and Seed Bank

Impact: Poor re-colonisation due to anaerobic conditions in stored soil, reduced fertility and loss of entrained seeds

Prolonged storage of topsoil (longer than six months) can cause loss of soil fertility, as nutrients may be leached out by rain or anaerobic conditions may be created by a lack of air circulation. Prolonged storage may also cause loss in viability of the seed bank in the stored topsoil. This can lead to poor vegetation re-colonisation during reinstatement. As soil storage is likely to be for a short duration, this impact is considered not significant.

Impeded Flow of River or Channel and Abstraction of Water

Impact: Loss of aquatic and water-margin habitats or barrier effects

Impeded river flow (including reduced flow owing to river water abstraction) reduces flow volumes, which can lead to direct habitat loss in aquatic and marginal habitats. It can also lead to indirect loss by reducing access to habitats through creation of barriers within the river channel (e.g., insufficient depths to allow fish passage). Reduced water volumes and velocities could also indirectly affect the biochemical conditions of a habitat (e.g., reducing dissolved oxygen levels owing to higher ambient water temperatures) which could have sublethal and lethal impacts on species. In some instances, the habitat structure may be modified rather than the aquatic or marginal habitats being lost altogether. As water levels within these rivers tend to fluctuate between seasons, this impact is considered not significant.

Loss of Habitat

Impact: Permanent loss of habitat from (AGIs and operational RoW)

The need to clear vegetation for the construction of AGIs will cause permanent direct habitat loss. Table 8.2-1 summarises the habitat loss at each AGI and the type of habitat affected. These facilities are not within protected areas or other areas highlighted through baseline studies as habitats of conservation importance and the habitat loss will be limited in extent. The impact is therefore considered not significant.

There will also be some permanent habitat loss along the RoW where woodland and forest habitats will be removed and not reinstated due to the requirement to have no deep-rooted species over the pipeline. As indicated in Table 8.2-1, this mostly affects modified habitats and this direct impact is considered not significant.

This habitat loss has indirect impacts on the species supported by the habitats as described in Section 8.3.

Table 8.2-1 Permanent Habitat Loss (Aboveground Installations and Operational Right-of-Way²) (ha)

	PS1	PS2	Operational RoW	Total	% of AOI ³
Natural ⁴	9.6	2.5	47.1	59.2	0.50
Forest	-	-	0.1	0.1	0.09
Woodland	-	-	3.2	3.2	0.51
Bushland	-	0.2	13.8	14.0	0.42
Wetland Forest	-	-	1.2	1.2	0.41
Wooded Grassland	9.6	2.3	28.8	40.8	0.55
Modified	2.1	10.1	236.7	248.9	0.66
Cultivation	2.1	10.1	224.7	236.9	0.70
Plantation	-	-	10.5	10.5	0.35
Settlement	-	-	0.02	0.02	0.01
Shrubland	-	-	1.5	1.5	0.48
Total	11.7	12.6	283.8	308.1	0.63

Impact: Temporary loss of habitat from construction activities (RoW and other temporary worksites, main camp and pipe yards (MCPYs))

² The Operational RoW is a 10-m exclusion zone centred on the pipeline centreline where no deep-rooted species will be allowed to grow, to ensure the integrity of the pipeline

³ Percentage of each habitat type found within the AOI

⁴ The classification of habitat types is described in Appendix A1 Table A1.3 2 Physiognomic Habitat Classes in the Study Area

Most of the construction causing temporary habitat loss is within modified habitat. Any habitat loss in areas of high bioquality⁵ is described in the location-specific impacts section. The temporary loss of vegetation along the RoW will cause a short-term direct impact on habitats (permanent loss of deep rooted species is described under permanent loss of habitat). Agricultural areas will be reinstated as grassland and all other habitats will be returned to their original condition. As these impacts are temporary and affect mostly modified habitat (592.2 ha of modified compared to 157.7 ha of natural habitat), this impact is considered not significant.

Table 8.2-2 summarises the type and extent of temporary habitat loss for the RoW and the construction facilities.

Table 8.2-2 Temporary Habitat Loss (Right-of-Way and Construction Facilities) (ha)

	MCPY1	MCPY2	MCPY3	MCPY4	PS1	PS2	ROW	Total	% of AOI ⁶
Natural	0.3	0.0	2.2	0.0	1.9	0.9	152.4	157.7	1.11
Forest	-	-	-	-	-	-	0.2	0.2	0.19
Woodland	0.0	-	-	-	-	-	7.5	7.5	1.19
Bushland	-	-	0.6	-	-	-	32.2	32.8	0.99
Wetland	0.0	0.0	0.0	0.0	0.0	0.0	42.4	42.4	1.72
Wetland forest	-	-	-	-	-	-	4.2	4.2	1.45
Wooded grassland	0.3	-	1.5	-	1.9	0.9	65.9	70.5	0.95
Modified	17.2	0.0	15.3	3.6	0.5	1.4	554.3	592.2	1.58
Cultivation	17.2	0.0	11.9	3.6	0.5	1.4	525.7	560.3	1.65
Plantation	-	-	-	-	-	-	24.2	24.2	0.80
Settlement	-	-	-	-	-	-	0.1	0.1	0.07
Shrubland	-	-	3.3	-	-	-	4.3	7.6	2.43
Total	17.5	0.0	17.4	3.6	2.3	2.3	706.7	749.9	1.45

Impact: Modified habitat structure following reinstatement after construction

Habitats may not fully establish or return to their pre-project condition following reinstatement and some may take longer than others to establish, for example grassland will be quicker than forest. This may cause a different habitat structure which may, in turn, affect the species using the habitat. As most of the habitats to be reinstated are modified and widespread, this direct impact is considered not significant.

Habitats of high bioquality (such as riparian forest) which are highly unlikely to regenerate naturally, are described in the location-specific section.

⁵ Bioquality is defined as an aspect of a plant community's conservation value, derived from the concentration of restricted-range species occurring in the community - see Baseline Section 6.3.1

⁶ Percentage of each habitat type found within the AOI

Impact: Loss of wetland and riparian habitat through open cut crossing during construction of the RoW

Open-cut crossing of rivers and wetlands during the pipeline construction will cause a direct loss of wetland and riparian habitat. Although this direct impact could affect habitat and species of very high sensitivity, and is of large magnitude, it is temporary and as such is considered not significant.

Impacts from Introduction of Alien Invasive Species or Plant and Animal Diseases

Impact: Poor re-colonisation by local flora through flora through competition by alien invasive species (AIS) following reinstatement

The introduction of competitive species or plant and animal diseases, including AIS, can modify the physical structure of aquatic and terrestrial habitats (e.g., changing flow patterns and choking channels in the case of some plant species). The accidental introduction of non-native species has the potential to hamper habitat reinstatement as these non-native species tend to be vigorous in growth and out-compete native species for resources.

Some diseases or animal species can also target and ultimately remove structural and functional habitat features (e.g., submerged tree roots and aquatic and riparian plants).

As the magnitude of this potential impact is large and, once established, it is very difficult to eradicate non-native species; this is a potentially significant indirect impact.

Impacts from Disturbance or Harm to Wildlife

Impact: Increased interaction between construction workers and habitats of conservation importance, especially relating to food and fuel

Construction workers living at the camps have the potential to use natural resources from adjacent habitats for fuel and food, causing local deforestation. This potential impact is not considered significant because meals will be provided and the camps will be closed.

Impact: PIIM to areas around camps causing increased pressure on natural resources (farming and deforestation for fuel)

Construction camps will be a source of revenue and may encourage people to move to the area and set up temporary accommodation on land around the camps. These people may clear land for cultivation and food which will cause very long duration impacts of local extent and on habitats of moderate sensitivity, causing not significant impacts.

Ecosystem Services

The following generic aspects may have impacts on ecosystem services that the habitats support:

- impeded flow of river or channel
- abstraction of water
- habitat loss.

Impacts from these aspects will have indirect effects on the ecosystem services that the habitats support.

Impacts from impeded flow of river or channel and abstraction of water could cause the loss of aquatic and water-margin habitats that have the potential to affect the following ecosystem services:

- provisioning services, including hunting, gathering and foraging food and collection of medicinal products
- cultural services, such as ethical and biodiversity 'non-use' values and a sense of place and way of life.

Impacts from impeded flow and abstraction are considered to be not significant and therefore the indirect impacts on ecosystem services are similarly likely to be not significant.

Impacts from habitat loss are wide ranging as the habitat types are varied and multi-functional. Loss of habitat, whether permanent or temporary, will affect the following ecosystem services:

- provisioning services, including wood and wood fuel; hunting, gathering and foraging food; collection of medicinal products; and trapping of wildlife for the live trade market
- regulating services, including carbon sequestration, local climate regulation, local water and air purification, water regulation and erosion control
- cultural services, including ethical and biodiversity 'non-use' values; sense of place and way of life; ecotourism; spiritual, sacred or religious values; inspiration for culture and design; and cognitive development
- habitat and species support, including the habitats which provide important refuge, feeding, watering, breeding and nursery areas.

Impacts from habitat loss are considered not significant as most habitats affected are modified and the impacts are localised, therefore associated impacts on ecosystem services are also likely to be not significant.

Location-Specific Impacts

Location: Guineo–Congolian Semi-Evergreen Forest (KP0–11)

Loss of Habitat

Impact: Loss of the natural habitat, Guineo–Congolian semi-evergreen forest

Guineo–Congolian semi-evergreen forest is a natural habitat and is of conservation importance. Guineo–Congolian semi-evergreen forest has a very high sensitivity to change. Construction of the pipeline will cause the loss of 0.24 ha of fragments of this habitat type adjacent to the Wambabya FR between KP0 and 11. Habitat mapping from aerial photography has estimated approximately 105 ha of this type of forest in the AOI, of which only 26 ha was mapped outside the Wambabya FR, predominantly distributed in discontinuous patches along tributaries and drainage lines of the Wambabya River. Although the loss of 0.24 ha of this habitat type is a small proportion of the overall resource, it may decrease connectivity between the remaining patches and increases the overall area of exposed patch to edge effects. These fragments are unlikely to regenerate passively once construction activities

are complete. This direct impact is of small magnitude and local extent, and is therefore considered not significant.

Location: Wetland Forests (Riverine and Swamp Forests) Throughout the Extent of the Pipeline Route

Loss of Habitat

Impact: Loss of wetland forests (swamp and riverine forest)

Construction of the pipeline will cause the loss of 5.04 ha of wetland forests within the RoW and additional temporary working areas. Swamp and riverine forests has a very high sensitivity to change. These habitat types are unlikely to regenerate passively once construction activities are complete. Table 8.2-3 provides a summary of where these wetland forest areas have been identified.

Table 8.2-3 Permanent Wetland Forest Loss

Approximate Location of Wetland Forest (KP)	Loss of Wetland Forest Operational RoW (ha)	Name of Adjoining Rivers
6	0.04	Unnamed tributary of Wambabya River
13	0.17	Unnamed tributary of Wambabya River
15	0.13	Upper Wambabya River
19–21	0.33	Unnamed tributary of Wambabya River
25	0.22	Unnamed tributary of Kafu River
32–33	0.62	Kanywabarogo River (tributary of Kafu River)
36	1.48	Kafu River
38	0.15	Lwebikere River (tributary of Kafu River)
55	0.12	Mabengere River (tributary of Kafu River)
65	0.24	Unnamed tributary of Kafu River
72	0.24	Unnamed tributary of Kafu River
79	0.12	Unnamed tributary of Lugolima River
88.5	0.57	Unnamed tributary of Lugolima River
98.4	0.20	Unnamed tributary of Nabakazi River
105.1	0.41	Nabakazi River
Total	5.04	

There is 290 ha of this habitat type within the AOI and therefore the loss of 5ha is only a small proportion of the total resource. However, the removal of this habitat type will increase the fragmentation of this habitat type. Although this direct impact could affect natural habitat of very high sensitivity, the small magnitude and site extent means that the impact is not significant.

Location: Taala Forest Reserve (KP78.3–82.5)**Loss of Habitat**

Impact: Permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR

The pipeline traverses the Taala FR and is adjacent to a village. Existing land use within the reserve is primarily agricultural, with some eucalyptus plantations to the north. Isolated patches of natural habitat remain in wet valleys. As indicated in Table 8.2-4, construction of the pipeline will cause the permanent loss of 4.2 ha from the 10-m wide operational corridor in Taala FR, of which 3.1 ha is extensively modified, the remainder being bushland and wetland supporting both being of low bioquality. This equates to a loss of 0.6% of natural habitat in Taala Forest, which is a small magnitude, local extent but very long duration. This direct impact is considered not significant.

Table 8.2-4 Permanent Habitat Loss in Taala Forest

	Operational RoW (ha)	Habitat Type in the Protected Area in the AOI ⁷ (%)
Natural	1.1	1.3
Bushland	0.8	1.0
Wetland	0.3	0.3
Wetland Forest	–	–
Modified	3.1	3.2
Bare	–	–
Cultivation	9.7	2.2
Pasture	0.2	0.4
Plantation	0.7	0.6
Total	4.2	4.5

Impact: Temporary loss of habitat within Taala FR during pipeline construction

Table 8.2-5 summarises the temporary loss of habitat in Taala FR from the pipeline construction (for the 20 m of the RoW width outside the operational corridor and over which deep-rooted species are permitted to grow). As the proportion of natural habitat (bushland and wetland) to be removed is small compared to the overall resource in the AOI within the FR, the magnitude is small, and all the habitats will be reinstated, the duration is moderate, extent local and impacts are considered not significant.

⁷ The protected area extends beyond the AOI so the figures represent the habitat in the AOI, not the whole protected area.

Table 8.2-5 Temporary Habitat Loss in Taala FR

	RoW (Including Additional Workspace⁸) (ha)	Habitat Type in Protected Area in AOI (%)
Natural	3	1.7
Bushland	2.0	2.4
Wetland	1.0	1.1
Wetland Forest	–	–
Modified	0.5	0.8
Bare	–	–
Pasture	0.5	0.8
Total	3.5	2.5

Ecosystem Services

The following location-specific impacts may have an impact on ecosystem services:

- permanent and temporary loss of habitat within Taala FR during pipeline construction (not significant)
- temporary loss of Guineo–Congolian semi-evergreen forest (not significant)
- permanent and temporary loss of wetland forests (not significant).

These impacts have the potential to cause impacts on the following ecosystem services:

- provisioning services, including wood and wood fuel, hunting, gathering and foraging food, collection of medicinal products, and trapping of wildlife for the live trade market
- regulating services, including carbon sequestration, carbon sinks, microclimate regulation, local water and air purification, water regulation, erosion control and regulation of ambient noise levels
- cultural services, including ethical and biodiversity 'non-use' values; sense of place and way of life; ecotourism; spiritual, sacred or religious values; inspiration for culture and design; and cognitive development
- habitat and species support, including the habitats which provide important refuge, feeding, watering, breeding and nursery areas for many animals that spend only part of their life in such areas.

However, the location-specific impacts from habitat loss are considered not significant and therefore, associated impacts on ecosystem services are also considered likely to be not significant.

⁸ The standard RoW is 30 m wide but in some areas such as steep side slopes or road, rail and river crossings, additional workspace may be required to safely construct the pipeline.

8.2.2.3 Operation

Generic Impacts

There are no generic impacts on habitats of conservation importance.

Location-Specific Impacts

There are no location-specific impacts on habitats of conservation importance.

Ecosystem Services

There are no potential impacts on ecosystem services during the operation phase as impacts during this phase are limited to minor maintenance activities which will only affect small areas for very short periods of time.

8.2.3 Mitigation Measures

This section describes the avoidance and mitigation measures that will be applied to the aspects and activities that could affect biodiversity impacts.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section and the associated management plan and other measures that are included in Appendix E4 have been collectively used to assess residual impacts, and to determine their significance.

8.2.3.1 Design

Generic Mitigation Measures

Soil Erosion and Compaction

Geological and geophysical surveys were undertaken to evaluate soil conditions and to assess potential geohazards (e.g., faulting) on the pipeline route.

Geotechnical surveys established the physical properties of subsurface soils. These surveys require drilling of boreholes to sample and test the subsurface.

Good soil management practices that reduce the potential for erosion and compaction have been built into the project description and are covered in Section 8.5.3.

Crossing of perennial wetlands (those with standing water or saturated soil for most of the year) will be undertaken using open-cut methods with a wider trench to reduce erosion. Seasonal wetlands (those with no standing water or saturated soil for part of the year) will also be open-cut, but with a narrower trench since the potential for erosion is not as great.

Impeded Flow of River or Channel and Abstraction of Water

A study to identify and evaluate potential water sources to support construction, commissioning and operations was undertaken to identify potential water sources with enough supply to meet project requirements without adversely affecting other water users and biodiversity.

Loss of Habitat

Route selection has been an iterative process of refinement based on a set of technical, environmental and social criteria. These criteria were applied with a view to delivering the final proposed route, worksite and facilities' locations that strike the optimum balance between socio-economic, environmental and technical factors. Environmental factors used in the selection process included potential impacts on rivers and wetlands, forests, and sensitive and protected areas.

Construction methods were considered at the design stage to reduce impacts on a variety of VECs. Where the pipeline crosses watercourses, special construction methods will be employed to reduce the effects on biodiversity. Where required, method statements will be drafted for river crossings. At many locations the watercourse is likely to be low or dry while at others there will be a wet open-cut crossing.

Introduction of Alien Invasive Species or Plant and Animal Diseases

The project description describes the reinstatement methods that will be used, including reinstating natural vegetation that occurs in non-agricultural areas from the soil seedbank to avoid introducing invasive species.

Disturbance or Harm to Wildlife

There are no specific design phase mitigation measures to address impacts of workers within construction camps and potential PIIM.

Location-Specific Mitigation Measures

Location: Guineo–Congolian Semi-Evergreen Forest (KP0–11)

Loss of Habitat

Impact: Temporary loss of Guineo–Congolian semi-evergreen forest

Route selection helped to reduce the impacts on the loss of Guineo–Congolian semi-evergreen forest within the Wambabya FR through avoidance of the protected area. There are no design-phase mitigation measures to reduce impacts on the loss of Guineo–Congolian semi-evergreen forests outside the reserve.

Location: Wetland Forests (Riverine Forest and Swamp Forests) Across the Extent of the Pipeline

Loss of Habitat

Impact: Temporary loss of wetland forests (swamp and riverine forests)

Route selection helped to reduce the impacts on habitat loss in protected areas through avoidance. The pipeline RoW mainly crosses already modified habitat.

Location: Taala FR (KP78–82.5)**Loss of Habitat**

Impact: Permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR

and

Impact: Temporary loss of habitat within Taala FR during pipeline construction

Route selection helped to reduce the impacts on habitat loss in protected areas through avoidance. The pipeline RoW mainly crosses already modified habitat.

8.2.3.2 Construction**Generic Mitigation Measures****Soil Compaction**

Impact: Impaired re-establishment of vegetation after construction

The soil management plan, reinstatement plan and the community health, safety and security plan will include measures that contribute to the control of impacts from soil erosion and compaction.

During construction, local communities will be discouraged from using the RoW as an access track. Ground protection such as bogmats and geotextile fabric will be used to support heavy loads where ground is soft. Stockpiled topsoil will be monitored for compaction and corrective action implemented if required. The reinstatement plan will include ways to achieve an increasing trend in vegetation regrowth and diversity of desired species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact will be reduced from small to negligible.

Soil Erosion

Impact: Loss of topsoil through erosion by wind or water causing impaired reinstatement

The soil management plan and reinstatement plan will include procedures to reduce and control erosion.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from large to small.

Impact: Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, degradation of spawning habitat

The soil management plan and reinstatement plan will include measures to manage erosion and reduce siltation above background levels. Locations for discharging excavated pipeline trench water will be identified in the pollution prevention plan. Appropriate sediment control measures consistent with recognised industry best practices will be implemented.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Loss of Soil Structure, Fertility and Seed Bank

Impact: Poor re-colonisation due to anaerobic conditions in stored soil, reduced fertility and loss of entrained seeds

The soil management plan will include measures for managing topsoil that will contribute to maintaining adequate soil condition.

Topsoil stacks will be monitored for compaction and corrective action implemented if required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impeded Flow of River or Channel and Abstraction of Water

Impact: Loss of aquatic and water-margin habitats or barrier effects

The soil management plan, reinstatement plan and natural resource management plan will include mitigation that will contribute to the management of impeded flow and water abstraction from surface waters.

Riverbed and bank material will be stored separately and away from active water channels during river crossings and, where conditions require, river crossing method statements will be developed. Water flow at surface water abstraction points will be monitored and corrective measures implemented if required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Loss of Habitat

Impact: Permanent loss of habitat from AGIs and operational RoW

The biodiversity management plan will include measures that will contribute to the control of impacts associated with loss of habitat.

A vegetation removal method statement will be implemented to control activities such as tree felling and ensure vegetation outside the RoW is not impacted. Where habitats of conservation have been identified, pre-construction surveys will inform location-specific biodiversity management plans that will consider micro routing to avoid impacts or conservation measures to achieve no net loss to biodiversity. A schedule for all the surveys will be developed in the early stages of construction planning to allow surveys to be undertaken at an appropriate time.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impact: Temporary loss of habitat from construction activities (RoW and other temporary worksites, main camps and pipe yards (MCPYs).

The biodiversity management plan will include measures that collectively manage habitat loss.

A vegetation removal method statement will be developed to control activities such as tree felling and ensure vegetation with the RoW is not affected. Where required pre-construction surveys will inform location-specific biodiversity management plans that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from large to medium.

Impact: Modified habitat structure following reinstatement after construction

The biodiversity management plan will include measures that manage modification of habitat.

Location-specific biodiversity management plans will be developed and implemented where applicable allowing for progressive, active habitat restoration (including seeding with seed collected from similar habitats, propagation of seedlings off-site for supplementary planting if required). Ways will be explored to achieve an increasing trend in vegetation regrowth and diversity of desired species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small while duration remains medium and extent remains local.

Impact: Loss of wetland and riparian habitat through open cut crossing during construction

The biodiversity management plan will include measures that manage loss of wetland and riparian habitat.

River crossing method statements will be developed that will set out measures to address impacts including construction during the dry period, pump-arounds to keep water flow and protection of riparian vegetation.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from large to medium.

Introduction of Alien Invasive Species (AIS) or Plant and Animal Diseases

Impact: Poor re-colonisation by local flora through competition by AIS following reinstatement

The biodiversity management plan will include measures that manage poor recolonisation of local flora.

Biosecurity measures will be developed and implemented that will include a strategy for weed and pest control and measures to prevent the introduction or spread of alien invasive such as wheel washing.

The application of the described mitigation will reduce the magnitude of impact from medium to small and hence the residual impact will be not significant; the duration remains very long term.

Disturbance or Harm to Wildlife

Impact: Increased interaction between construction workers and habitats of conservation importance, especially relating to food and fuel

The biodiversity management plan, project induced in-migration plan, community health, safety and security plan and the occupational health, safety and security plan will include measures that collectively manage interaction between workers and habitats.

Construction camps will be designated as having “closed” status and food and fuel will be provided to prevent interactions between the workforce and surrounding habitats reducing the likelihood of fuel and food gathering activities.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impact: PIIM to areas around camps causing increased pressure on natural resources (farming, deforestation for fuel)

The project will develop and implement a project induced in-migration plan that will aim to reduce the number of people that arrive into potentially affected communities.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Location-Specific Mitigation Measures

Location: Guineo–Congolian Semi-Evergreen Forest (KP0 to 11)

Loss of Habitat

Impact: Temporary loss of the natural habitat, Guineo–Congolian semi-evergreen forest

In addition to the generic mitigation addressing habitat loss described in Section 8.2.3.2, the biodiversity management plan and reinstatement plan will include the following measures that will manage the temporary loss of Guineo-Congolian semi-evergreen forest.

The project will complete pre-construction biodiversity surveys that will inform site specific biodiversity management plans to reduce impacts on biodiversity during construction (exploring options to avoid, reduce, mitigate or compensate for loss). Pre-construction surveys will inform location-specific biodiversity management plans that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored as well as possible enhancements to achieve no net loss of biodiversity.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the duration of the residual impact is reduced from long term to medium term.

Location: Wetland Forests (Riverine and Swamp Forests) along the Entire Pipeline Route

Loss of Habitat

Impact: Permanent loss of wetland forests (swamp and riverine forest)

In addition to the generic mitigation addressing habitat loss described in Section 8.2.3.2, the biodiversity management plan and reinstatement plan will include the following measures that will manage the permanent loss of wetland forest.

The project will complete pre-construction biodiversity surveys that will inform site specific biodiversity management plans to reduce impacts on biodiversity during construction (exploring options to avoid, reduce, mitigate or compensate for loss). Pre-construction surveys will inform location-specific biodiversity management plans that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored as well as possible enhancements to achieve no net loss of biodiversity.

River crossing method statements will be developed that will set out options to protect the integrity of riparian vegetation where possible in addition to the most suitable approach for the removal and reintroduction of riparian vegetation.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the impact is reduced from small to negligible.

Location: Taala Forest Reserve (KP78.3–82.5)

Loss of Habitat

Impact: Permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR

Impact: Temporary loss of habitat within Taala FR during pipeline construction

In addition to the generic mitigation addressing habitat loss described in Section 8.2.3.2, the biodiversity management plan and reinstatement plan will include the following measures that will manage the permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR.

Where a section of the ROW is through habitats with high biodiversity value, the area will be reviewed to determine if the working width can be reduced to limit impacts as much as possible.

The project will complete pre-construction biodiversity surveys that will inform site specific biodiversity management plans to reduce impacts on biodiversity during construction (exploring options to avoid, reduce, mitigate or compensate for loss). Pre-construction surveys will inform location-specific biodiversity management plans that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored as well as possible enhancements to achieve no net loss of biodiversity.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the impact is reduced from small to negligible.

Ecosystem Services

Mitigation described to control location-specific impacts on habitats of conservation importance will control impacts to ecosystem services where applicable.

8.2.3.3 Operations

There are no location-specific impacts on habitats of conservation importance during the operation phase and hence no mitigation measures are required

8.2.4 Residual Impacts and Significance Summary

This section summarises the potential residual impacts on biodiversity after mitigation has been implemented, following the order in Table 8.2-6 and focusing on those impacts that are considered significant.

8.2.4.1 Generic and Location-Specific Impacts

Table 8.2-6 summarises the potential generic biodiversity impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.2-7 summarises the location-specific impacts.

Considering the generic and location-specific mitigation described there are no residual impacts on habitats of conservation importance.

Table 8.2-6 Habitats of Conservation Importance – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Soil compaction	Impaired re-establishment of vegetation after construction	C	–	Soil Management Plan Reinstatement Plan Community Health, Safety and Security Plan	2	2	1	3	8
Soil erosion	Loss of topsoil through erosion by wind or water causing impaired reinstatement	C	–	Soil Management Plan Reinstatement Plan	4	3	1	4	12
	Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, degradation of spawning habitat	C	–	Soil Management Plan Reinstatement Plan	4	2	2	3	11
Loss of soil structure, fertility and seed bank	Poor re-colonisation owing to anaerobic conditions in stored soil, reduced fertility and loss of entrained seeds	C	–	Soil Management Plan	4	2	1	3	10
Impeded flow of river or channel	Loss of aquatic and water-margin habitats or barrier effects	C	–	Natural Resource Management Plan	4	2	4	3	13
Loss of habitat	Permanent loss of habitat from AGIs and operational RoW	C	–	Biodiversity Management Plan	4	5	2	3	14
	Temporary loss of habitat from construction activities (RoW and other temporary worksites main camps and pipe yards)	C	–	Biodiversity Management Plan	6	3	2	4	15
	Modified habitat structure following habitat reinstatement after construction	C	–	Biodiversity Management Plan	4	3	2	4	13
	Loss of wetland and riparian habitat through open-cut crossing during construction of the RoW	C	–	Biodiversity Management Plan	6	2	2	5	15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.2-6 Habitats of Conservation Importance – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Introduction of competitive species or plant/animal diseases	Poor re-colonisation by local flora through competition by non-natives following reinstatement	C and O	–	Biodiversity Management Plan	4	5	2	5	16
Disturbance or harm to wildlife	Interaction between humans at camps and habitats conservation importance, especially relating to food and fuel	C	–	Biodiversity Management Plan Project Induced In-Migration Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan	4	2	3	5	14
	PIIM to areas around camps causing increased pressure on natural resources (farming, deforestation for fuel)	C	–	Project Induced In-Migration Management Plan	4	5	2	3	14

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.2-7 Habitats of Conservation Importance – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
KP0–11 Guineo–Congolian semi-evergreen forest	Loss of habitat	Loss of, Guineo–Congolian semi-evergreen forest	C	–	Biodiversity Management Plan Reinstatement Plan	2	5	1	5	13
Wetland forests (riverine forest and swamp forests) throughout the extent of the pipeline route	Loss of habitat	Loss of wetland forest (swamp and riverine forest)	C	–	Biodiversity Management Plan Reinstatement Plan	2	5	1	5	13
KP78–82 Taala FR	Loss of habitat	Permanent loss of natural and modified habitats (bushland, wetland and wetland forest) from Taala FR	C	–	Biodiversity Management Plan Reinstatement Plan	2	5	1	4	12
KP78–82 Taala FR	Loss of habitat	Temporary loss of habitat from Taala FR	C	–	Biodiversity Management Plan Reinstatement Plan	2	3	1	4	10

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.2.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.2.6 Cumulative Impacts

EACOP's contribution to cumulative impacts on the habitats of conservation importance VEC is negligible and no further mitigation measures other than those described in Section 8.2.3 are considered necessary.

8.2.6.1 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts affecting habitats of conservation importance.

8.3 Biodiversity: Flora and Fauna Species of Conservation Importance

This section describes potential impacts on biodiversity during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.3.1 Key Sensitivities and Considerations

The flora and fauna species of conservation importance baseline is described in Section 6.3.1, as well as:

- their sensitivity ranking based on the relevant tables in Appendix D
- key considerations.

The sensitivity ranking of flora and fauna VECs ranges from low to very high.

Key considerations include the presence of 11 species of vascular plants of conservation importance. These species are important because they are listed as globally or nationally rare, threatened, endemic or range-restricted. The majority of these species were recorded in wetland forests (swamp and riverine forests), degraded swamps and Guineo–Congolian semi-evergreen forest (see Section 8.2).

Leplaea cedrata is International Union for Conservation of Nature (IUCN) vulnerable. This species has undergone major declines in distribution and abundance across its range in tropical Africa owing to habitat loss, degradation and fragmentation, and unsustainable harvesting.

The following species are of conservation importance in accordance with the National Red List for Uganda (WCS 2016) and were only recorded in Wambabya FR during the baseline botanical surveys:

- *Leplaea cedrata* – Uganda endangered
- *Chrysophyllum perpulchrum* – Uganda vulnerable
- *Chrysophyllum albidum* – Uganda vulnerable
- *Citropsis articulata* – Uganda vulnerable
- *Mondia whitei* – Uganda vulnerable.

The range-restricted or endemic species, *Leptonychia mildbraedii* and *Rytigynia beniensi*, have a highly localised distribution. These species are particularly vulnerable to the impacts of habitat loss, degradation and fragmentation.

Leptonychia mildbraedii was recorded in riverine forest of low bioquality at a tributary of the Wambabya River (KP12.3) approximately 970 m from the pipeline centre-line and therefore will not be directly impacted by the project.

Fauna species of conservation importance include (where these species were identified is included in the baseline reports in Appendix A4):

- sitatunga (*Tragelaphus spekii*) – IUCN vulnerable, Uganda vulnerable
- Bohor reed buck (*Redunca redunca*) – IUCN least concern, Uganda endangered
- Temminck's ground pangolin (*Smutsia temminckii*) – IUCN vulnerable, Uganda vulnerable
- tree pangolin (*Phataginus tricuspis*) – IUCN vulnerable, Uganda vulnerable
- long-tailed pangolin (*Phataginus tetradactyla*) – IUCN vulnerable, Uganda endangered
- African golden cat (*Caracal aurata*) – IUCN vulnerable, Uganda endangered
- African clawless otter (*Aonyx capensis*) – IUCN near threatened, Uganda vulnerable
- hippopotamus (*Hippopotamus amphibius*) – IUCN vulnerable, Uganda vulnerable
- spot necked otter (*Hydricus maculicollis*) – IUCN near threatened, Uganda endangered
- leopard (*Panthera pardus*) – IUCN vulnerable, Uganda vulnerable
- chimpanzee (*Pan troglodytes schweinfurthii*) – IUCN endangered, Uganda endangered
- Sierra Leone mops bat (*Mops brachypterus*) – IUCN least concern, Uganda vulnerable
- golden-throated rocket frog (*Ptychadena chrysogaster*) – IUCN least concern, Uganda vulnerable.

Avifauna species of conservation importance include (where these species were identified is included in the baseline report in Appendix A3):

- hooded vulture (*Necrosyrtes monachus*) – IUCN critically endangered, Uganda endangered
- grey crowned crane (*Balearica regulorum*) – IUCN endangered, Uganda endangered
- white backed duck (*Thalassornis leuconotus*) – IUCN not listed, Uganda vulnerable
- African woollyneck (*Ciconia microscelis*) – IUCN not listed, Uganda vulnerable
- saddle billed stork (*Ephippiorhynchus senegalensis*) – IUCN not listed, Uganda vulnerable
- rufous bellied heron (*Ardeola rufiventris*) – IUCN not listed, Uganda vulnerable
- ovambo sparrowhawk (*Accipiter ovampensis*) – IUCN not listed, Uganda vulnerable
- grey parrot (*Psittacus erithacus*) – IUCN near threatened, Uganda vulnerable

- papyrus gonolek (*Laniarius mufumbiri*) – IUCN near threatened, Uganda vulnerable.

None of the fish or invertebrate species sampled during the surveys is critically endangered, endangered or vulnerable (IUCN Red List), although secondary data indicates that fish, crustacean and macroinvertebrate species of conservation importance are likely to be present in the AOI.

Two of the fish species sampled (*Barbus kerstenii* and *Schilbe intermedius*) undertake in-river migrations. Secondary data also indicates the likely presence of endemic and range-restricted species in the AOI.

Ecosystem Services

Ecosystem services associated with species of conservation importance are listed below. Potential impacts to ecosystem services are addressed in Section 8.3.3.

Provisioning services include:

- collection of wood (including for fuel and charcoal manufacture)
- hunting, gathering and foraging food
- collection of medicinal products
- trapping of wildlife for the live trade market.

Cultural services include:

- ethical and biodiversity 'non-use' values – in particular in terms of maintaining populations of endangered and endemic species
- ecotourism, particularly in protected areas.

8.3.2 Potential Project Impacts

The assessment of potential impacts from AGIs has been included in the description of generic impacts because these facilities are in areas that do not tend to support species that have high or very high sensitivity. The nature of these impacts (in terms of magnitude, duration and extent) will be the same for each of these facilities and, consequently, the proposed mitigation measures will also be the same. A similar approach has been taken for the construction facilities.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on biodiversity, flora and fauna of conservation importance, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

Potential impacts to ecosystem services have been addressed throughout this section where relevant. Ecosystem services impacts have not been scored in the

same way as other impacts but an indication of the likely significance of the ecosystem service impact has been provided in each case.

8.3.2.1 Construction

General

Impacts from the construction phase, including the development of construction facilities; construction and commissioning of the pipeline and aboveground installations (AGI) and; the decommissioning of construction facilities are described together in this section as the impacts are similar for all of the activities.

Generic Impacts

Treatment and Disposal of Known and Unknown Contamination; Disposal of Solid and Liquid Waste and; Accidental Release of Oil and Chemicals

Impact: Injury or mortality of flora and fauna due to mobilisation of soil contaminants

Impact: Mortality of flora and fauna through contamination of food and water supply

Impact: Stress or mortality of flora and fauna due to disposal of solid and liquid waste

Accidental disposal of waste material and chemicals have the potential to pollute watercourses and cause mortality of macrophytes, which species of conservation importance may use. Accidental spills of waste material and chemicals are unlikely and not planned events and therefore this direct impact is considered not significant.

Impact: Increase in vermin around any established waste dumps and consequent increase in prey availability for carnivorous birds and mammals

There is the potential that the inappropriate disposal of waste may encourage vermin into the camps which could alter the predator–prey balance for species close to the camps causing an indirect impact on species. This may encourage some native raptors to the site but is more likely to increase vermin such as rats and invasive species such as Indian house crow (*Corvus splendens*). The duration of such incidences is likely to be short, localised at site level and hence be small in magnitude; consequently, this direct impact is considered not significant.

Disposal of Surplus Water from Working Areas and Hydrotest Water

Impact: Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, and degradation of spawning habitat

As described in the habitats section, soil erosion can directly impact turbidity, which can cause smothering and degradation of aquatic habitats. This may indirectly impact primary productivity rates and degrade aquatic habitats (e.g., alter biochemistry), including functional habitats such fish spawning and foraging habitats. As the rivers along the pipeline route generally have high turbidity and the duration of any event resulting from construction activities is likely to be short, this impact is considered not significant.

Impeded Flow of River or Channel

Impact: Restriction of fish (ranging from non-migratory fish species to potamodromous fish species) movement and reduced reproductive success, impaired movement of other aquatic organisms and reduced habitat suitability

Impeding a river's flow or channel may impair movement and reduce reproductive success for all fish but is a key consideration for potamodromous fish; those fish that migrate within or between rivers, wetlands or lakes to access key functional habitats used for refuge, foraging or spawning at different life stages. Nonmigratory fish are less sensitive to this impact and therefore sensitivity is lower. Impaired movement has the potential to affect the reproductive success of fish species. River crossings during construction are typically of short duration therefore these impacts are considered not significant.

Abstraction of Water from River or Channel

Impact: Decreased water level from water abstraction for project use leading to loss of aquatic and water-margin habitats, causing reduced spawning activity

Impact: Mortality to aquatic organisms from the river through direct abstraction

Entrainment and removal of aquatic species during abstraction activities is likely to cause stress, injury and or mortality. If no screens or inappropriate screens are used, there is also a risk that species may become trapped in or on the screens, which would cause stress, injury and or mortality. An indirect impact linked to abstraction is a loss or reduction of aquatic and marginal habitat availability for aquatic flora and fauna caused by reduced water levels. As water levels generally rise and fall during the wet and dry seasons, these indirect impacts are considered not significant.

Management of Black and Grey water

Impact: Injury or mortality of flora and fauna from surface water contamination

Inappropriate disposal of black and grey water could contaminate surface water which may cause stress, injury or mortality to aquatic species. Accidental release of oil or chemicals into aquatic habitats can also cause stress, injury or mortality of aquatic species, and terrestrial species using surface water habitats. Although the impacts resulting from surface water contamination can be widespread and chronic, accidental discharge of untreated grey or black water is unlikely and is not a planned event and therefore this indirect impact has a small magnitude and therefore is considered not significant.

Abstraction of Groundwater

Impact: Decreased water level from water abstraction for project use leading to loss of habitat for stygofauna

As described in Section 8.7.4, there are no significant residual impacts anticipated on groundwater levels from abstraction for project use during construction. Based on available secondary data relating to stygofauna in East Africa, the species of stygofauna (groundwater-dwelling animals) likely to be impacted are not of conservation importance, and habitat loss for stygofauna is predicted to be temporary; hence the indirect impact on stygofauna is considered not significant.

Loss of Habitat to Species of Conservation Importance

Impact: Permanent loss of breeding and foraging habitat for fauna through site clearance for construction

Vegetation removal and site clearance required when construction begins will remove habitat which can be used by species for breeding and foraging. Table 8.2-1 in Section 8.2.2.2 quantify the amount of permanent habitat loss. This direct impact will disturb or remove breeding sites such as dens, earths and nests that may be present in the project footprint, and reduce forage availability, which could influence a species' distribution or ability to reproduce, causing a decline in the local population. Although most of the permanent habitat loss in the RoW and AGIs is farmland or other modified habitat, species are opportunistic and may still use modified habitats for parts of their life cycle. Birds may forage on crop land and large mammals may roam through cultivated land. Species of conservation importance must therefore be assumed to be present in most habitat types if they are present in the landscape. Although the extent of habitat loss is local, the sensitivity of potentially affected species is high and the magnitude is large as loss of breeding sites could cause a failure of that species to breed, duration is long because the loss is permanent, but the extent is local. As such, this potential direct impact on species is significant.

Impact: Temporary loss of breeding and foraging habitat for fauna through site clearance for construction

As described above for permanent habitat loss, the temporary loss of habitat will also have impacts on a variety of species using the landscape. Table 8.2-1 in Section 8.2.2.2 quantify the amount of temporary habitat loss. However, as these temporary land takes will be reinstated, the duration is short and the magnitude medium, and therefore temporary habitat loss is not significant.

Impact: Habitat fragmentation causing disrupted species movement during construction of RoW

During construction, vegetation will be removed from a 30-m wide strip along the length of the RoW. Tree-dwelling species and those that prefer cover to facilitate movement will not be able to move through their usual territories or will become more susceptible to predation and unable to move between habitat patches. Species of very high sensitivity that are susceptible to fragmentation are described in the location-specific impacts section. Typically the duration when passage is blocked by either open trench or a pipeline string is short however, the species of conservation importance are of high sensitivity and the magnitude is large as fragmentation could cause abandonment of breeding sites or reduced forage range, extent is regional as species can move through large areas and duration is medium (due to the time it takes for various habitats to re-establish, grassland will be much quicker than forest); hence this impact is considered significant.

Introduction of AIS, or Plant or Animal Diseases

Impact: Modified habitats from alien invasive species establishment leading to increased competition and loss of habitat for breeding and foraging

Non-native species can hinder the establishment of native species which has an indirect impact on species that use these habitats for breeding and foraging. Some invasive species can outcompete native species for ecological resources such as food and refuge or predate them in a way that they have not adapted to avoid. Some diseases and parasites can target native species, weakening them or removing them from habitats all together.

Once established, invasive species can be hard to eradicate causing a very long duration of medium magnitude for this potential indirect impact on very highly sensitive species of conservation importance, but at a local level only; hence this indirect impact is considered not significant.

Disturbance or Harm to Wildlife

Impact: Increased predation owing to removal of habitat used to shelter and forage

Site clearance will create a 30-m wide strip of un-vegetated areas of land that could cause increased predation on species due to the loss of cover and shelter. This indirect impact is considered of moderate duration due to the time taken for vegetation to re-establish but only of medium magnitude, and hence it is not significant.

Impact: Mortality of fauna species of conservation importance from movement of vehicles and presence of construction plant and structures

The use of vehicles and construction equipment may directly impact less mobile species such as reptiles and amphibians by death or injury. However, as most species can move away from vehicles and will avoid the construction area and hence traffic movement, the magnitude of potential impact is medium and the duration will be short; hence this direct impact is considered not significant.

Impact: Increased gathering of flora and hunting of fauna species of conservation importance from PIIM to construction camps facilitated by improved access along new or upgraded project access roads and along the RoW during construction and reinstatement.

The PIIM of people seeking employment at and around the camps or using the newly created access roads has the potential to cause indirect impacts on species using habitats surrounding the camps and accessed by roads. The clearance of land along the RoW can cause PIMM of people using the RoW as an unofficial access route. Most roads and camps are in areas surrounded by modified habitat types. Where roads are in areas of high conservation importance, they are described in the location-specific section. When people move to an area, some will clear trees for charcoal and cultivate land leading to loss of habitat on which species of conservation importance depend. There may also be increased hunting of bushmeat and fishing which will have direct impacts on species of conservation importance. The duration is very long as people outside the project cannot be directly controlled and access roads will be permanent, the sensitivity of the species of conservation importance is high (as species are opportunistic and can be found in modified and natural habitats), and the magnitude is medium as the loss of breeding habitat could affect a portion of a population and may bring about a change in abundance and/or distribution over more than one generation; hence this potential indirect impact is considered significant.

Impact: Disturbance from activities causing noise, vibration, human and vehicle activity affecting breeding and or behaviour of animals

Construction activities create noise and visual disturbance from vehicle and human movement. This activity can cause species to move away from forage and breeding areas and can restrict breeding for some sensitive species. Those species considered to be very sensitive to disturbance are more likely to be found in natural habitats within the protected areas. As the pipeline mostly passes through modified habitat with settlements and human activity, this impact is considered of medium magnitude and short duration and therefore not significant.

Open Excavations

Impact: Injury or fatality of fauna from falling into excavations if they cannot escape and where they are at increased risk of predation

Trenching will create a long, linear trench of typically around 1.5 m width in which species could get trapped, particularly smaller, less mobile species. Once in the trench they are potentially subject to predation or are unable to access food and water which could cause mortality. Impacts are of short duration and medium magnitude on species including those of very high sensitivity; as such, they are considered not significant.

Ecosystem Services

All the aspects described in the generic impacts section have the potential to affect ecosystem services. Any aspect which affects animals or plants that are used by local people for food, fuel or medicine will affect the provisioning ecosystem services delivered by these species. However, the significance of the impact on ecosystem services is difficult to be quantified as it depends on how reliant each community is on the particular ecosystem service and whether there are any alternatives available.

Impacts on rivers through abstraction, sedimentation or contamination could affect fish used for the following provisioning service:

- capture fisheries and food (fishing, gathering and foraging).

Impacts from smothering of species from soil disposal, waste spills and introduction of competitive species could affect plants and animals used for these provisioning services:

- wood (including collection for fuel and charcoal manufacture)
- food (hunting, gathering and foraging)
- collection of medicinal products.

Impacts from disturbance or harm to wildlife, habitat loss and impeded movement could affect plants and animals used for these provisioning services:

- wood (including collection for fuel and charcoal manufacture)
- food (hunting, gathering and foraging)
- collection of medicinal products.

Location-Specific Impacts

Location: KP6, 165, 187, 218–231 and 289

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and disturbance to Bohor reedbuck

The Bohor reedbuck is IUCN least concern and Ugandan endangered. Bohor reedbuck tend to use wooded grassland or wetland habitats. Site clearance will cause the loss of breeding and forage habitat of approximately 7.5 ha over the five sites where this species has been observed and may cause short term displacement. This species has a large range, and habitat removal will be temporary (transient duration) and of site extent. Therefore the direct impact is considered not significant.

Location: Wambabya–Bugoma Corridor (KP0–20)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of chimpanzee habitat

Chimpanzees are classified as Uganda and IUCN endangered and therefore have very high sensitivity to change.

High rates of deforestation in Uganda are increasing pressure on chimpanzee habitat and resource availability (Twongyirwe et al. 2015). This is confirmed by studies highlighting that remnant corridors of riparian forest (forest adjacent to a body of water [e.g., stream]) and remaining forest fragments in the landscape between Budongo FR in the north and Bugoma FR in the south provide commuting and foraging habitats for chimpanzees (WCS and eCountability 2016). Within this landscape the pipeline RoW crosses the remnant riparian corridors that link Wambabya FR and Bugoma FR (Figure 8.3-1).

Between Wambabya and Bugoma the forest corridors are mainly provided by two streams, the Kasoma and Kanywabarogo. These two corridors are therefore likely to facilitate the movement of chimpanzees. In an ongoing study chimpanzee faecal DNA is collected in the Wambabya and Bugoma forest reserves to determine the presence of gene flow, augmented by chimpanzee nest surveys to understand the corridors' use in time and space. The information collected at the time of writing suggests that chimpanzees do not move regularly between the Wambabya and Bugoma FRs, but completion of the study is required to confirm their use.

While chimpanzee home-range⁹, (including access to water sources) and community dynamics in this area are unknown and information regarding habitat use is limited, the ongoing study suggests that there is movement of chimpanzees out of the two FRs, particularly during the dry season. Habitat degradation within Wambabya FR, resulting in less food availability during the dry season, is known to prompt small 'raiding parties' of chimpanzees that take jackfruit, mango and sugar cane from communities between the two FRs (Ganas-Swaray and Koojo 2017). The analysis of chimpanzee faecal DNA will assist to determine whether the

⁹ An area in which an animal lives and moves on a periodic basis

riparian corridors also play an important role in maintaining the viability of the chimpanzee groups in the two forest blocks.

However, until completion of this study a precautionary approach has been taken that assumes the riparian corridors provide an opportunity for the chimpanzees to move between the two forest blocks and allow geneflow, thus supporting their important role in maintaining this population. The precautionary approach is further supported by the results from previous studies for the general area that indicate the chimpanzee population is already under pressure as a result of a growing human population.

Site clearance required for the 30 m pipeline construction RoW will result in the temporary removal of vegetation used by chimpanzees for moving, nesting and foraging, with permanent loss of trees within the 10 m operational RoW (where deep-rooted trees are not allowed, but herbaceous vegetation and shrubs are permitted). During construction the RoW will hinder movement, and this may potentially limit access to foraging and nesting habitat and may impact on behavioural patterns. After construction has been completed the areas outside the permanent 10 m RoW will be reinstated but within the permanent RoW, the removal of trees causes partial habitat loss. The long-term effect of this partial habitat loss on chimpanzee habitat usage, movement and community structure is currently unknown.

The magnitude is large as the initial loss of nest and forage trees and the hindrance to movement by the 30 m construction RoW may fundamentally affect the character and composition of chimpanzee groups and may cause a decline in abundance and/or change in distribution. The duration is medium as revegetation within the RoW may take 5-10 years and the establishment of trees of a suitable height for nesting¹⁰ (outside the permanent 10 m RoW) up to 15 years¹¹. The extent is evaluated as national (owing to a national and international status as endangered) and the sensitivity ranking is considered to be very high. Based on present knowledge the impact is significant (significance score 20) but will be re-assessed upon completion of the presently ongoing study.

Disturbance or Harm to Wildlife

Impact: Disturbance to chimpanzees

Pipeline construction activities will disturb chimpanzees through noise, vibration and the movement of construction vehicles. This may cause the displacement of chimpanzees from habitat near these sources, resulting in increased pressure on resources in remaining habitat.

Disturbance from noise and vibration may cause stress with the level of impact depending on noise intensity, vibration and human activity and the proximity of chimpanzee habitat to the sources. Chimpanzees hear one octave higher than humans and are therefore likely to be impacted more by high pitched noises than humans. As the distribution of chimpanzee habitat in the area is not fully

¹⁰ studies of nesting chimpanzees in the human-dominated landscape between Budongo and Bugoma forests found a mean nest height of 10.9 m (McArthy 2016).

¹¹ Based on estimates of growth rates of typical nest trees listed in McArthy 2016 and Kew gardens database

understood, the effects of this disturbance may cause temporary displacement from sections of their home range.

Chimpanzee group displacement may result in a larger number of chimpanzees having to depend on fewer resources as a result of habitat reduction. This may lead to inter- and intracommunity conflict that can even result in mortality (Arcus Foundation, 2018).

If conditions do not allow chimpanzee groups with a home range that overlaps the RoW to move away from noise, stress may decrease the biological fitness of individuals (Arcus Foundation, 2018) and increase interactions with humans because of attempts to avoid areas of disturbance. Such interactions with communities could potentially further exacerbate the human - wildlife conflict observed in the region (McLennan 2008.)

There is potential for chimpanzees to habituate to constant and consistent levels of noise over time, provided that they do not perceive it as a threat, but the duration of activities will be too short for habituation.

This impact is of medium to long-term duration and national extent (owing to a national and international status as endangered) and chimpanzees are ranked as being of very high sensitivity. The overall impact is of medium magnitude owing to the potential effect that disturbance may have on feeding and nesting behaviour. Based on present knowledge the impact is significant (significance score 18-19) but will be re-assessed upon completion of the presently ongoing study

Location: Wambabya FR

Disturbance or Harm to Wildlife

Impact: Noise and visual disturbance to species of conservation importance using the adjacent reserve

In addition to chimpanzees, the Wambabya FR supports the following species of conservation importance:

- African golden cat (*Caracal aurata*) – IUCN vulnerable, Uganda endangered
- African clawless otter (*Aonyx capensis*) – IUCN near threatened, Uganda vulnerable
- long-tailed pangolin (*Phataginus tetradactyla*) – IUCN vulnerable, Uganda endangered.

Several butterfly species of conservation interest (Ugandan vulnerable to critically endangered) and two dragonflies, *Chlorocypha victoriae* (IUCN least concern and Uganda vulnerable) and *Neodythemis afra* (IUCN least concern and Uganda critically endangered), were recorded in Wambabya FR and the surrounding area.

There will be no direct impacts on the reserve during construction. However, as the RoW passes about 40 m from the reserve, there may be indirect disturbance of species using the reserve from noise and activity from people and machinery. The mammals described above are most vulnerable to this indirect impact. As the indirect impact is of transient duration and low magnitude, it is not significant.

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat, and noise and visual disturbance during construction for grey parrot.

The grey parrot typically inhabits dense forest, but it is commonly observed in other habitats such as forest edges, clearings, wooded savannah, cultivated areas and even gardens. Grey parrots are of very high sensitivity (IUCN endangered and Uganda vulnerable). This species was observed in the Wambabya FR during baseline surveys, but they may be present in supporting habitat around the reserve as they use a wide variety of habitats. Nests are formed in tree cavities and any tree felling in this area has the potential to cause a loss of breeding and forage habitat for this species. Where direct habitat is avoided, there are indirect impacts on species in surrounding habitats through noise and disturbance during site clearance and construction. The grey parrot, although of very high sensitivity, is versatile and the potential magnitude of the impact is small. The impact extent is national (owing to the importance of the local population at a national level) and the duration is short as habitats along the RoW will be reinstated. As such, the potential direct impact is not significant.

Location: Kafu Crossing (KP36–37), Nabakazi River (KP141–148) and Associated Habitats**Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife**

Impact: Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance

The proposed open cut crossing of the Kafu and Nabakazi Rivers will cause direct short-term habitat loss for endemic birds reliant on papyrus swamp. A species of high sensitivity using this habitat type is a bird, the papyrus gonolek (*Laniarius mufumbiri*) which is IUCN near threatened and Uganda vulnerable. Intact papyrus swamp at KP113 and swamp habitat around the Nabakazi River are likely to support a range of amphibians and sitatunga (*Tragelaphus spekii*; Uganda vulnerable) were recorded at this location during the baseline surveys. In addition, the construction activities will cause indirect noise and disturbance that may restrict the activity of birds near construction.

Habitat loss is the primary threat to sitatunga, with the increasing loss of wetlands and suitable habitat throughout their range cutting off former dispersal routes and many populations becoming increasingly isolated. Papyrus swamp can regenerate easily and rapidly and therefore the impacts are of short duration and small magnitude. The species are of high sensitivity and the extent of the impact local. As such, the direct and indirect potential impact is considered to be not significant.

Location: Wetland on Northern Edge of Taala FR (79–80)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat supporting species of conservation importance and noise and visual disturbance during construction

The RoW passes through about 4.3 km of the Taala FR from KP78–82.5 which mostly comprises degraded habitats with eucalyptus plantations, maize fields and a large village. However, there is a small patch (1 ha) of papyrus swamp 1.3 ha of which would be affected at KP79–80. Baseline surveys in this area identified species of conservation importance: two butterflies (*Prosopalpus styła* (Uganda vulnerable), and *Actinote pentapolis* (Uganda vulnerable)), a dragonfly *Acisoma inflatum* (Uganda vulnerable) and the spot-necked otter (*Hydrictis maculicollis*); IUCN near threatened, Uganda endangered). Site clearance will cause the short term loss of the papyrus swamp used by these species for breeding and foraging. However, as papyrus regenerates easily and rapidly, this direct impact will be short term and is therefore not significant.

Locations: Secondary Acacia sp. Woodland, Bushland and Wooded Grassland (KP99.5, 276.5, 201.5, 217.5, 191.2 and 178.8) and Swampy Grassland with Occasional Woody Species (KP122.7, 164.9 and 201.1)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the endemic evergreen scrambling shrub *Blepharispermum pubescens*.

Clearance of secondary *Acacia* sp. woodland, bushland and wooded grassland of low bioquality and, swampy grassland with occasional woody species of low bioquality will cause the loss of individual endemic evergreen scrambling shrubs (*Blepharispermum pubescens*). This direct impact is of medium magnitude and long duration on a species of low sensitivity to change, and is therefore not significant.

Locations: Swampy Grassland with Occasional Woody Species (KP93.1)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the endemic *Leucas calostachys*

Clearance of swampy grassland with occasional woody species of low bioquality for pipeline construction will cause the loss of individuals of the endemic shrub *Leucas calostachys*. This direct impact is of medium magnitude and long duration on a species of low sensitivity to change, and is therefore not significant.

Location: Swamp Forest (KP106.0) and Papyrus Swamp (KP 112.6)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the vascular plant *Mondia whitei* (Uganda vulnerable)

Swamp forest at KP106 and papyrus swamp (KP 112.6) of low bioquality will be cleared for pipeline construction causing the loss of individuals of the Uganda vulnerable vascular plant *Mondia whitei* (WCS 2016). The local abundance of this

perennial woody climber is uncertain. There is potential for this species to inhabit other areas of wetland forests in the RoW. The direct impact is of medium magnitude and long duration on a species of moderate sensitivity, and is therefore not significant.

Location: Katonga River (KP165)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat supporting high-sensitivity species, and noise and visual disturbance during construction

The Katonga River and its riparian habitat support several species of conservation interest:

- spot-necked otter (*Hydricus maculicollis*) - IUCN near threatened
- hippopotamus (*Hippopotamus amphibius*) - IUCN vulnerable and Uganda vulnerable
- leopard (*Panthera pardus*) - IUCN vulnerable and Uganda vulnerable
- tree pangolin (*Phataginus tricuspis*) - IUCN vulnerable and Uganda vulnerable
- Temminck's ground pangolin (*Smutsia temminckii*) - IUCN vulnerable and Uganda vulnerable
- sitatunga (*Tragelaphus spekii*) - IUCN least concern, Uganda vulnerable.

The open-cut crossing of the river will cause short term loss of riparian habitat and swamp that may be used by these species for feeding and breeding. In addition, construction could present a physical barriers which inhibits the movement of species using the watercourse with further disturbance caused by noise and activity by people and machinery.

Species like the sitatunga that are sensitive to human activity and tree pangolins that have low reproductive rates are more likely to be affected by the temporary loss of habitat and disturbance. However, as the construction will be temporary and habitats reinstated once complete, this direct and indirect impact is considered not significant.

Location: Wetland and Ponds Supporting Golden-Throated Rocket Frog (KP187)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and direct mortality to Golden-throated rocket frog

Any construction activities directly affecting ponds or wetlands at KP187, where the golden-throated rocket frog (*Ptychadena chrysogaster*) was identified, has the potential to cause mortality or injury to this species which is IUCN least concern and Uganda vulnerable. The species is of high sensitivity, but the impact duration is short, as habitat loss will be temporary, the magnitude of the impact is considered to be moderate because mortality of species could affect their long-term success, and the extent local. As such, this direct impact is considered to be not significant.

Location: Valleys in Southern Uganda (KP203–270)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of breeding and foraging habitat and noise and visual disturbance to grey crowned cranes

Grey crowned crane inhabit wetland habitats and are associated with valleys in southern Uganda. They are of very high sensitivity owing to their IUCN and Ugandan endangered status. Vegetation clearance in suitable habitat will cause direct loss of breeding and foraging habitat. As pressure on wetland habitats through human activities is already large, any additional habitat loss and disturbance could cause population loss.

These potential direct and indirect impacts on species of very high sensitivity are of short duration; national extent (owing to their national importance) and medium magnitude (as it affects a portion of a population and may bring about a change in abundance and/or distribution over more than one generation, but does not threaten the integrity of that population). As such, the impact is considered to be significant.

Location: MCPY4 at KP283

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of breeding and forage habitat and noise and visual disturbance to Bunyoro rabbit (*Caprolagus marjorita*) from MCPY4

The Ugandan vulnerable species Bunyoro rabbit was identified at the site of the proposed MCPY4. Although the land use here is mainly agricultural it is being used by this species for foraging and breeding. The clearance of land for the camp will cause a loss of breeding and forage habitat for this species. In addition the noise and visual disturbance from the increased activity of people, vehicles and machinery in the area is likely to cause this high sensitivity species to be temporarily displaced from the area.

These potential direct impacts on species of high sensitivity are of short duration, local extent and medium magnitude, and are therefore considered not significant.

Location: Disused Airstrip and Associated Borrow Pits (KP288–289)

Disturbance or Harm to Wildlife

Impact: Noise and visual disturbance to bird and fauna species using the adjacent borrow pits causing a restriction in species' distributions

The RoW passes approximately 500m from a disused airstrip at KP288 in the Sango Bay area (an Important Bird Area (IBA), covering 54,000ha). Next to the airstrip are flooded abandoned borrow pits which are used by a variety of avifauna and fauna species, including:

- white-backed duck *Thalassornis leuconotus* (Uganda vulnerable)
- rufous-bellied heron *Ardeola rufiventris* (IUCN least concern, Uganda vulnerable and congregatory)

- Bohor reedbuck *Redunca redunca* (IUCN least concern, Uganda endangered)

The construction of the RoW has the potential to cause adverse impacts on species of conservation interest using the borrow pits through increased noise and visual disturbance. This may cause short term abandonment of nest and forage sites by birds. This indirect impact is of medium magnitude, short duration will affect species of high sensitivity; and is considered not significant.

Ecosystem Services

As described in Section 8.3.2.1, the impacts on species of conservation importance will have indirect impacts on ecosystem services should those species be used for provisioning services. Of the species of conservation interest described in the location-specific section, the following plants and animals are considered to provide specific ecosystem services:

- Temmick's ground pangolin and tree pangolin – collection of medicinal products, as it is used in traditional medicine
- leopard – trophy hunting and for illegal international trade
- birds, game and some plants – food (hunting, gathering and foraging)
- woody plant species (including collection for fuel and charcoal manufacture).

8.3.2.2 Operation

Generic Impacts

Disturbance or Harm to Wildlife

Impact: Maintenance activities causing minor habitat loss and alteration

The only generic impact that may affect species of conservation importance during project operations is the maintenance activities to manage scrub and tree establishment along the RoW through clearance by hand. These activities may cause injury or mortality to fauna species using these habitats. Maintenance activities will affect only very small areas and therefore this impact is considered not significant.

Location-Specific Impacts

There are no location-specific impacts on flora and fauna species of conservation interest.

Ecosystem Services

There are no potential impacts on ecosystem services during the operation phase as impacts during this phase are limited to minor maintenance activities which will only affect small areas for very short periods of time.

8.3.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect biodiversity impacts.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key

mitigation measures presented in this section, and the associated management plan and other measures that are included in Appendix E4 have been collectively used to assess residual impacts, and to determine their significance.

8.3.3.1 Design

Generic Mitigation Measures

Treatment and Disposal of Known and Unknown Contamination; Disposal of Solid and Liquid Waste; and Accidental Release of Oil and Chemicals

The construction waste management plan will be based on the following elements:

- avoidance – establishing contracts to allow return of excess product and packaging
- reduction – construction processes to reduce waste generation (e.g., accurate calculation of concrete mixes) and waste reduction techniques (e.g., reduce volume of waste materials)
- reuse and recycling – all categories of waste will be segregated to facilitate recycling and reuse. Waste materials which cannot be recycled locally or shipped to recycling facilities (e.g., plastics) will be treated at site.

Disposal of Surplus Water from Working Areas and Hydrotest Water

Each pipeline section will be dewatered after completion of the tests. The water will be reused to test the next section via a temporary connection. Upon completion of the hydrostatic testing, the water will be released as described in the project description and meeting water quality discharge standards.

Impeded Flow of River or Channel

Design mitigation measures are the same as those described for habitats in Section 8.2.3.

Abstraction of Water from River or Channel

Design mitigation measures are the same as those described for habitats in Section 8.2.3.

Abstraction of Groundwater

The primary source of water for pipeline hydrostatic testing will be surface water. If enough surface water is not available to make up losses incurred during testing, groundwater may be used. An application for a drilling and ground water use permit which would include mitigation measures would be submitted to local water management authorities.

Management of Black and Grey Water

As outlined in the project description (Section 2), there will be a sewage treatment plant at each MCPY for the treatment of black and grey water with discharge of effluent to discharge quality standards and periodic removal of sewage sludge for treatment at an approved waste management facility. An alternative is the use of septic tanks and tanker transfer of sewage/effluent to a project facility for processing.

Loss of Habitat to Species of Conservation Importance

Design mitigation measures are the same as those described for habitats in Section 8.2.3.

Introduction of AIS, or Plant or Animal Diseases

Design mitigation measures are the same as those described for habitats in Section 8.2.3.

Disturbance or Harm to Wildlife

Route selection and methods for construction through wetlands and rivers, as described in the habitats section (8.2.3) have helped to reduce potential impacts on wildlife.

Impeded Movement of Animals and People

Route selection and methods for construction through wetlands and rivers as described in the habitats section (8.2.3) have helped reduce potential impacts on wildlife.

Open Excavations

There are no design phase mitigation measures specific to this impact.

Location-Specific Mitigation Measures

Design mitigation measures are the same as those described for habitats in Section 8.2.3.

8.3.3.2 Construction

Generic Mitigation Measures

Treatment and Disposal of Known and Unknown Contamination; Disposal of Solid and Liquid Waste and; Accidental Release of Oil and Chemicals

Impact: Injury or mortality of flora and fauna due to mobilisation of soil contaminants

Impact: Mortality of flora and fauna through contamination of food and water supply

Impact: Stress or mortality of flora and fauna due to spills of hazardous materials into watercourses

The pollution prevention plan and waste management plan will include measures to manage contamination, waste and accidental oil and chemical releases.

The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from surface waters; storage will be covered, bunded (no drainage valves/holes) and have an impermeable floor. A refuelling procedure will be developed to address mobile and static refuelling, spill prevention techniques and training will be included as part of the pollution prevention plan.

Areas of contamination identified before construction within the project footprint will be remediated before or during construction. Contaminated material will be temporarily stored in impermeable bunds and covered to prevent contaminated runoff and airborne losses. In the event of accidental spills, a trained rapid response

team will be mobilised to contain, clean and remediate polluted locations; spill response equipment will be available at all work site locations.

Although the pre-mitigation impacts are considered not significant, the application of the above measures will further reduce impact; the residual impacts will still have a medium duration but the magnitudes are reduced from medium to small or negligible.

Impact: Stress or mortality of flora and fauna due to disposal of solid and liquid waste

The pollution prevention plan and waste management plan will include measures to manage floral or faunal stress from waste spills.

The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from surface waters; storage will be covered, bunded (no drainage valves/holes) and have impermeable floor. In the event of accidental spills, a trained rapid response team will be mobilised to contain, clean and remediate polluted locations; spill response equipment will be available at all work site locations.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Impact: Increase in vermin around any established waste dumps and consequent increase in prey availability for carnivorous birds and mammals

The occupational health, safety and security plan and the waste management plan will include measures that manage vermin.

Worker food requirements will be planned with a focus to reduce food waste; waste will be managed as per the waste management plan that will detail waste collection, segregation, treatment, storage, transfer and final disposal.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Disposal of Surplus Water from Working Areas and Hydrotest Water

Impact: Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, and degradation of spawning habitat.

The pollution prevention plan and waste management plan will include measures that manage effects on surface water and aquatic ecology.

An environmental evaluation will be completed for potential treated wastewater discharge locations; the results will inform the development of location-specific mitigation.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impeded Flow of River or Channel

Impact: Restriction of fish (ranging from non-migratory to potamodromous fish species) movement and reduced reproductive success, impaired movement of other aquatic organisms and reduced habitat suitability

The biodiversity management plan, natural resource management plan and the pollution prevention plan will include measures that manage effects on fish and aquatic habitat.

During open-cut watercourse crossing activities, bank and bed material will not be placed where flow or drainage will be obstructed. If dams and pumps are used to maintain water flow then fish screens will be used on the end of the pump inlet hose; fish caught within dammed areas either side of the crossing will be transferred up or downstream as appropriate by suitably experienced personnel.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Abstraction of Water from River or Channel

Impact: Decreased water level from water abstraction for project use leading to loss of aquatic and water-margin habitats, causing reduced spawning activity

Impact: Mortality to aquatic organisms from the river through direct abstraction

The biodiversity management plan and natural resource management plan will include measures that manage habitat loss, effects on spawning and mortality of aquatic organisms.

Flow, water level or water volume in the waterbody will be assessed before abstraction and monitored during abstraction to evaluate compliance with permit conditions; suitably sized fish screens will be fitted to water inlet hoses.

Although the pre-mitigation impacts are considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impacts are reduced from medium to small and small to negligible respectively.

Management of Black and Grey Water

Impact: Injury or mortality of flora and fauna from surface water contamination

The waste management plan and natural resource management plan will include measures that manage black and grey water.

Grey water will be separated from black water, treated to meet legislation and project discharge standards and permit conditions. Treated wastewater will be reused where possible.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to negligible, duration is reduced from long term to short term and extent reduces from regional to local.

Abstraction of Groundwater

Impact: Decreased water level from water abstraction for project use leading to loss of habitat for stygofauna

The natural resource management plan will include measures that manage effects on stygofauna.

Hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points; if significant adverse impacts are predicted then alternative borehole locations will be considered.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Loss of Habitat for Species of Conservation Importance

Impact: Permanent loss of breeding and foraging habitat for fauna through site clearance for construction

The biodiversity management plan will include measures that manage permanent habitat loss.

Pre-construction surveys within the RoW are planned to identify whether action is required to protect species during construction in the RoW; and, a vegetation removal method statement will be developed to control activities such as tree felling and ensure vegetation outside the RoW is not impacted. These surveys will inform location-specific biodiversity management plans that will consider micro routing to avoid impacts or additional conservation measures to achieve no net loss to biodiversity.

The pre-mitigation impact is significant, however, application of mitigation described above will reduce magnitude of impact from large to small and hence the residual impact is not significant.

Impact: Temporary loss of breeding and foraging habitat for fauna through site clearance for construction

The biodiversity management plan will include measures manage temporary habitat loss.

Pre-construction surveys within the RoW are planned to identify whether action is required to protect species during construction in the RoW; and, a vegetation removal method statement will be developed to control activities such as tree felling and ensure species outside the RoW are not impacted. These surveys will inform location-specific biodiversity management plans that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impact: Temporary habitat fragmentation causing disrupted species movement during construction of RoW

The biodiversity management plan will include measures that manage temporary habitat fragmentation.

The total duration of construction disturbance will be minimised and location-specific biodiversity management plans produced that allow for progressive, active habitat restoration; ways to achieve an increasing trend in vegetation regrowth and diversity of desired species will be explored.

The pre-mitigation impact is considered significant, however, application of mitigation described above will reduce magnitude of impact from large to medium and duration from medium to small; hence the residual impact is not significant.

Introduction of AIS, or Plant or Animal Diseases

Impact: Modified habitats from alien invasive species establishment leading to increased competition and loss of habitat for breeding and foraging

The biodiversity management plan will include measures that manage alien invasive species and plant or animal diseases.

Biosecurity measures will be developed and implemented measures to prevent the introduction or spread of alien invasive, and for weed and pest control.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Disturbance or Harm to Wildlife

Impact: Mortality of fauna species of conservation importance from movement of vehicles and presence of construction plant and structures

The biodiversity management plan, community health, safety and security plan and the transport and road safety management plan will include measures that contribute to the management of faunal mortality.

Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Pre-construction surveys will be completed to inform site-specific biodiversity management plans that will address species related seasonal constraints. Welded pipe sections will be capped to prevent fauna entering; fauna ladders will be placed in open excavations and morning trench inspection will be conducted.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small and the duration from medium to short term.

Impact: Increased predation owing to removal of habitat used to shelter and forage

The biodiversity management plan will include measures that contribute to management of increased predation rates.

Pre- construction surveys within the RoW are planned to identify whether action is required to protect species during construction in the RoW; a vegetation removal method statement will be developed to ensure vegetation outside the RoW is not impacted; in areas of high biodiversity value the area will be reviewed to determine if the working width can be reduced and a strategy for tree removal and replanting, minimising habitat loss, will be developed.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Impact: Increased gathering of flora and hunting of fauna species of conservation importance from PIIM to construction camps facilitated by improved access along new or upgraded project access roads and along the RoW during construction and reinstatement.

The biodiversity management plan, labour management plan, community health, safety and security plan and the stakeholder engagement plan will include measures that contribute to the control of impacts associated with this aspect.

Construction camps will be “closed” to reduce interaction between workers and the environment. Employment opportunities will be communicated to communities to reduce the numbers of people collecting around camps in the hope of employment and the project induced in-migration management plan will aim to reduce in-migration. Additionally, local communities will be discouraged from using the right-of-way as an access road and, hunting, fishing, unauthorised gathering of products and deliberate disturbance or harassment of fauna will be prohibited for project personnel.

The pre-mitigation impact is considered significant, however, application of mitigation described above will reduce magnitude of impact from large to medium hence the residual impact is not significant.

Impact: Disturbance from activities causing noise, vibration, human and vehicle activity affecting breeding and or behaviour of animals

The pollution prevention plan will include measures to control and manage project emissions; this, with measures described in the biodiversity management plan, the community health, safety and security plan, the occupational health, safety and security plan, the project induced in-migration plan and the transport and road traffic management plan will manage faunal disturbance.

Project noise emissions will not exceed project emission limits and noise and vibration impacts will be assessed where piling is to be undertaken. The total duration of construction disturbance will be minimised. Vehicle movements will be restricted to defined access routes and demarcated working areas (unless in the event of an emergency). Construction camps will be “closed” status to reduce interaction between workers and the environment.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Open Excavations

Impact: Injury or fatality of fauna from falling into excavations if they cannot escape or where they are at increased risk of predation

The biodiversity management plan will include measures that manage the risk of injury or fatality of fauna from construction activity.

Fauna ladders will be placed at suitable intervals in all open excavations and trapped animals will be safely removed and released into suitable habitat away from working areas; the maximum length of open trench at any one time (per spread) will be managed depending on the sensitivity of the habitat and species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Ecosystem Services

All aspects described in the generic impacts section have the potential to affect ecosystem services. Any aspect which affects animals or plants that are used by local people for food, fuel or medicine will cause an effect on provisioning ecosystem services delivered by these species. However, the significance of the impact on ecosystem services is difficult to be quantified as it depends on how reliant each community is on the particular ecosystem service and whether there are any alternatives available. However, as impacts to species of conservation importance are considered to be not significant it is determined that associated impacts on ecosystem services are also likely to be not significant.

Location-Specific Mitigation Measures

Location: KP6, 165, 187, 218–231 and 289

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and disturbance to Bohor reedbuck

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measure to manage the effects on Bohor reedbuck.

An increasing trend in vegetation regrowth and diversity of desired species (specifically species composition) and, plant species that support forage and refuge for species of conservation importance will be explored. In addition, seasonal constraints will be evaluated to limit disturbance on sensitive species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Location: Wambabya–Bugoma Corridor (KP0–20)**Loss of Habitat to Species of Conservation Importance**

Impact: Loss of chimpanzee habitat

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measures that will contribute to the management of loss of chimpanzee habitat.

A biodiversity survey strategy will address timings and methods for pre-construction surveys, the establishment of a reduced working width in sensitive habitats, identification of seasonal constraints and measures to keep construction duration to a minimum. Pre-construction surveys will also aim at retaining as many trees as possible, in particular food species and nesting trees. Site-specific reinstatement measures will be developed and implemented to promote a reinstatement programme that aims to achieve a species composition that provides refuge, forage, and nesting for species of conservation importance.

In addition the following mitigations will specifically address chimpanzees:

- The ongoing chimpanzee faecal DNA and movement study will extend cover an annual cycle before construction begins. The results of the study will be used to reassess impacts and inform additional enhancement and conservation measures, particularly regarding the maintenance of chimpanzee movement corridors.
- The project will partner with forest conservation initiatives within the Albertine Graben which will also be of benefit for chimpanzees. The selected initiatives would address the development and implementation of forest management and restoration plans with the involvement of communities to improve:
 - o sustainable management of forest areas to maintain natural resource availability and the supply of ecosystem services for local communities
 - o connectivity between forest blocks
 - o improve management of forested protected areas, such as Budongo, Wambabya and Bugoma Forest Reserves within the wider landscape.

Chimpanzee groups will be monitored pre and post construction with adaptive management in response to findings.

Although the pre-mitigation impact is considered significant, the application of mitigation described above should reduce magnitude of impact from large to medium; the residual impact is not significant (significance score of 18).

Disturbance or Harm to Wildlife

Impact: Disturbance to chimpanzees

In addition to the generic mitigation addressing habitat loss described above, the biodiversity management plan will include the following measures to manage the effect of disturbance on chimpanzees.

Construction will be avoided during sensitive periods and the surveys will confirm the seasonality of habitat use, with the total duration of construction disturbance also being kept to a minimum. Chimpanzee groups will be monitored pre and post construction with adaptive management in response to findings.

The application of the above measures should reduce the magnitude of the residual impact from medium to small; the residual impact (significance score of 15-16) is not significant.

Location: Wambabya FR

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Noise and visual disturbance to species of conservation importance using the adjacent reserve

In addition to the generic mitigation addressing habitat loss and disturbance described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measure that will contribute to managing effects on flora and fauna of conservation concern using the adjacent reserve.

Seasonal constraints will be evaluated to limit disturbance on sensitive species and a vegetation removal method statement developed and implemented to reduce impacts on biodiversity in adjacent protected areas. Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Impact: Loss of habitat, and noise and visual disturbance during construction for grey parrot.

In addition to the generic mitigation addressing habitat loss and disturbance described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measure that will manage the effects on grey parrot.

An increasing trend in vegetation regrowth and diversity of desired species (specifically species composition) and, plant species that support forage, refuge and nesting for species of conservation importance will be explored. In addition, seasonal constraints will be evaluated to limit disturbance on sensitive species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Location: Kafu Crossing (KP36–37), Nabakazi River (KP141–148) and Associated Habitats

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance

In addition to the generic mitigation addressing habitat loss and disturbance described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measure that will manage the effects on papyrus specialists, endemics and other species of conservation importance.

Total duration of construction disturbance will be minimised and a river crossing plan will be developed and implemented which may include population monitoring

pre and post construction with adaptive management if required in response to findings.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Location: Wetland on Northern Edge of Taala FR (79–80)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat supporting species of conservation importance and noise and visual disturbance during construction

In addition to the generic mitigation addressing habitat loss and disturbance described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measure that will manage the effects on species of conservation importance.

An increasing trend in vegetation regrowth and diversity of desired species (specifically species composition) and, plant species that support forage, refuge and nesting for species of conservation importance will be explored. Total duration of construction disturbance will be kept to a minimum.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Locations: Secondary Acacia Species Woodland, Bushland and Wooded Grassland (KP99.5, 276.5, 201.5, 217.5, 191.2 and 178.8) and Swampy Grassland with Occasional Woody Species (KP122.7, 164.9 and 201.1)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the endemic evergreen scrambling shrub *Blepharispermum pubescens*

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measures that will manage effects on *Blepharispermum pubescens*.

A biodiversity survey strategy will be developed for flora. Where a section of the RoW is through habitats which support species of conservation importance, the area will be reviewed to determine if the working width can be reduced to limit impacts.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact from medium to small.

Locations: Swampy Grassland with Occasional Woody Species (KP93.1)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the endemic *Leucas calostachys*

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measures that will manage the effects on *Leucas calostachys*.

A biodiversity survey strategy will be developed for flora. Where a section of the RoW is through habitats which support species of conservation importance (i.e., *Leucas calostachys*), the area will be reviewed to determine if the working width can be reduced to limit impacts.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Location: Swamp Forest (KP106.0) and Papyrus Swamp (KP112.6)

Loss of Habitat to Species of Conservation Importance

Impact: Loss of habitat supporting the vascular plant *Mondia whitei* (Ugandan Red Listed vulnerable (WCS 2016)).

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measures that will manage effects on *Mondia whitei*.

A biodiversity survey strategy will be developed for flora. Where a section of the right-of-way is through habitats which support species of conservation importance, the area will be reviewed to determine if the working width can be reduced to limit impacts.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Location: Katonga River (KP165)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat supporting high-sensitivity species and noise and visual disturbance during construction

In addition to the generic mitigation addressing habitat loss and disturbance described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measure that will contribute to the management of habitat loss and disturbance.

Total duration of construction disturbance will be minimised and species population will be monitored pre and post construction with adaptive management if required in response to findings.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from large to medium.

Location: Wetland and Ponds Supporting Golden-Throated Rocket Frog (KP187)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of habitat and direct mortality to golden-throated rocket frog

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measure to manage the effects on Golden-throated rocket frog.

Pre-construction surveys within the RoW are planned and any discovered individuals will be translocated to ponds outside the RoW.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

Location: Valleys in Southern Uganda (KP203-270)

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of breeding and foraging habitat and noise and visual disturbance to grey crowned cranes.

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the following measures to manage loss of breeding and foraging habitat and disturbance to grey crowned cranes.

A biodiversity survey strategy will be developed to include timings and methods of surveys to be undertaken. An increasing trend in vegetation regrowth and diversity of desired species (specifically species composition) and, plant species that support forage, refuge and nesting for grey crowned cranes will be explored. In addition, seasonal constraints will be evaluated to limit disturbance on sensitive species.

The pre-mitigation impact is considered significant, however, application of mitigation described above will reduce the magnitude of the impact from medium to small; hence, the residual impact is not significant.

Location: MCPY4 at KP283

Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife

Impact: Loss of breeding and forage habitat and noise and visual disturbance to Bunyoro rabbit from MCPY4

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan and reinstatement plan will include the

following measures to manage loss of breeding and foraging habitat and disturbance to.

An increasing trend in vegetation regrowth and diversity of desired species (specifically species composition) and, plant species that support forage, refuge and nesting for Bunyoro rabbit will be explored.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from small to negligible.

Location: Disused Airstrip and Associated Borrow Pits (KP288–289)

Disturbance or Harm to Wildlife

Impact: Noise and visual disturbance to bird and fauna species using the adjacent borrow pits causing a restriction in species' distributions

In addition to the generic mitigation addressing habitat loss described in Section 8.3.3.2, the biodiversity management plan will include the following measure that will manage the effects on bird and fauna species using the adjacent borrow pits.

Seasonal constraints will be evaluated to limit disturbance on sensitive species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the residual impact is reduced from medium to small.

8.3.3.3 Operations

Generic Mitigation Measures

Disturbance or Harm to Wildlife

Impact: Maintenance activities causing minor habitat loss and alteration

The biodiversity management plan will include measures to manage habitat loss and alteration.

The project will develop and implement a maintenance plan for the control of vegetation around AGIs and along the RoW; this will include information on the relevant habitat and species of conservation importance with recommended action to reduce impacts on these habitats and species such as nesting checks and avoidance of work during sensitive periods.

This will reduce the impact from small to negligible; the residual impact is not significant.

Location-Specific Mitigation Measures

There are no location-specific impacts on species of conservation importance during the operation phase and therefore no mitigation measures are required.

8.3.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on biodiversity after mitigation has been implemented, following the order in Table 8.3-1 and focusing on those impacts that are significant.

8.3.4.1 Generic and Location-Specific Impacts

Table 8.3-1 summarises the potential generic biodiversity impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.3-2 summarises location-specific impacts.

Table 8.3-1 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Treatment and disposal of known/unknown contamination	Injury or mortality of flora and fauna through mobilisation of soil contaminants	C	–	Pollution Prevention Plan	4	3	2	5	14
Disposal of solid and liquid waste and accidental release of oil and chemicals	Mortality of flora and fauna through contamination of food and water supply	C	–	Pollution Prevention Plan Waste Management Plan	2	2	1	5	10
	Stress or mortality to flora and fauna from spills of waste	C	–	Pollution Prevention Plan Waste Management Plan	2	2	1	5	10
	Increase in vermin around temporary waste storage and consequent increase in prey availability for carnivorous birds and mammals	C	–	Occupational Health, Safety and Security Plan Pollution Prevention Plan Waste Management Plan	2	2	1	5	10
Disposal of surplus water from working areas and hydrotest water	Reduced primary productivity in watercourses, smothering of invertebrates, lethal or sublethal effects on fish, degradation of spawning habitat	C	–	Waste Management Plan Pollution Prevention Plan	4	2	3	5	14
Impeded flow of river or channel	Restriction of fish (ranging from general fish species (nonmigratory) to potanodromous fish) movement and reduced reproductive success, impaired movement and reduced habitat suitability of other aquatic organisms -	C	–	Biodiversity Management Plan Natural Resource Management Plan	4	2	4	3–5	13–15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-1 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Abstraction of water from river or channel	Decreased water level from water abstraction for project use leading to loss of aquatic and water-margin habitats causing reduced spawning activity	C	–	Biodiversity Management Plan Natural Resource Management Plan	4	2	4	3	13
	Mortality to aquatic organisms from the river through direct abstraction	C	–	Natural Resource Management Plan	2	2	2	4	10
Management of black and grey water	Injury or mortality of flora and fauna through surface water contamination	C&O	–	Natural Resource Management Plan Waste Management Plan	2	2	2	4	10
Abstraction of groundwater	Decreased water level owing to water abstraction for project use leading to loss of habitat for stygofauna	C	–	Natural Resource Management Plan	2	2	2	2	8
Loss of habitat for species of conservation importance	Permanent loss of breeding and foraging habitat for fauna through site clearance before construction	C	–	Biodiversity Management Plan	4	5	2	4	15
	Temporary loss of breeding and foraging habitat for fauna through site clearance before construction	C	-	Biodiversity Management Plan	4	2	2	4	12
	Temporary habitat fragmentation causing disrupted species movement during pipeline construction along the RoW	C	–	Biodiversity Management Plan	6	2	4	4	16

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-1 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Introduction of competitive species or plant and animal diseases	Modified habitats caused by non-native species establishment leading to increased competition and loss of habitat for breeding and foraging	C&O	–	Biodiversity Management Plan	4	5	3	4	16
Disturbance or harm to wildlife	Mortality of fauna species of conservation importance from movement of vehicles and presence of construction plant and structures	C	–	Community Health, Safety and Security Plan Biodiversity Management Plan	4	3	2	5	14
	Increased predation from predator species from removal of habitat used to shelter and forage	C	–	Biodiversity Management Plan Labour management plan Community Health, Safety and Security Plan Stakeholder Engagement plan	4	3	2	5	14
	Increased gathering of flora and hunting of fauna species of conservation importance from PIIM to construction camps, from improved access along new or upgraded project access roads and access provided by RoW during construction and reinstatement.	C	–	Project Induced In-Migration Management Plan	6	5	2	4	17

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-1 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact*				
					M	D	E	S	SS
Disturbance or harm to wildlife	Disturbance from activities causing noise, vibration, human and vehicle activity affecting breeding and behaviour of animals	C	–	Pollution Prevention Plan Biodiversity Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Project Induced In-Migration Management Plan Road Traffic Management Plan	4	2	2	5	13
Disturbance or harm to wildlife	Maintenance activities causing minor habitat loss and alteration	O	-	Biodiversity Management Plan	2	1	1	5	9
Open excavations	Injury or fatality of fauna from falling into excavations if they cannot escape or where they are at increased risk of predation	C	–	Biodiversity Management Plan	4	2	2	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-2 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
KP6, 165, 187, 218–231 and 289	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance to Bohor reedduck	C		Biodiversity Management Plan	4	2	2	4	12
KP0–20 Wambabya–Bugoma corridor	Loss of Habitat to Species of Conservation Importance	Loss of chimpanzee habitat	C	-	Biodiversity Management Plan Reinstatement Plan	6	3	4	5	18
KP0–20 Wambabya–Bugoma corridor	Disturbance or Harm to Wildlife	Disturbance to chimpanzee	C	-	Biodiversity Management Plan Reinstatement Plan	4	3 - 4	4	5	16 - 17
KP4.5–8 Wambabya	Disturbance or Harm to Wildlife	Noise and visual disturbance to species of conservation importance using the adjacent reserve	C	-	Biodiversity Management Plan Reinstatement Plan	2	1	2	4	9
KP4.5–8 Wambabya	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat, and noise and visual disturbance during construction for grey parrot.	C	-	Biodiversity Management Plan Reinstatement Plan	2	3	3	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-2 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
KP36–37 Kafu Crossing	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance	C	-	Biodiversity Management Plan Reinstatement Plan	2	2	2	4	10
KP79–80 Wetland on northern edge of Taala FR	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat supporting species of conservation importance and noise and visual disturbance during construction	C	-	Biodiversity Management Plan	4	2	3	4	13
Secondary Acacia sp. woodland, bushland and wooded grassland (KP99.5, 276.5, 201.5, 217.5, 191.2 and 178.8)	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the gold star evergreen scrambling shrub <i>Blepharispermum pubescens</i>	C	-	Biodiversity Management Plan	4	4	4	2	14
Swampy grassland with occasional woody species (KP93.1 and 1001.1)	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the endemic <i>Leucas calostachys</i>	C	-	Biodiversity Management Plan	4	4	4	2	14

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-2 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Swamp forest (KP106.0) and Papyrus swamp (KP 112.6)	Loss of Habitat to Species of Conservation Importance	Loss of habitat supporting the vascular plant, <i>Mondia whitei</i>	C	-	Biodiversity Management Plan	4	4	4	3	15
KP147–148 River Crossing (Nabakazi River)	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and disturbance (noise and visual) during construction on papyrus specialists, endemics and other species of conservation importance	C	-	Biodiversity Management Plan Reinstatement Plan	2	2	2	4	10
KP164–165 Katonga River	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat supporting species of conservation interest, and noise and visual disturbance during construction	C	-	Biodiversity Management Plan Reinstatement Plan	6	2	3	3	14
KP187–187 Wetland	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of habitat and direct mortality for golden throated rocket frog	C	-	Biodiversity Management Plan	4	2	2	4	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.3-2 Flora and Fauna Species of Conservation Importance (Terrestrial and Aquatic) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
KP203–270 approx. Valleys in southern Uganda	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of breeding and foraging habitat and noise and visual disturbance to grey crowned cranes	C	-	Biodiversity Management Plan Reinstatement Plan	4	2	4	5	15
KP283 MCPY4	Loss of Habitat to Species of Conservation Importance and Disturbance or Harm to Wildlife	Loss of breeding and forage habitat and noise and visual disturbance to Bunyoro rabbit from MCPY4	C	-	Biodiversity Management Plan Reinstatement Plan	4	3	3	4	14
KP288–289 Disused airstrip and associated borrow pits	Disturbance or Harm to Wildlife	Noise and visual disturbance to bird and fauna species causing a restriction in species' distributions	C	-	Biodiversity Management Plan	4	2	2	4	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.3.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.3.6 Cumulative Impacts

8.3.6.1 Context

The baseline condition of flora and fauna species of conservation importance in the EACOP project's AOI, the trends and sensitivity to change are described in Section 6.3.1. Residual project impacts are summarised in Table 8.3-1 and Table 8.3-2.

Associated facilities and third party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H. The developments are:

- associated facilities:
 - o Tilenga project (AF01)
 - o Kingfisher oil project (AF02)
- third-party developments:
 - o Lot 4 road upgrade – R4 (Kabaale -Kiziranfumbi) and R5 (Kaseeta-Lwera via Bugoma Forest) (UG19)
 - o the Hoima–Buloba Pipeline (UG08)
 - o the refinery (UG07)
 - o Kabaale International Airport (UG04)
 - o the transmission line to Kabaale Airport (UG05).

The preferred condition is that the number of species remains stable or increases, relative to the background changes in population levels. The limit of acceptable change is a short-term decrease followed by recovery to pre-construction numbers.

8.3.6.2 Cumulative Impacts

Wambabya–Bugoma Corridor

The area between the Wambabya and Bugoma FRs is important for chimpanzees in the adjacent FRs. Riparian corridors allow for movement, provide nesting trees as well as foraging habitat.

As described in Section 8.3.2.1, the construction phase could cause significant impacts on chimpanzees caused by temporary loss of habitat and disturbance.

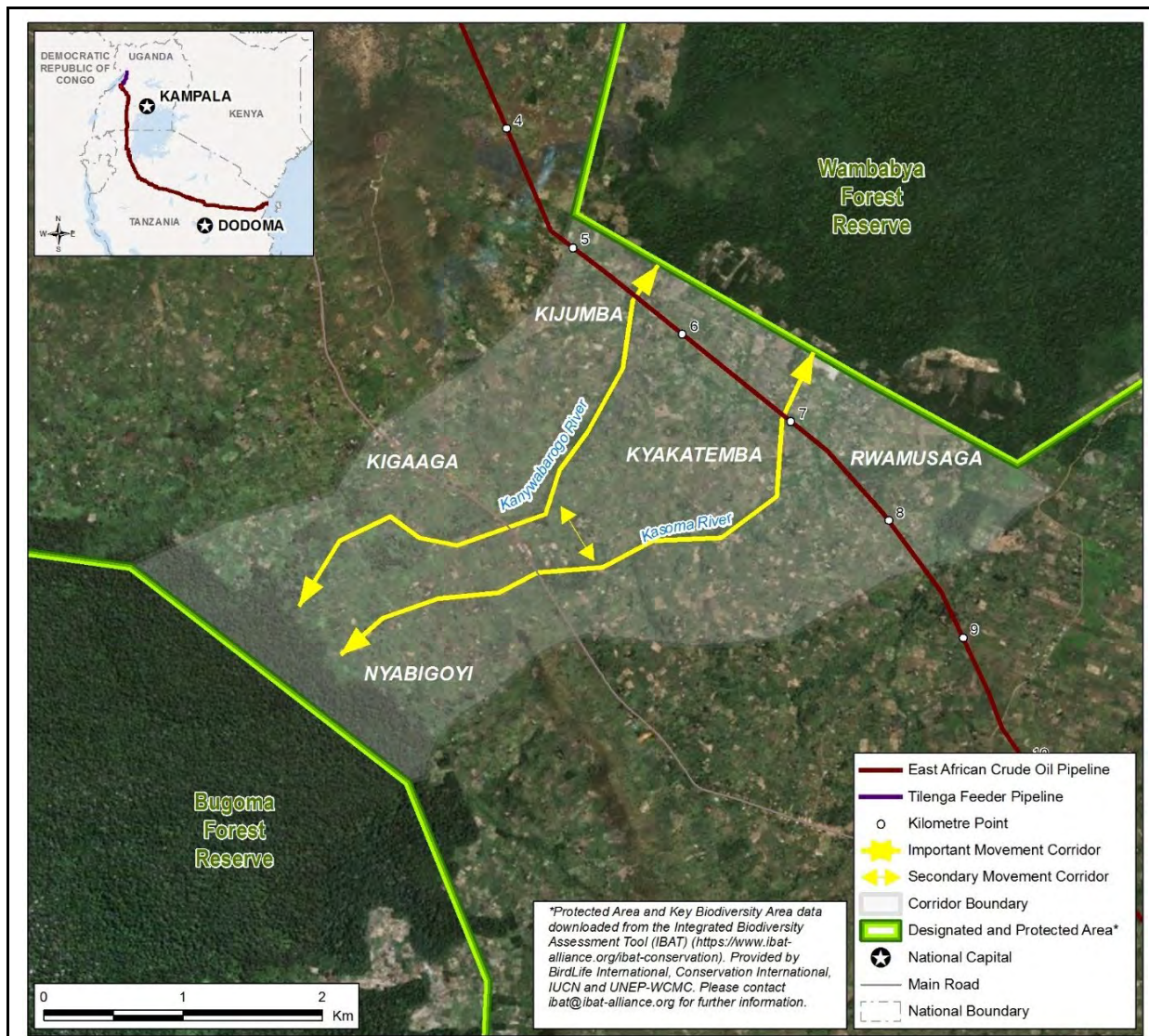


Figure 8.3-1 Wambabya Forest Reserve and the Corridors of Remnant Riparian Forest Linking it to Bugoma Central Forest Reserve

The overhead transmission line (OHTL) to the airport, the Hoima–Buloba pipeline and Lot 4 – R4 (Kabaale -Kiziranfumbi) and R5 (Kaseeta-Lwera via Bugoma Forest) road upgrade all pass through the same area. It is assumed that there would be no habitat loss for the road upgrades as construction should be limited to road surface and shoulder only. The other two projects have varying potential to cause chimpanzee habitat loss. For the OHTL, vegetation clearance along a 40-m-wide RoW is assumed with a 5-m easement kept permanently clear of trees. The Hoima-Buloba pipeline is assumed to be similar to EACOP with a construction RoW of approximately 30 m and an operational RoW of 10 m, which will also be kept permanently clear of trees.

The cumulative impact of these projects operational RoWs within the area between Wambabya and Bugoma will cause permanent loss of chimpanzee habitat.

During the project's operational phase, permanent habitat loss may hinder movement and, potentially, restrict access to food and water sources as well as interfere with behavioural patterns. Although it is predicted in Section 8.3.3.2 that the residual impact of permanent loss of chimpanzee habitat is not significant, the activities of these projects have the potential to increase the cumulative impact significance.

The disturbance on chimpanzees' movement and foraging during construction of the road upgrade, OHTL and Hoima-Buloba pipeline in the area between the two FRs will be similar to those caused by the EACOP project construction. The road and OHTL are more or less parallel to each other and the project RoW at an approximate distance of 2 km. The Hoima-Buloba pipeline is parallel in between the EACOP pipeline and Wambabya FR (see Figure 8.3-2). If concurrent construction is assumed for all three projects, a larger area will be affected by noise and visual disturbance. In the case of EACOP and the Hoima-Buloba pipeline, the proximity of the two projects would cause a combined elevated noise level and higher degree of visual disturbance. Sequential construction would extend the period of disturbance, but the area affected would be smaller. Although it is predicted in Section 8.3.4 that disturbance to chimpanzees residual impacts from the project are not significant, the cumulative activities of these projects have the potential to increase the cumulative impact to significant.

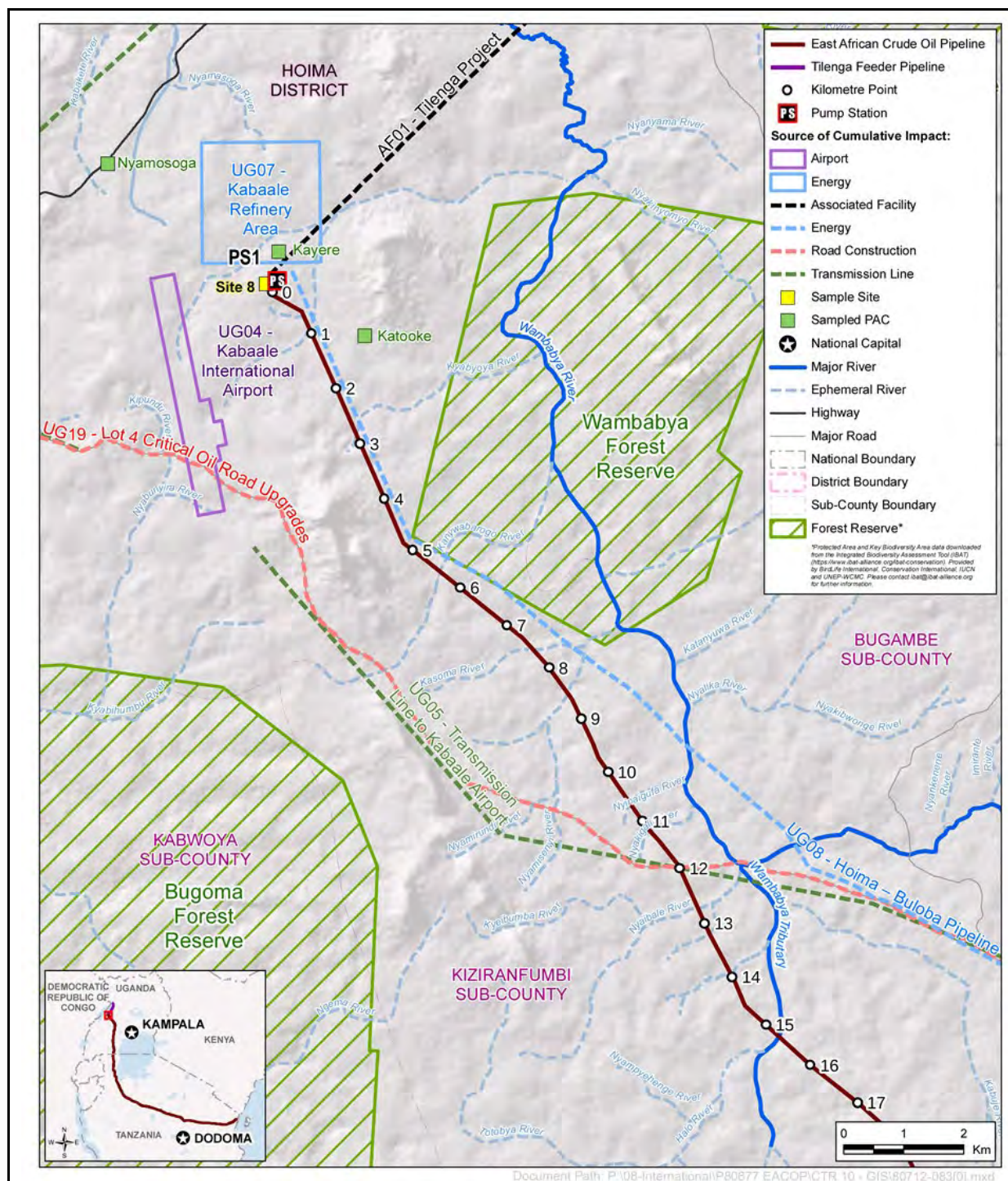


Figure 8.3-2 Cumulative Impacts: Wambabya - Bugoma Corridor

At the time of writing not enough information for the third-party projects is available to confirm categorically the potential effects on chimpanzees. In addition, there are still gaps in the understanding of chimpanzee ecology and behaviour in the area between the Wambabya and Bugoma FRs making it difficult to assess cumulative impacts. The project will therefore implement the following mitigation measures in addition to the ongoing chimpanzee faecal DNA and movement study while

continuing to monitor project development as well as chimpanzee dynamics in the area.

The project will partner with forest conservation initiatives within the Albertine Graben which will also be of benefit for chimpanzees. The selected initiatives would address the development and implementation of forest management and restoration plans with the involvement of communities to improve:

- sustainable management of forest areas to maintain natural resource availability and the supply of ecosystem services for local communities
- connectivity between forest blocks
- improve management of forested protected areas, such as Budongo, Wambabya and Bugoma Forest Reserves within the wider landscape.

The conclusion of this study will lead to collaboration and support of a chosen forest conservation initiative as part of the project's mitigation strategy and contribution to cumulative impact management.

With the implementation of the EACOP project mitigation measures as well as the regional environmental management initiatives the cumulative impact magnitude and duration will be reduced; hence the cumulative residual impact is considered not significant.

8.3.6.3 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts on species of conservation importance.

8.4 Biodiversity: Legally Protected, Internationally or Nationally Recognised Areas

This section describes potential impacts on legally protected, internationally or nationally recognised areas during construction, commissioning and operation of the EACOP project and associated mitigation measure to be adopted.

8.4.1 Key Sensitivities and Considerations

The legally protected, internationally or nationally recognised areas baseline conditions are described in Section 6.3.1 as well as:

- their sensitivity ranking based on the relevant table in Appendix D
- key considerations for legally protected, internationally or nationally recognised areas.

The sensitivity ranking of legally protected, internationally or nationally recognised areas ranges from moderate to high.

Key legally protected, internationally or nationally recognised areas for consideration include:

- Wambabya Forest Reserve
- Taala Forest Reserve.

Ecosystem Services

A summary of the ecosystem services provided by the habitats found within these protected areas is described in habitats Section 6.3.1.

8.4.2 Potential Project Impacts

8.4.2.1 Construction

Generic Impacts

There are no generic impacts for the legally protected, internationally or nationally recognised areas VEC.

Location-Specific Impacts

Location: Wambabya FR

Loss of Habitat and Disturbance or Harm to Wildlife

Impact: Loss of ecological function and integrity of protected site through impacts on species and habitats

Though the project has the potential to affect species of conservation importance in the reserve through noise and visual disturbance this will not affect its integrity and the impact is of small magnitude, therefore not significant.

Location: Taala FR

Loss of Habitat and Disturbance or Harm to Wildlife

Impact: Loss of ecological function and integrity of protected site through impacts on species and habitats

Although pipeline construction along the RoW will cause a permanent loss of 11.6 ha of habitat within the reserve, only 1.1 ha is natural habitat (0.8 ha of bushland and 0.3 ha of wetland) and species of conservation importance were only found within the remnant wetland which will largely be unaffected. As the project is not considered to cause a loss of integrity of the reserve the magnitude is small and the impacts are not significant.

Ecosystem Services

Potential impacts on ecosystem services are described in Sections 8.2 and 8.3. There are no ecosystem services that relate to protected areas exclusively that are not already described in the habitats of conservation importance and species of conservation importance sections. However, given the protected areas status, potential non-use values can be considered to be higher for habitats with protected areas.

8.4.2.2 Operation

Generic Impacts

There are no generic impacts from the pipeline, AGI and MST operation on legally protected, internationally or nationally recognised areas.

Location-Specific Impacts

There are no specific impacts from the pipeline and AGI operation on legally protected, internationally or nationally recognised areas.

Ecosystem Services

Potential impacts on ecosystem services are described in Sections 8.2 and 8.3. There are no ecosystem services that relate to protected areas exclusively that are not already described in the habitats of conservation importance and species of conservation importance sections. However, given the protected areas status, potential non-use values can be considered to be higher for habitats with protected areas.

8.4.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects that could affect biodiversity impacts.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included in Appendix E4 have been collectively used to assess residual impacts, and to determine their significance.

8.4.3.1 Design**Generic Mitigation Measures**

The design mitigation measures relating to route selection described under Section 8.2.3.1 are of relevance.

Location-Specific Mitigation Measures

There are no specific design mitigation measures of relevance to protected areas.

8.4.3.2 Construction**Generic Mitigation Measures**

The mitigation measures described for habitats of conservation importance and species of conservation importance will be used to mitigate for impacts on these VECs and will, in turn, mitigate for impacts on protected areas.

Location-Specific Mitigation Measures

The mitigation measures described for habitats of conservation importance and species of conservation importance will be used to mitigate for impacts on these VECs and will, in turn, mitigate for impacts on protected areas.

Location: Wambabya FR

Loss of Habitat and Disturbance or Harm to Wildlife

Impact: Loss of ecological function and integrity of protected site through impacts on species and habitats

The biodiversity management plan will include measures that collectively contribute to the control of impacts described for habitats and species associated with the reserve.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the impact is reduced from small to negligible.

Location: Taala FR

Loss of Habitat and Disturbance or Harm to Wildlife

Impact: Loss of ecological function and integrity of protected site through impacts on species and habitats

The biodiversity management plan will include measures that collectively contribute to the control of impacts described for habitats and species associated with the reserve.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude of the impact is reduced from small to negligible.

8.4.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on biodiversity after mitigation has been implemented, following the order in Table 8.4-1 and focusing on those impacts that are significant.

The implementation of mitigation measures for habitats of conservation importance and species of conservation importance will reduce impacts on those VECs and although there are some residual impacts on those VECs, none will be enough to cause an overall loss of integrity of the protected areas. It is therefore considered that there are no residual impacts on protected areas.

In concordance with IFC PS6 guidance, a biodiversity action plan incorporating further enhancement and conservation measures will be developed and implemented to achieve no net loss of biodiversity where feasible.

Table 8.4-1 Legally Protected, Internationally or Nationally Recognised Onshore Areas – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plans	Residual Impact				
						M	D	E	S	SS
KP4.5–8 Wambabya FR	Loss of Habitat and Disturbance or Harm to Wildlife	Loss of ecological function and integrity of protected site through impacts on species and habitats	C&O		Biodiversity management plan	2	5	3	3	13
KP78–82 Taala FR	Loss of Habitat and Disturbance or Harm to Wildlife	Loss of ecological function and integrity of protected site through impacts on species and habitats	C&O		Biodiversity management plan	2	5	3	3	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.4.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.4.6 Cumulative Impacts

Potential cumulative impacts on habitats and species of conservation importance within protected areas are described in Sections 8.2.6 and 8.3.6. There are no cumulative impacts identified that are likely to affect the integrity or ecological function of a protected area.

8.4.6.1 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts affecting legally protected, nationally and internationally recognised areas.

8.5 Soils

This section describes potential impacts on soil during construction, commissioning and operation of the EACOP project in Uganda and the associated planned mitigation measures to be adopted.

As mentioned in Section 6.4.2.1, while geology for this ESIA, is not considered a VEC, and is not assessed, the potential impact on aggregate extraction has been assessed and described in this section. Information on seismic risk areas traversed by the pipeline has been included in the project description (see Section 2).

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on soil, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.5.1 Key Sensitivities and Considerations

The soil baseline conditions are described in Section 6.4.2.1, as well as:

- soil key valued environmental components (VEC) and their sensitivity ranking based on the relevant table in Appendix D
- key considerations for the soil impact assessment.

Sensitivity in the soil area of influence (AOI) ranges from very low to very high, depending on the soil type, and varies considerably throughout the pipeline route.

Key considerations include:

- The texture of the soil at several of the survey sample locations, for example, at KP40 and KP180, on the pipeline route was found to be very fine. It was

primarily fine silt and clay, which are considered more prone to compaction, to have poor trafficability when wet and to be prone to dust generation during dry conditions.

- Several areas of the proposed pipeline route are noted as having particularly high erosion potential, for example, KP68.5 and KP206.
- The topsoil depth is generally deep (20–30 cm) along the route and at construction facilities, although there are likely to be sections where the topsoil is thin (<5 cm).
- The proposed pipeline route is predominantly through agricultural land with mostly low to moderate productivity and high productivity at several locations.
- Contamination from industrial or agricultural activities was not identified at any of the locations along the proposed route, due to the predominantly rural nature of the AOI.
- Unexploded ordnance (UXO) may exist in certain areas within the AOI, particularly near the Uganda–Tanzania border.

The project impacts are assessed cumulatively, incorporating qualitatively, the baseline conditions.

Section 6.4.2.1 identifies ecosystem services associated with soil in the AOI. The following ecosystem services have been considered:

- aggregates and topsoil
- soil quality
- water storage
- water flow control.

Soil also provides the following ecosystem services that are considered in other sections:

- agriculture (land-based livelihoods VEC, Section 8.13)
- biodiversity (biodiversity VECs, Section 8.2 to Section 8.4).

8.5.2 Potential Project Impacts

8.5.2.1 Construction

Generic Impacts

Use of Raw Materials and Natural Resources

Impact: Depletion of natural resources, for example, aggregate

Aggregate will be needed for aboveground installation (AGI) construction, for use as padding material for the pipeline and for concrete for constructing AGI components, construction of main line block valves, and construction of the main camp and pipe yards (MCPY) and access roads. The extraction and use of aggregate constitutes the use of non-renewable natural resources, which is a direct impact that is expected to be minimal because of the quantities required and their sourcing being distributed over a long distance (296 km).

Construction will require the stripping of topsoil from within the soil AOI, which will be stored for later use, including pipeline reinstatement. If poorly managed, topsoil could be lost as a resource in several ways:

- reducing soil quality, for example by mixing topsoil with subsoil
- wasting soil by mixing it with construction waste or contaminated materials, which then must be treated before reuse or even disposed as a last resort.

The extraction of aggregate may also have indirect impacts on surface water and water resources, biodiversity, cultural heritage, land users and communities that will be considered when an environmental and social appraisal is undertaken of sites, see Section 10.10

The pre-mitigation impact for use of raw materials and natural resources during construction is considered not significant, because of the small magnitude, site-based extent and short duration.

Soil Compaction

Impact: Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development and loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity

Compaction of soil during construction may occur and compaction-prone soil was identified at several locations during the field survey, for example, KP0, KP80 and KP260. Compaction of soil during construction will occur where and when the soil bearing strength is exceeded by the load of construction activities, for example, vehicle movements and pipe storage. This causes soil particles to be compressed together, which reduces the soil's porosity and increases its bulk density. Wet and clay-dominated soil is more sensitive to compaction due to the relatively small particle size and high bulk density.

Topsoil and subsoil will be stripped from all working areas before construction, so the impact will be limited to sites that are due to be reinstated, i.e., the RoW.

The indirect impacts of soil compaction are the alteration of drainage characteristics, which may cause surface runoff and localised flooding, and reduced dissolved oxygen levels in receiving waters, which could cause anaerobic conditions to develop. Compaction can also have indirect impacts on ecology by restricting root zone growth, as it can affect vegetation re-establishment (see habitats of conservation importance VEC, Section 8.2) and on agricultural productivity and associated livelihoods (see land-based livelihoods VEC, Section 8.13).

The pre-mitigation impact for use of soil compaction during construction is considered not significant. Although the magnitude is potentially large, the impact is not significant because of the site-based extent and short duration.

Soil Erosion

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

Preparation of the RoW and construction of the MCPYs and access roads, including removing vegetation, topsoil stripping and benching, will affect soil

structure and stability. This may increase the risk of erosion, particularly where the soil has poor cohesion or there are steep slopes. The erosion risk is expected to be highest during wet weather, when runnels may develop, and it will be exacerbated by vehicle movements.

Topsoil removed from the RoW will be stored at the edge of the working area pending replacement during reinstatement. Topsoil stockpiles can be poorly consolidated, so prone to erosion and soil loss via wind erosion or washout by rainfall.

Soil stability at areas that exhibit active erosion could be made worse by AGI and pipeline construction activities, or erosion could be triggered in areas with erosion potential.

A RoW soil erosion classification study was conducted and is described in Appendix C2. Highly erodible soil was identified at several locations along the pipeline route, for example, KP68.5, KP104.5 and KP221.5.

Treated hydrotesting water will be discharged to either land or a watercourse. Erosion could occur at the point of discharge to land. This discharge could indirectly cause scour and increased sediment loading if to a watercourse (see surface water VEC, Section 8.6).

Where access roads to the right of way (RoW) are widened, construction will include the removal of topsoil and subsoil, which can leave soil more exposed and more prone to erosion. Soil erosion may cause indirect impacts on aquatic fauna (from sediment release into watercourses) and could affect vegetation re-establishment (loss of soil). These potential impacts are described in the habitats of conservation importance VEC (Section 8.2). Soil erosion could also affect agricultural productivity, see land-based livelihoods VEC (Section 8.13) for a description of the potential impacts.

The pre-mitigation impact for soil erosion during construction is considered not significant, because of the site-based extent and short duration, although the magnitude is potentially large.

Loss of Soil Structure, Fertility and Seed Bank

Impact: Development of anaerobic conditions in stored soil and mixing of different soil or soil with foreign materials leading to loss of drainage and fertility

In areas with thin topsoil coverage, stripping of topsoil and segregation of topsoil and subsoil may be more difficult. A pre-construction survey will confirm location-specific topsoil depths.

Soil structure can be damaged by soil stripping and the nutrient content can be decreased due to leaching, which can affect vegetation re-establishment. Alterations to structure and nutrient content can also occur if topsoil and subsoil layers are mixed during construction and/or storage, or if surplus subsoil is disposed by spreading over topsoil or vegetation.

Prolonged storage of topsoil (longer than six months) can cause loss of soil fertility, as nutrients may be leached out by rain or by anaerobic conditions may be created by a lack of air circulation. Prolonged storage may also cause loss in viability of the seed bank in the stored topsoil. Soil fertility was identified as a key stakeholder

concern; highly productive soil was identified in several areas within the AOI. Most of the AOI is considered to have low to medium fertility.

Indirect impacts include ecological effects due to loss of seed bank diversity, effects on vegetation re-establishment (see habitats of conservation importance VEC, Section 8.2).

The pre-mitigation impact on soil structure, fertility and seed bank during construction is considered not significant because of the small magnitude, short duration and site-based extent of the potential impact.

Disturbance, Treatment and Management of Contaminated Soil

Impact: Mobilisation of soil contaminants

There is a risk that unidentified contaminated soil may be encountered during construction. Two potential impacts are associated with encountering contaminated soil during construction:

- direct risks to the health and safety of construction personnel (see workers' health, safety and welfare VEC, Section 8.16)
- indirect risks from mobilising contaminants into the wider environment, thereby contaminating previously clean soil with consequent potential indirect impacts on community water sources, agricultural land, flora and fauna.

In addition to the risk of encountering contaminated soil, the border of Uganda and Tanzania has been identified as a potential UXO area. At the time of writing, the Ugandan and Tanzania authorities are undertaking a survey to assess the UXO risk in the project area. Depending on the findings of the survey, a programme will be implemented to clear the area of UXOs.

The pre-mitigation impact of disturbance, treatment and disposal of contaminated soil during construction is considered not significant because of the small magnitude, short duration, and site-based extent of the potential impact.

Management of Solid and Liquid Waste and Accidental Release of Oil and Chemicals

Impact: Soil contamination

Construction activities have the potential to produce soil contamination. The principal potential contaminants associated with the construction activities are:

- fuels and lubricating oils
- hazardous wastes
- welding wastes
- field coating materials
- paints and solvents.

Potential indirect impacts from contamination of soil include:

- impacts on the viability of terrestrial flora and fauna (see flora and fauna species of conservation concern VEC, Section 8.3)
- damage to the viability of aquatic vegetation and fish through contaminants leaching into watercourses (see flora and fauna species of conservation concern VEC, Section 8.3)

The pre-mitigation impact for solid and liquid waste disposal and accidental release of oil or chemicals during construction is considered not significant because of the small magnitude, short duration and site-based extent of the potential impact.

Management of Surplus Subsoil and Aggregate

Impact: Loss of soil structure, drainage, fertility and seed bank

If subsoil and aggregate are stored in areas where the topsoil has not been stripped before storage and the surplus subsoil and aggregate is not removed after construction, there could be adverse impacts on soil structure, fertility and the seed bank with consequent effects impacts on vegetation re-establishment and agricultural productivity. Offsite disposal at approved borrow and spoil pits of aggregate and surplus subsoil and aggregate and within project areas to be reinstated has the potential to cause impacts on the soil structure, fertility and seed bank of the receiving site.

The pre-mitigation impact for surplus subsoil and aggregate disposal during construction is considered not significant because of the small magnitude, transient duration and site-based extent of the potential impact.

Location-Specific Impacts

Location: Areas Sensitive to Soil Compaction

Soil Compaction

Impact: Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development and loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity

Compaction of soil during construction will occur where and when the soil bearing strength is exceeded by the load of construction activities, for example, vehicle movements and pipe storage. The potential impacts associated with soil compaction described in the generic impacts section above apply.

Compaction-prone soil was identified at several locations along the RoW, for example, KP40 and KP260, and it is likely that additional areas will be identified before construction. Sand-dominated soil was identified at the sample locations closest to the MCPYs for example, KP40 (MCPY1), KP126 (MCPY2), KP200 (MCPY3) and KP288 (MCPY4), which suggests that these sites will be less prone to compaction. Clay soil is still likely to exist in certain areas at the MCPY and access road locations. When this soil is wet (i.e., during the wet season), it will be prone to compaction regardless of texture. Topsoil and subsoil will be stripped from all working areas before construction, so the impact will be limited to sites that are due to be reinstated.

The pre-mitigation impact for soil compaction during construction at the above locations is considered not significant because of the short duration and site-based extent, although the magnitude is potentially large.

Location: Area Sensitive to Soil Erosion**Soil Erosion**

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

Construction, including removing vegetation, topsoil stripping and benching, will disturb soil structure and stability. The potential impacts associated with soil erosion described in the generic impacts section above apply.

A soil erosion classification study was conducted and described in Section 8.5.2.2. Highly erodible soil was identified at several locations along the RoW, for example, KP68.5, KP104.5 and KP221.5. No highly erodible soil types were identified at any of the locations close to the MCPYs. However, it is possible that additional areas of highly erodible soil exist at other locations.

The pre-mitigation impact for soil erosion during construction at the above locations is considered not significant because of the short duration and site-based extent, although the magnitude is potentially large.

As described in Section 2.3.6 and 2.4.6.1, the land required for facilities will be leased from the government. When the construction phase has been completed and after decommissioning, the leases will be surrendered and some of the facilities, such as the MCPYs and CF may be transferred to the government with some structures left in place.

Project-related construction phase location-specific impacts will be managed by the generic mitigation described in Section 8.5.3; there will not be any project-related location-specific impacts to soil once project-related construction activities are concluded, irrespective of whether the MCPYs and CF are retained by the government or reinstated.

8.5.2.2 Project Operation**Generic Impacts****Soil Erosion**

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

As soil will be replaced during trench backfilling and reinstatement of the RoW and natural regeneration of vegetation allowed to occur, no potential impacts on soil are expected during project operation.

Following construction reinstatement, restoration of any soil cover to its original state will partially depend on the risk of erosion. Vegetation will eventually re-establish naturally, though it will take longer in areas with thin or erodible topsoil.

Soil stability at areas that exhibit active erosion could be exacerbated following AGI and pipeline construction activities or erosion could be triggered in areas with erosion potential. This may lead to erosion of the RoW and pipe trench following reinstatement, which would potentially cause displacement of the pipeline, thereby risking its integrity. Further information regarding management of pipeline integrity is provided in the project description (see Section 2.4.5).

During project operation, the only activity permitted on the RoW in agricultural areas will be grazing.

When the pipeline is operating, unmanned aerial vehicles will undertake regular patrols of the pipeline RoW. Driving along the RoW will be kept to a minimum and only allowed for maintenance and urgent security matters.

The pre-mitigation impact of soil erosion during project operation during project operation is considered not significant because of the site-based extent, although the magnitude is potentially large and the duration potentially long.

Location-Specific Impacts

Location: PS1 and PS2

Management of Solid and Liquid Waste and Accidental Release of Oil and Chemicals

Impact: Soil contamination

Security personnel will be accommodated at PS1 and PS2. At these locations there will be the need to dispose of small quantities of treated sewage, waste water and domestic waste, and very small quantities of chemicals and fuel for maintenance activities that could contaminate soil if spilled.

There will also be some surface water runoff from concreted areas on the sites that has the potential to contaminate soil through accidental release of oil and chemicals and to potentially cause localised flooding (see Section 8.5.2.1). Potential indirect impacts could occur on surface water (see Section 8.6.2) and groundwater (see Section 8.7.2).

The pre-mitigation impact of solid and liquid waste disposal and accidental release of oil or chemicals during project operation is considered not significant because of the small magnitude and site-based extent of the potential impact although the duration is potentially long.

8.5.3 Mitigation Measures

This section describes the avoidance and mitigation measures that will be applied to the aspects and activities that could affect soil.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plans and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.5.3.1 Design

Design, routing and siting measures to avoid or minimise project impacts on soil are described in Section 2.2, Section 2.3 and Section 3.

8.5.3.2 Construction

Generic Impacts

Use of Raw Materials and Natural Resources

Impact: Depletion of natural resources, for example, aggregate

The waste management plan and the natural resource management plan will include measures that contribute to the management of natural resource use.

Excavated materials will be screened and reused where possible and new aggregate extraction sites will undergo environmental and social evaluation before development.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent and long duration, although the magnitude is reduced to negligible.

Soil Compaction

Impact: Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development and loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity

The soil management plan and the community health, safety and security plan will include measures that contribute to the management of compaction.

During construction, local communities will be discouraged from using the RoW for transportation. Ground protection such as bogmats and geotextile fabric will be used to support heavy loads where ground is soft. The soil management plan and reinstatement plan will include procedures to reduce and control compaction.

Stockpiled topsoil will be monitored for compaction and corrective action implemented if required; stockpiled topsoil areas will be free draining and include gaps to allow passage of floodwater.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, although magnitude is reduced to medium and the duration is reduced to transient.

Soil Erosion

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

The soil management plan and the community health, safety and security plan will include measures that contribute to the management of erosion.

During construction, local communities will be discouraged from using the RoW as an access track. Ground protection such as bogmats and geotextile fabric will be used to support heavy loads where ground is soft. The soil management plan and reinstatement plan will include procedures to reduce and control erosion. Stockpiled topsoil will be monitored for weeds and compaction and corrective action implemented if required; stockpiled topsoil areas will be free draining and include gaps to allow passage of floodwater.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, although magnitude is reduced to medium and the duration is reduced to transient.

Loss of Soil Structure, Fertility and Seed Bank

Impact: Development of anaerobic conditions in stored soil and mixing of different soil or soil with foreign materials leading to loss of drainage and fertility

The soil management plan will include measures that contribute to the management of loss of soil productivity.

Stockpiled topsoil will be monitored for weeds and compaction and corrective action implemented if required. Stockpiled topsoil and subsoil areas will be free draining and include gaps to allow passage of floodwater.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and a site-based extent, although the magnitude is reduced to negligible.

Disturbance, Treatment and Management of Contaminated Soil

Impact: Mobilisation of soil contaminants

The pollution prevention plan and the reinstatement plan will include measures that contribute to the management of soil contamination.

Areas of surface contamination identified before construction within the project footprint will be remediated before or during project construction. Contaminated material will be temporarily stored in impermeable bunds and covered to prevent runoff and airborne losses.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and a site-based extent, although the magnitude is reduced to negligible.

Management of Solid and Liquid Waste and Accidental Release of Oil and Chemicals

Impact: Soil contamination

The pollution prevention plan and the waste management plan will include measures that contribute to the management of impacts from waste management and accidental substance releases.

In the event of a spillage of hazardous materials a trained rapid response team will be mobilised to contain, clean and remediate spills. Spill response equipment will be available at all work sites. The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from surface waters; storage will be covered, bunded (no drainage valves/holes) and have impermeable floor. A refuelling procedure will be developed to address mobile and static refuelling, spill prevention techniques and training.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and site-based extent, although the magnitude is reduced to negligible.

Surplus Subsoil and Aggregate

Impact: Loss of soil structure, drainage, fertility and seed bank

The waste management plan will include measures that contribute to the surplus soil materials.

Disposal of surplus subsoil and aggregate will be subject to environmental and social evaluations to identify suitable offsite disposal sites to avoid impacts on soil structure, drainage, fertility and seed bank at potentially affected sites.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and site-based extent, although the magnitude is reduced to negligible.

Location-Specific Impacts

Location: Areas Sensitive to Soil Compaction

Soil Compaction

Impact: Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development and loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity.

The generic mitigation for soil compaction described in Section 8.5.3.2 will contribute to the management of compaction; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, although magnitude is reduced to medium and the duration is reduced to transient.

Location: Areas Sensitive to Soil Erosion

Soil Erosion

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

The generic mitigation for soil erosion described in Section 8.5.3.2 will contribute to the control of this impact; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, although magnitude is reduced to medium and the duration is reduced to transient.

8.5.3.3 Operation

Generic Impacts

Soil Erosion

Impact: Loss of topsoil causing reduced fertility and impaired reinstatement

The reinstatement plan and biodiversity management plan will include measures to reduce and control erosion during operation and explore ways to achieve an increasing trend in vegetation regrowth and diversity of desired species.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, although magnitude is reduced to medium and the duration is reduced to transient.

Location-Specific Impacts

Location: PS1 and PS2

Management of Solid and Liquid Waste and Accidental Release of Oil and Chemicals

Impact: Soil contamination

The pollution prevention plan and the waste management plan will include measures that contribute to the management of impacts from waste management and accidental substance releases, including spill response procedures, management of hazardous materials and a requirement for wastewater discharges to comply with permit conditions and project environmental standards.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a long duration and site-based extent, although the magnitude is reduced to negligible.

8.5.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on soil after mitigation measures have been implemented.

Table 8.5-1 summarises the potential generic soil impacts, the proposed mitigation measures and the significance of the residual impacts after implementation of the mitigation measures. Table 8.5-2 summarises the location-specific impacts.

8.5.4.1 Generic Impacts

The residual impacts of the following are considered not significant after mitigation measures are assumed to be implemented:

- use of raw materials and natural resources
- soil compaction
- soil erosion
- loss of soil structure, fertility and seed bank

- disturbance, treatment and disposal of contaminated soil
- management of solid and liquid waste and accidental release of oil or chemicals
- disposal of surplus subsoil and aggregate
- flooding
- disruption of irrigation or drainage infrastructure.

8.5.4.2 Location-Specific Impacts

With the implementation of the planned mitigation measures, no significant residual location-specific impacts to soil are predicted.

8.5.4.3 Ecosystem Services

Section 6.4.2.1 identifies ecosystem services associated with soil in the AOI. The following ecosystem services have been assessed in Sections 8.5.2 and 8.5.3:

- aggregates and topsoil
- soil quality
- water storage
- water flow control.

With the implementation of the planned mitigation measures, there are no predicted significant residual impacts on the above services.

Table 8.5-1 Soil – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S*	SS
Use of raw materials and natural resources	Depletion of natural resources, for example, aggregate	C	–	Waste Management Plan Natural Resource Management Plan	2	2	1	1–3	6–8
Soil compaction	Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development Loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity	C	–	Soil Management Plan Community Health, Safety and Security Plan	6	1	1	1–3	9–11
Soil erosion	Loss of topsoil causing soil erosion and impaired reinstatement	C	–	Soil management plan Community health, safety and security plan	6	4	1	1–3	12–14
		O		Reinstatement plan Biodiversity management plan					
Loss of soil structure, fertility and seed bank	Development of anaerobic conditions in stored soil Mixing of different soil types or soil containing foreign materials leading to loss of drainage and fertility	C	Y	Soil Management Plan	2	2	1	1–4	6–9

NOTES: *Soil sensitivity varies considerably throughout the AOI (see Section 6.4.2.1); the amount of variation means it is not practicable to separate out all the locations based on sensitivity, so the full range (very low to very high) has been included.

C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.5-1 Soil – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S*	SS
Disturbance, treatment and management of contamination	Mobilisation of soil contaminants	C	–	Pollution Prevention Plan Reinstatement Plan	2	1	1	3	7
Management of waste and accidental release of oil or chemicals	Soil contamination	C	–	Pollution Prevention Plan	2	1	1	3	7
		O	–	Waste Management Plan	2	2	1	3	8
Management of surplus subsoil and aggregate	Loss of soil structure, drainage, fertility and seed bank	C	–	Waste Management Plan	2	1	1	1–3	5–7

NOTES: *Soil sensitivity varies considerably throughout the AOI (see Section 6.4.2.1); the amount of variation means it is not practicable to separate out all the locations based on sensitivity, so the full range (very low to very high) has been included.

C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.5-2 Soil – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S ¹	SS
All locations sensitive to soil compaction	Soil compaction	Anaerobic conditions developing that restrict plant nutrient uptake efficiency and root development Loss of drainage capacity and poor plant establishment causing increased surface water ponding, runoff, soil erosion and decreased productivity	C	–	Biodiversity Management Plan Community Health, Safety and Security Plan Transport and Road Safety Management Plan	6	1	1	4–5	12–13
All locations sensitive to soil erosion	Soil erosion	Loss of topsoil causing reduced fertility and impaired reinstatement	C	–	Soil Management plan Reinstatement Plan	6	4	1	5	16

NOTES: *Soil sensitivity varies considerably throughout the AOI (see Section 6.4.2.1); the amount of variation means it is not practicable to separate out all the locations based on sensitivity, so the full range (very low to very high) has been included.

C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.5.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.5.6 Cumulative Impacts

EACOP's contribution to cumulative impacts on the soil VEC is negligible and no further mitigation measures other than those described in Section 8.5.3 are considered necessary.

8.5.6.1 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts affecting soils.

8.6 Surface Water

This section describes potential impacts on surface water during construction, commissioning and operation of the Uganda EACOP project and associated mitigation measures to be adopted.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on surface water, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.6.1 Key Sensitivities and Considerations

The surface water baseline conditions are described in Section 6.4.2.2 as well as:

- surface water key valued environmental and social components (VEC) and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the surface water impact assessment.

Sensitivity rankings for surface water range from very low to high. High sensitivities include:

- change in the Wambabya River flow regime, as hydroelectricity is generated at the Kabalega hydropower plant about 25 km downstream of the pipeline crossing (KP15.4)
- change of the Jemakunya River channel about 0.1 km downstream of the pipeline at KP289, as a relatively narrow zone of riparian vegetation protects the riverbanks from erosion and instability
- change in the watercourse that may receive drainage from the access roads to main camp and pipe yard (MCPY) 2 and pumping station (PS) 2, and in the watercourses that may receive drainage from facilities PS2 and MCPY3 since these undefined channels in uncohesive materials are protected only by scrub vegetation, and so are at risk from erosion.

- change in water quality in the Katonga (KP164.7) and Kibale Rivers (KP274.1), with swamp channel vegetation, as water quality is considered and confirmed to be very good (i.e., occasionally within national potable water specification standards for natural water) in these relatively sparsely settled catchments
- change in water quality in ephemeral watercourses crossed by the project roads to PS1, MCPY2 and PS2, as water quality is considered and confirmed to be very good (i.e., occasionally within national potable water specification standards for natural water) in these relatively sparsely settled catchments
- change of water quality in ephemeral watercourses that may receive drainage from project facilities MCPY1, PS2, MCPY3 and MCPY4, as the water quality is considered very good (i.e., occasionally within national potable water specification standards for natural water) in these relatively sparsely settled catchments.

Key considerations include:

- flow in watercourses
- river channel morphology and stability
- water and sediment quality and sensitivity to contamination.

Section 6.4.2.2 identifies ecosystem services associated with surface water in the EACOP area of influence (AOI). The regulation of flood flows and water quality ecosystem service is considered in this section.

Surface water also provides the following ecosystem services that are considered in other sections:

- provision of water for people, livestock and agriculture (see Section 8.13)
- supporting biodiversity (see Section 8.2).

8.6.2 Potential Project Impacts

8.6.2.1 Construction

Generic Impacts

Erosion

Impact: Erosion of river or channel banks, scour, sediment contamination of surface waters

Direct impacts from erosion-causing and sediment-generating activities may occur during construction, including from vegetation removal, topsoil stripping and benching (see soil VEC, Section 8.5.2).

When bare soil is exposed to rain splash, fine particles may seal the surface, reducing the infiltration rate below the rainfall rate, causing sheet overland flow and sheet soil erosion. Where sheet flow is concentrated, rills and gullies may be eroded. Where runoff from a site reaches a watercourse, the flow rate may increase above baseline conditions and sustained higher flow rates may increase channel bed and bank erosion, channel instability and suspended sediment.

Sediment suspended in runoff from construction areas may be transported to downstream VECs. It may also be released to watercourses during soil handling,

using vehicles in watercourses and during the excavation of trenches for foundations and services (e.g., for water supply pipes).

Sediment reduces light levels within the water column and can therefore have an indirect impact on aquatic biodiversity (see biodiversity VEC, Section 8.2). High suspended sediment concentrations can also make watercourses unsuitable as drinking water sources. However, at watercourses where vegetation is present this will act as a sediment filter, reducing suspended sediment concentrations.

Activities with similar direct impacts, include the excavation of the pipeline trench, wet and dry open-cut watercourse crossings, and the excavation of trenches for building foundations and services.

Open-cut crossings may affect the stability of the bed and banks of watercourses formed in uncohesive alluvial material. Natural processes of channel erosion and deposition may be exacerbated, resulting in an indirect impact on agricultural land (see land-based livelihoods VEC, Section 8.13).

Many watercourses in the AOI are protected from erosion by riparian vegetation.

The pre-mitigation impact for erosion and increased suspended sediment in watercourses during construction is considered not significant because of the small magnitude, short duration and local extent of the potential impact, even though surface water sensitivity is moderate to high.

The potential for increased erosion and suspended sediment to affect highly sensitive watercourses is identified in the location-specific section.

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

There is the potential for direct impacts on surface water quality in receiving watercourses from the following sources:

- the management of solid and liquid waste generated during the construction process and MCPY operation
- the management of surplus water (trench water) from working areas
- the accidental release of oil or chemicals during construction.

The principal potential contaminants associated with the construction activities are:

- fuel and lubricating oils
- hazardous waste
- paints and solvents
- high pH runoff from concrete batching areas.

Surface water contamination may increase downstream substance concentrations with indirect impacts on water supplies for drinking and domestic use (see social VECs, Section 8.11), aquatic biodiversity (see biodiversity VECs, Section 8.2) and agricultural land (see land-based livelihoods VEC, Section 8.13).

Most rivers considered in this study have good water quality and therefore have moderate or high sensitive to contamination depending on the density of settlement in their catchments. Most rivers are used as sources of water for washing, bathing, and watering of livestock.

The pre-mitigation impact for the management of liquid waste and surplus water, and the accidental release of oil or chemicals in watercourses during construction is considered not significant because of the small magnitude, transient duration and local extent of the potential impact.

The potential for contamination of highly sensitive watercourses is identified in the location-specific section.

Impeded Flow in Watercourses

Impact: Deterioration of water quality

During the construction of watercourse crossings, the contractor may need to temporarily impede flow. There is potential for direct impact on water quality, mainly as a result of downstream scour, which can increase turbidity and suspended-sediment concentrations with indirect impacts on water supplies for drinking and domestic use (see social VECs, Section 8.11), aquatic biodiversity (see biodiversity VECs, Section 8.2), channel morphology (see above) and possibly agricultural land (see land-based livelihoods VEC, Section 8.13).

Specific locations where flow may need to be impeded will be identified at the time of construction.

The pre-mitigation impact for water-quality deterioration at sites of impeded flow during construction is considered not significant because of the negligible magnitude, transient duration and local extent of the potential impact.

Altered Drainage Pattern

Impact: Trench can act as conduit for groundwater, draining higher areas and flooding lower areas

Surface flooding may occur in new areas if the drainage pattern is altered. This may occur where stockpiled soil redirects floodwaters from the normal flow direction. On sloping ground, the pipeline trench may intercept groundwater and alter drainage patterns.

Specific locations where the drainage pattern may be altered are not known.

The pre-mitigation impact for flooding from an altered drainage pattern during construction is considered not significant because of the negligible magnitude, short duration and local extent of the potential impact, and low sensitivity of the VEC.

Location-Specific Impacts

Erosion and Increased Suspended Sediment in Watercourses

Impact: Erosion of river or channel banks, scour, sediment contamination of surface waters

Locations-specific impacts from erosion-causing and sediment-generating activities may occur during construction, with the direct impacts described in the generic impact section above.

The baseline study identified the following watercourses as being particularly sensitive to erosion:

- the ephemeral watercourse crossed by the existing road upgrade (ERU) connecting MCPY2 (KP126) to the RoW (ERU-MCPY2) at road KP1
- the watercourse crossed by the ERU to PS2 (ERU-PS2) at road KP0.5
- the ephemeral watercourse at PS2 (KP185)
- the watercourse to the southwest of PS2 and watercourses to the northeast and southwest of MCPY3 (KP191)
- the Jemakunya River crossing at KP289.3.

Open-cut crossings on these rivers may increase their lateral mobility (change in channel position through bed and bank erosion, and sediment deposition). This could increase the rate of cultivated-land loss (potentially impacting livelihoods of affected farmers).

The pre-mitigation impact for erosion and increased suspended sediment at the above locations during construction is considered not significant because of the medium magnitude, short duration and local extent of the potential impact.

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

There is potential for direct impacts on surface water quality during construction, as a result of waste management and accidental release of oil or chemicals with the direct impacts described in the generic impact section above.

This risk exists mainly at construction facilities due to the longer duration of construction activity at these locations than on the ROW. The baseline study identified the following watercourses crossed by the pipeline as being particularly sensitive to contamination:

- the ephemeral floodplain east of MCPY1 (KP40)
- the ephemeral watercourse northeast of MCPY3 (KP191)
- the ephemeral watercourse southwest of MCPY3 (KP191)
- the ephemeral floodplain southeast of MCPY4 (KP283).

The baseline study identified the following watercourses crossed by roads as being highly sensitive to contamination owing to the sparsely settled nature of their catchments and likely good water quality, those on roads:

- PS1 (KP0) at road KP2.5
- the RoW from MCPY2 (KP126) at road KP1.0
- PS2 (KP185) at road KP0.5.

The baseline study also identified the ephemeral watercourse at PS2 (KP185) as being particularly sensitive to contamination, as the rural and sparsely settled catchment has very good water quality (i.e., occasionally within national potable water specification standards for natural water).

The pre-mitigation impact from the management of liquid waste and the accidental release of oil or chemicals in the above watercourses during construction is considered not significant because of the small magnitude, transient duration and local extent of the potential impact, even though surface water has a moderate to high sensitivity to contamination.

Impeded Flow in Watercourses

Impact: Deterioration of water quality

Direct impacts on surface water quality may occur where flow is impeded by the construction of access roads across watercourses. This can cause downstream scour, which can increase turbidity and suspended-sediment concentrations with indirect impacts on water supplies for drinking and domestic use (see social VECs, Section 8.11), aquatic biodiversity (see biodiversity VECs, Section 8.2), channel morphology (see above) and possibly agricultural land (see land-based livelihoods VEC, Section 8.13).

Flow will only be impeded where the minor ephemeral streams are crossed by access roads during times of flow.

The pre-mitigation impact for water quality deterioration at sites of impeded flow during construction is considered not significant because of the negligible magnitude, transient duration and site-based extent of the potential impact, even though surface water has a moderate to high sensitivity to contamination of the VEC.

Surface Water Use

Impact: Decreased water level due to abstraction for project use

During pre-commissioning, the pipeline will be hydrotested as described in Sections 2.4.4.2 and 2.4.4.3. Surface water abstraction could cause a reduction in water level, flow or volume, depending on the waterbody from which water is abstracted.

The plan will be to abstract water from a source large enough such that the withdrawal volumes requirements will be negligible, relative to the volume of water in the waterbody, such as Lake Albert or Lake Victoria. Even though the impact is expected to have a negligible magnitude, transient duration, and very localised extent, in the absence of a defined water source, the significance of the impact of abstraction is indeterminable.

Hydrotest Water Disposal

Impact: Deterioration of water quality

Disposal of the hydrotest water may impact the quality of the receiving water, depending on the waterbody receiving the discharge.

Potential receiving surface locations or waterbodies will be identified in the above-noted hydrotest management plan. Even though the impact is expected to have a transient duration and localised extent, in the absence of a defined receiving waterbody, the significance of the impact of abstraction is indeterminable.

8.6.2.2 Operation

Generic Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

There is potential for direct impact on surface-water quality from the following sources:

- the management of solid and liquid waste generated during operations
- the management of black water (e.g., sewage) and grey water
- the accidental release of oil or chemicals during refilling of storage tanks and maintenance.

All the watercourses have good water quality and are therefore sensitive to contamination. Most rivers are used as sources of water for a predominantly rural population and their livestock.

Surface water contamination may increase downstream pollutant concentrations with indirect impacts on aquatic biodiversity (see social VECs, Section 8.14), aquatic biodiversity (see biodiversity VEC, Section 8.3) and agricultural land (see land-based livelihoods VEC, Section 8.13).

The pre-mitigation impact from the management of liquid waste and the accidental release of oil or chemicals during operation is considered not significant because of the small magnitude, short duration and local extent of the potential impact.

Location-Specific Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

The baseline study identified the ephemeral watercourse southwest of PS2 (KP185) as having a high sensitivity to contamination owing to the sparsely settled nature of the catchment and likely good water quality.

The pre-mitigation impact for the management of liquid waste and the accidental release of oil or chemicals during operation is considered not significant because of the small magnitude, short duration and local extent of the potential impact.

8.6.3 Mitigation Measures

This section describes avoidance and mitigation measures that will be applied to the aspects and activities that could affect surface water.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.6.3.1 Design

Design, routing and siting measures to avoid or reduce impacts of the project on surface water are described in Sections 2.2, 2.3 and 2.4.

8.6.3.2 Construction

Generic Impacts

Erosion

Impact: Erosion of river or channel banks, scour, sediment contamination of surface waters

The soil management plan and reinstatement plan will include procedures to reduce and control erosion and compaction through measures developed for soil handling and management, topsoil stripping and storage, sediment interception, a strategy for tree removal and replanting and progressive, active, habitat restoration where required. Additionally, location-specific method statements for open-cut watercourse crossings will be prepared where necessary; requirements such as segregation of bed and bank material; retention of as much riparian vegetation as possible and maintaining environmental base flows downstream of water crossings will be included.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a local extent and short duration, although the magnitude is reduced to negligible.

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

The soil management plan, reinstatement plan and the waste management plan will include measures that contribute to the management of impacts from waste management and accidental releases.

An environmental and social evaluation of treated effluent discharge locations will be undertaken; treated effluent which is not reused will be preferentially discharged to land. Grey water will be separated from black water, treated in accordance with the project environment standards, treated wastewater will be reused where possible or discharged as per permit conditions. Kitchen facilities will be fitted with industry standard grease traps. In the event of a spillage of hazardous materials a trained rapid response team will be mobilised to contain, clean and remediate spills. Spill response equipment will be available at all work sites. The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from surface waters; storage will be covered, bunded (no drainage valves/holes) and have impermeable floor. A refuelling procedure will be developed to address mobile and static refuelling, spill prevention techniques and training.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a local extent and transient duration, although the magnitude is reduced to negligible.

Impeded Flow in Watercourses

Impact: Deterioration of water quality

The biodiversity management plan, soil management plan and the pollution prevention plan will include measures that collectively contribute to the management of water quality deterioration.

Vehicles and equipment will cross watercourses after installation of appropriately sized temporary culverts and bridging structures. During open-cut river crossings, bed and bank material will be stored away from active water channels and, where necessary, river crossing method statements will be developed. Bathing or washing clothes, vehicles and equipment by project employees will be prohibited in watercourses.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a negligible magnitude and transient duration, although the extent is reduced to site based.

Altered Drainage Pattern

Impact: Trench can act as conduit for groundwater, draining higher areas and flooding lower areas

The reinstatement plan will describe where trench breakers will be installed in the pipeline trench.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a negligible magnitude and local extent, although the duration is reduced to transient.

Location-Specific Impacts

Erosion and Increased Suspended Sediment in Watercourses

Impact: Erosion of river or channel banks, scour, sediment contamination of surface waters

The generic mitigation addressing erosion described in Section 8.6.3.2 will contribute to the management of this impact; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and local extent, although the magnitude is reduced to small.

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

The generic mitigation addressing surface water contamination described in Section 8.6.3.2 will contribute to the management of this impact; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and local extent, although the magnitude is reduced to negligible.

Impeded Flow in Watercourses

Impact: Deterioration of water quality

The generic mitigation addressing deterioration of water quality described in Section 8.6.3.2 will contribute to the management of this impact; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and site-based extent, although the magnitude is reduced to medium.

Surface Water Use

Impact: Decreased water level due to abstraction for project use

The generic mitigation for decreased water level described in Section 8.6.3.2 will manage water level; no additional mitigation is required.

Water sources will be confirmed in the hydrotest management plan, a subplan of the water management plan which will be produced in later project phases.

Mitigation measures for potential abstraction impacts will be developed and included in the hydrotest management plan. The mitigation measures will be submitted as part of the surface water abstraction permit application to the relevant water authority with jurisdiction over the planned water abstractions.

Even though the pre-mitigation impact is expected to have a negligible magnitude, transient duration, and very localised extent, as water sources are yet to be defined, with the mitigation measures in the hydrotest management plan the residual impact is expected to be not significant.

Hydrotest Water Disposal

Impact: Deterioration of water quality

The natural resource management plan, pollution prevention plan and hydrotest management plan will include procedures to manage hydrotest water disposal during construction.

Mitigation measures for potential impacts on water quality of receiving waters will be developed and included in the hydrotest management plan. Mitigation measures will be included in the application for discharge approval.

Even though the pre-mitigation impact is expected to have a negligible magnitude, transient duration, and very localised extent, as receiving water bodies are yet to be defined, with the mitigation measures in the hydrotest management plan the residual impact is expected to be not significant.

8.6.3.3 Operation

Generic Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

The pollution prevention plan, waste management plan and the emergency preparedness and response plan will include procedures to manage impacts from waste management and accidental release of oil or chemicals during operation.

In the event of a spillage of hazardous materials a trained rapid response team will be mobilised to contain, clean and remediate spills. Spill response equipment will be available at all work sites. The storage of hazardous materials will be restricted to designated hazardous materials storage areas; storage will be covered, bunded (no drainage valves/holes) and have impermeable floor. A refuelling procedure will be developed to address mobile and static refuelling, spill prevention techniques and training.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and local extent, although the magnitude is reduced to negligible.

Location-Specific Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of surface water

The generic mitigation addressing contamination of surface water described in Section 8.6.3.2 will contribute to the management of accidental releases; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a short duration and local extent, although the magnitude is reduced to negligible.

8.6.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on surface water after mitigation measures have been implemented, focusing on those impacts that are significant.

Table 8.6-1 summarises the potential generic surface water impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.6-2 summarises location-specific impacts.

8.6.4.1 Generic Impacts

The residual impacts of the following are considered not significant after mitigation measures are implemented:

- erosion of river or channel banks, scour and surface water sediment contamination
- surface water contamination from waste management and the accidental release of oil or chemicals;

- water-quality deterioration owing to impeded flow in channels
- flooding due to altered drainage patterns.

8.6.4.2 Location-Specific Impacts

The residual impacts of the following are considered not significant after relevant mitigation measures are implemented:

Construction

Erosion and increased suspended-sediment concentrations in:

- the ephemeral watercourse crossed by the existing road upgrade (ERU) connecting MCPY2 (KP126) to the RoW (ERU-MCPY2) at road KP1
- the ephemeral watercourse crossed by the ERU to PS2 (ERU-PS2, KP185) at road KP0.5
- the ephemeral watercourse to the northeast of MCPY3 (KP191)
- the ephemeral watercourse to the southwest of MCPY3 (KP191)
- the ephemeral floodplain southeast of MCPY4 (KP283)
- the Jemakuriya River, which crosses the pipeline at KP289.3
- the ephemeral watercourse crossed by the existing road upgrade (ERU) connecting MCPY2 (KP126) to the RoW (ERU-MCPY2) at road KP1
- the watercourse crossed by the ERU to PS2 (ERU-PS2) at road KP0.5
- the hill-slopes draining to the east and north of MCPY3 (KP191.5)
- the wetland at MCPY4 (KP288).

Surface water contamination as a result of the disposal of waste and the accidental release of oil or chemicals at:

- road KP2.5, PAR-PS1 (KP0)
- road KP1.0, the RoW from MCPY2 (KP126)
- road KP0.5, ERU-PS2 (KP185)
- ephemeral floodplain east of MCPY1 (KP40)
- ephemeral watercourse northeast of MCPY3 (KP191)
- ephemeral watercourse southwest of MCPY3 (KP191)
- ephemeral floodplain southeast of MCPY4 (KP283)
- ephemeral floodplain 70 m from MCPY1 (KP40)
- the hill-slopes east and north of MCPY3 (KP191.5)
- the wetland 70 m south of MCPY4 (KP288).

Derogation of the water resource for other users by abstraction of surface water for hydrotesting from:

- Lake Albert and Lake Victoria.

Contamination of unidentified watercourses through:

- the disposal of hydrotest water.

Operations

Contamination of surface water as a result of the disposal of waste and the accidental release of oil or chemicals at:

- the ephemeral watercourse at PS2 (KP185).

Table 8.6-1 Surface Water – Generic Impacts

Aspect	VEC	Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Erosion	Surface water	Erosion of river or channel banks, scour, sediment contamination of surface waters	C&O	-	Soil management plan Reinstatement plan	2	2	2	3–4	9–10
Management of waste and accidental release of oil or chemicals	Surface water	Contamination of surface water	C	Y	Soil management plan Reinstatement plan Waste management plan	2	1–2	2	3–4	8–10
			O	Y	Pollution prevention plan Waste management plan Emergency preparedness and response plan	2	2–4	1–2	3–4	9–10
Impeded flow of river or channel	Surface water	Deterioration of water quality	C	Y	Biodiversity management plan Soil management plan Pollution prevention plan	2	1	1	3–4	7–8
Altered drainage pattern	Surface water	Trench can act as conduit for groundwater, draining higher areas and flooding lower areas	C&O	Y	Reinstatement plan	2	2	1	2	7

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.6-2 Surface Water – Location-Specific Impacts

Location	Aspect	VEC	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
							M	D	E	S	SS
KP0 PAR-PS1, road KP2.5 KP40 MCPY1 KP126 ERU-MCPY2 at road KP1.0 KP185 ERU-PS2 at road KP0.5 KP191 MCPY3 KP283 MCPY4	Management of waste and accidental release of oil or chemicals during development of construction facilities	Surface water	Contamination of surface water	C	Y	Soil Management Plan Reinstatement Plan Waste Management Plan	2	1	2	3	8
KP126. ERU-MCPY2 at road KP1.0. KP185 ERU-PS2 at road KP0.5 KP191 MCPY3 KP283 MCPY4 KP289.3 Pipeline crossing	Erosion and increased suspended sediment in watercourses	Surface Water	Erosion of river or channel banks, scour and sediment contamination of surface waters	C	-	Reinstatement Plan Soil Management Plan	2	1	1	3	7

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.6.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.6.6 Cumulative Impacts

EACOP's contribution to cumulative impacts on the surface water VEC is negligible and no further mitigation measures other than those described in Section 8.6.3 are considered necessary.

8.6.6.1 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts surface water.

8.7 Groundwater

This section includes potential impacts on groundwater during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on groundwater, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.7.1 Key Sensitivities and Considerations

The groundwater baseline conditions are described in Section 6.4.2.3, as well as:

- groundwater key valued environmental components (VEC) and their sensitivity ranking based on Table D11 in Appendix D
- key considerations for the groundwater impact assessment.

Sensitivity in the groundwater area of influence (AOI) ranges from moderate to very high.

Key considerations include:

- In all districts, groundwater is the most important source of public water supply. Shallow wells and boreholes are the primary source of water for over 60% of the population in all districts.
- Groundwater will continue to be a principal source of water for the population in all districts.

Section 6.4.2.3 identifies ecosystem services associated with groundwater in the EACOP AOI including:

- provision of freshwater for community use (see community health VEC, Section 8.18)
- supporting aquatic and riparian habitats and wildlife, both directly (where groundwater feeds wetlands) and indirectly (where groundwater maintains surface water flows) (see biodiversity VECs, Section 8.2).

8.7.2 Potential Project Impacts

8.7.2.1 Construction

Generic Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of groundwater

Potential direct impacts on groundwater quality may occur due to the storage, transportation, treatment and disposal of solid and liquid waste, chemicals and fuel. These impacts on groundwater quality may lead to indirect impacts associated with the need to use alternative water sources or restricted access to existing sources such as increased costs with consequent impacts on livelihoods (see socio-economic and health VECs, Section 8.14).

The pre-mitigation impact of waste management and accidental release of oil or chemicals during construction is considered not significant because the magnitude is negligible, the duration is transient and the extent is site based.

Location-Specific Impacts

Location: All MCPYs, PS1 and PS2

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of groundwater

Potential direct impacts on groundwater quality may occur due to the storage, transportation, treatment and disposal of solid and liquid waste, chemicals and fuel.

These impacts on groundwater quality may lead to indirect impacts associated with the need to use alternative water sources or restricted access to existing sources such as increased costs with consequent impacts on livelihoods (see socio-economic and health VECs, Section 8.14).

The sensitivity of groundwater is ranked as very high at PS2 and MCPY3, high at PS1 and MCPY1 and MCPY4 and moderate at MCPY2.

The pre-mitigation impact for the management of waste and accidental release of oil or chemicals during construction is considered not significant because the magnitude of the impact is ranked as small, the duration is transient and the extent is the site.

Location: All MCPYs, PS1 and PS2**Management of Black and Grey Water**

Impact: Contamination of groundwater

Black water is waste water from bathrooms and toilets that contains faecal matter and urine. Also called sewage or brown water, it can carry disease-causing bacteria that are harmful to humans. Grey water is waste water that comes from sinks, washing machines, bathtubs and other site activities.

Black water from camp facilities used during the development of the MCPYs and grey water from vehicle washdown areas, roads and hardstanding will be produced and will be treated and disposed of as outlined in the project description (see Section 2). Potential direct impacts on groundwater quality may occur through inappropriate disposal practices such as the use of pit latrines. This may lead to indirect impacts on other groundwater users, including the need to use alternative water sources or restricted access to existing sources with consequent increased costs and impacts on livelihoods (see socio-economic and health VECs, Section 8.18).

The pre-mitigation impact for the management of black and grey water during development of construction facilities is considered not significant because the magnitude is ranked as small, the duration is transient and the extent is local.

Location: All MCPYs, PS1 and PS2**Abstraction of Groundwater**

Impact: Decreased water level due to abstraction for project use

The abstraction of groundwater to supply MCPYs may have a direct impact on the water table near the well through drawdown, which may have an indirect impact on the yield of nearby boreholes and wells. In all the districts that the pipeline traverses, groundwater is the most important source of public water supply, so abstraction in districts where MCPYs are located may indirectly affect communities (see socio-economic and health VECs, Section 8.18) and ecosystems (see biodiversity VECs, Section 8.2).

The pre-mitigation impact for the abstraction of groundwater during construction, based on currently available information on the planned abstraction is ranked as not significant because for all MCPYs the magnitude is ranked as small the duration is transient and the extent is local.

As described in Section 2.3.6 and 2.4.6.1, the land required for facilities will be leased from the government. When the construction phase has been completed and after decommissioning, the leases will be surrendered and some of the facilities, such as the MCPYs may be transferred to the government with some structures left in place. Project-related construction phase location-specific impacts will be controlled by the generic mitigation described in Section 8.6.3. It is expected pumps and power supply will be removed and the wells decommissioned; there will not be any project-related location-specific impacts to groundwater once project related construction activities are concluded irrespective of whether the MCPYs are retained by the government or reinstated.

8.7.2.2 Operation

Generic Impacts

It is considered that there are no potential generic impacts from normal operation. The impacts from abnormal operations and unplanned events are described in Section 9.

Location-Specific Impacts

Location: PS1 and PS2

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of groundwater

Direct impacts on groundwater quality may occur from the management of solid and liquid waste and accidental releases during the operation of the AGIs.

The pre-mitigation impact of waste management and accidental release of oil or chemicals during pipeline and AGI operation is considered not significant. This is because the magnitude is negligible and the extent is site based.

Location: PS1 and PS2

Abstraction of Groundwater

Impact: Decreased water level due to abstraction for project use

Direct impacts on groundwater availability may occur from abstracting groundwater at the AGIs.

The pre-mitigation impact of groundwater abstraction during pipeline and AGI operation is considered not significant. This is because the magnitude is small, the extent is local and the duration long.

8.7.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect groundwater.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance

8.7.3.1 Design

Design, routing and siting measures to avoid or reduce project impacts on groundwater are described in Sections 2.2, 2.3 and 2.4.

8.7.3.2 Construction

Generic Impacts

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Potential for groundwater contamination if disposal is uncontrolled

The waste management plan, pollution prevention plan and natural resource management plan will include measures that collectively contribute to the management of impact from the management of solid and liquid waste and accidental releases.

Grey water will be separated from black water, treated in accordance with the project environment standards, treated wastewater will be reused where possible or discharged as per permit conditions. Kitchen facilities will be fitted with industry standard grease traps. The waste management plan will identify requirements for waste collection, storage, transfer and disposal. An environmental and social evaluation of treated effluent discharge locations will be undertaken; treated effluent which is not reused will be discharged to land.

In the event of a spillage of hazardous materials a trained rapid response team will be mobilised to contain, clean and remediate spills. Spill response equipment will be available at all work sites. The storage of hazardous materials will be restricted to designated hazardous materials storage areas at least 50 m from surface waters; storage will be covered, bunded (no drainage valves/holes) and have impermeable floor. A refuelling procedure will be developed to address mobile and static refuelling, spill prevention techniques and training.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent, transient duration and negligible magnitude.

Location-Specific Impacts

Location: All MCPYs, PS1 and PS2

Management of Waste and Accidental Release of Oil or Chemicals

Impact: Contamination of groundwater

The pollution prevention plan, waste management plan and the emergency preparedness and response plan will include measures to manage solid and liquid waste and accidental releases during construction; relevant measures are outlined above.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and site-based extent, although the magnitude will be reduced to negligible.

Location: All MCPYs, PS1 and PS2**Management of Black and Grey Water**

Impact: Contamination of groundwater

The waste management plan and the pollution prevention plan will include measures that collectively contribute to the management of impact from management of black and grey water.

Grey water will be separated from black water, treated in accordance with the project environment standards, treated wastewater will be reused where possible or discharged as per permit conditions. Kitchen facilities will be fitted with industry standard grease traps. Contingency will be provided for wastewater treatment plant maintenance.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and site-based extent, although the magnitude will be reduced to negligible.

Location: All MCPYs, PS1 and PS2**Abstraction of Groundwater**

Impact: Decreased water level due to abstraction for project use

The natural resource management plan and hydrotest management plan will describe measures that will be undertaken to evaluate the potential impact on local groundwater abstraction points, such as the undertaking of hydrogeological evaluations; if significant adverse impacts are predicted by these evaluations then alternative borehole locations will be considered; the water quality and sustainability of water abstracted from either new or existing boreholes will be monitored.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a transient duration and site-based extent, although the magnitude will be reduced to negligible.

Project Operation**Location-Specific impacts****Location: PS1 and PS2****Management of Waste and Accidental Release of Oil or Chemicals**

Impact: Potential for groundwater contamination

The natural resource management plan will describe the stormwater drainage to be provided at aboveground installations. The pollution prevention plan and waste management plan will include measures to manage solid and liquid waste and accidental release of oil and chemicals. The waste management plan will identify requirements for waste collection, storage, transfer and disposal.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a

transient duration and site-based extent, although the magnitude will be reduced to negligible.

Location: PS1 and PS2

Abstraction of Groundwater

Impact: Decreased water level due to abstraction for project use

The generic mitigation for decreased water level described in Section 8.7.3.2 will contribute to the management of abstraction of groundwater; no additional mitigation is required.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the potential impact will still have a long duration and local extent, although the magnitude will be reduced to negligible.

8.7.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on groundwater after mitigation measures have been implemented and focuses on those impacts that are significant (scoring 19 or more).

Table 8.7-1 summarises the potential generic groundwater impacts, proposed mitigation measures and the significance of the residual impacts after implementation of the mitigation measures. Table 8.7-2 summarises the location-specific impacts.

The residual impact of the following is considered not significant:

- management of solid and liquid waste
- management of black and grey water
- abstraction of groundwater
- accidental release of oil or chemicals.

Table 8.7-1 Groundwater – Generic Impacts

Aspect	VEC	Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
						M	D	E	S	SS
Management of waste and accidental release of oil or chemicals	Groundwater	Potential for groundwater contamination	C&O	–	Waste Management Plan Pollution Prevention Plan Natural Resource Management Plan Emergency Preparedness and Response plan	2	1	1–2	5	9–10

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.7-2 Groundwater – Location-Specific Impacts

Location	Aspect	VEC	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
							M	D	E	S	SS
PS1, PS2 MCPY1, MCPY2, MCPY3, MCPY4	Management of waste and accidental release of oil or chemicals	Groundwater	Potential for groundwater contamination	C	Y	Pollution Prevention Plan Waste Management Plan	2	1	1	4	8
PS1, PS2 MCPY1, MCPY2, MCPY3, MCPY4	Management of black and grey water	Groundwater	Contamination of groundwater	C	Y	Pollution Prevention Plan Waste Management Plan	4	1	2	4	11
PS1, PS2 MCPY1, MCPY2, MCPY3, MCPY4	Abstraction of groundwater	Groundwater	Decreased water level due to water abstraction for project use	C	Y	Natural Resource Management Plan	2	1	1	4	8

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.7.5 Transboundary Project Impacts

No transboundary project impacts were identified.

8.7.6 Cumulative Impacts

EACOP's contribution to cumulative impacts on the groundwater VEC is negligible and no further mitigation measures other than those described in Section 8.7.3 are considered necessary.

8.7.6.1 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts on groundwater.

8.8 Landscape

This section includes potential impacts on landscape and views during construction, commissioning and operation of the EACOP project, and the associated mitigation measures to be adopted.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on landscape, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.8.1 Key Sensitivities and Considerations

The landscape baseline conditions are described in Section 6.4.2.4, as well as:

- landscape and visual sensitivity ranking based on Table D15, Appendix D
- key considerations for the landscape and visual impact assessment.

Landscape sensitivity has been ranked according to the key characteristics and value placed on them. Areas of biodiversity value were considered, as these areas may be associated with features of higher landscape sensitivity, such as having a greater degree of naturalness and absence of modern infrastructure.

Visual sensitivity is associated with receptors that have a particular interest in their surroundings, such as tourists, or views that are associated with features of aesthetic, cultural or religious importance.

Key considerations are:

- Most of the EACOP route is in an area of low biodiversity significance with the exception of a few sections that are in or adjacent to forest reserves. Areas of high biodiversity value are often linked to sensitive landscapes, as they can possess valued or rare natural scenic features. However, the areas traversed

by EACOP have been affected by farming and grazing and are of low landscape sensitivity.

- PS1 AOI: the landscape has been modified by human activity; although rural in nature, the landscape has lost most of its natural scenic value and it is of low landscape sensitivity.
- PS2 AOI: although remote the landscape sensitivity is low; it is not a wild or particularly scenic landscape, as human activities have altered it.
- No visual receptors of high sensitivity have been identified: visual receptors at PS1 and PS2 are limited to users of unsealed roads, farm workers and people living in small settlements.

Landscape is recognised for having the potential to provide cultural ecosystem services, including nonmaterial benefits from the sense of wellbeing and value provided to people by living in an attractive environment. However, stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape (see Section 7.6.2) and the AOIs of the pumping stations areas do not attract tourists.

8.8.2 Potential Project Impacts

8.8.2.1 Construction

Generic Impacts

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character and views caused by project components

During construction, the RoW and construction facilities (including MCPYs) will be cleared of vegetation, stripped of topsoil and construction plant and machinery will be visible, which will have a direct impact on the landscape and visual receptors. Tree removal will be confined to small sections of tree lines and small areas; no large-scale tree removal is required. No blasting of surface rock is required.

When construction is complete, agricultural areas will be reinstated as grassland and non-agricultural areas will be reinstated using natural revegetation to avoid the introduction of invasive species (see Section 2.3.7.1 and 2.4.3.4). Landscape and visual impacts will therefore be short term during construction and for the period afterwards required to re-establish vegetation cover. The magnitude will be medium, the extent local and of short-term duration. The landscape and visual impacts will be not significant.

Disposal of Surplus Subsoil and Aggregate

Impact: Permanent change of views because of disposal of surplus subsoil and aggregate

There may be a direct permanent impact (medium magnitude, permanent, local, not significant) from the disposal of excess subsoil created by trench excavation, if imported fill is needed to pad the pipe. However, this can normally be spread without creating any visual impact within the RoW before the topsoil is replaced. Any excess will be disposed as waste off-site.

There may be a direct impact (small magnitude, permanent, local, not significant pre-mitigation) from the disposal of surplus aggregate during the decommissioning of construction facilities.

Location-Specific Impacts

Location: Side Slope Areas with Permanent Benching

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character due to permanent benching of RoW in side slope areas

Impact: Change of views in areas of permanent benching of RoW in side slope areas affecting views from small settlements, farms and unsealed roads

The RoW will need to be benched on side slopes to create a safe working area for construction. The impacts will mostly be short term, as most of the RoW will be reinstated to original profiles and natural vegetation. However, on some steep slopes it may not be possible to completely reinstate the RoW to pre-existing profiles and there will be a permanent landscape impact.

Precise locations and reinstatement plans will be defined in subsequent development phases. Landscape or visual impacts experienced because of permanent benching, owing to the medium magnitude and local nature of the impacts, are considered not significant pre-mitigation.

Location: Pumping Stations

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character due to construction and commissioning of the AGIs

Impact: Change of views due to construction and commissioning of the AGIs

PS1 and 2 have been located to avoid impacts on sensitive landscapes. No naturally scenic landscapes of high landscape sensitivity have been identified that are visible from the pumping stations. No significant landscape impacts on these farmland landscapes will be experienced during construction due to the short-term and local nature of the construction phase.

Stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape (see Section 7.6.2) and did not identify any tourist attractions. All visual receptors are therefore assessed as being of low sensitivity. Owing to the short-term duration and local extent, the pre-mitigation visual impacts are considered not significant.

Other AGIs (electric substations and block valves) were screened out of the impact assessment due to their small size and insignificant landscape and visual effects.

8.8.2.2 Operation

Generic Impacts

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character and views caused by project components

There will be a permanent change of land-use on the RoW from crop-land to grassland in agricultural areas during the operational phase of the project (see Section 2.4.3.4). This will have a direct biodiversity benefit and a not significant landscape or visual impact, owing to the low sensitivity of receptors, small magnitude and local extent of the impact.

Location-Specific Impacts

Location: Pumping Stations

Visual intrusion of Project Components into Landscape

Impact: Change of landscape character due to operation of the AGIs

Impact: Change of views due to operation of the AGIs

Views and landscape character will be modified at PS1 and 2 for the project life span (approximately 25 years). The sites will comprise low-level equipment, single storey buildings and a communications tower that may be approximately 100 m high, see Section 2.3.3.2. The landscapes are assessed as low sensitivity. Owing to the local extent, the pre-mitigation permanent landscape impacts for both sites is considered not significant.

Visual receptors at the PS1 and PS2 are mainly farms, small villages and road users, which are all low sensitivity. Visibility of the proposed AGIs is summarised as follows:

- 0–1-km radius – some views of the AGI, but often screened by hills and vegetation
- 1–3-km radius – views limited to the taller elements of the AGI, such as the communications antenna
- 3–5-km radius – views limited to the taller elements of the AGI from hilltops.

Figure 8.8-1 and Figure 8.8-2 show typical views toward PS1 (the location of the viewpoints is shown in Figure 6.4-8 in Section 6.4.2.4). The landscape is typical of this AOI.

Figure 8.8-3 and Figure 8.8-4 show the view toward the PS2 location from viewpoints PS2-A and PS2-B (the location of the viewpoints is shown in Figure 6.4-8 in Section 6.4.2.4). The landscape shown is typical of this AOI.

Permanent visual impacts at both PSs will be small in magnitude. Owing to the low sensitivity of the receptors and the local extent of the impact, the pre-mitigation visual impact is considered not significant.

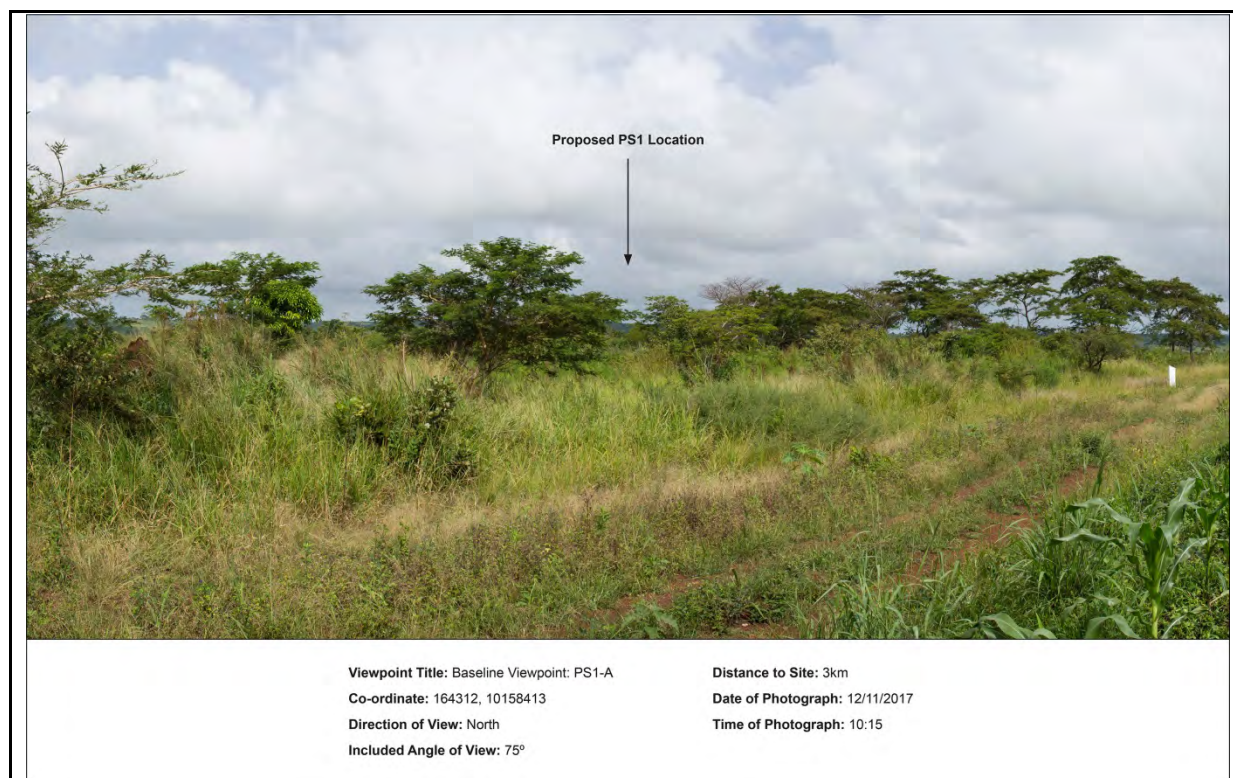


Figure 8.8-1 PS1 Viewpoint PS1-A Photograph



Figure 8.8-2 PS1 Viewpoint PS1-B Photograph



Figure 8.8-3 PS2 Viewpoint PS2-A Photograph



Figure 8.8-4 PS2 Viewpoint PS2-B Photograph

8.8.3 Mitigation Measures

This section evaluates impacts in terms of the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect landscape and visual impacts.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.8.3.1 Design

Generic Mitigation Measures

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character and views caused by project components

Route selection has been an iterative process of gradual route refinement based on a set of technical, environmental and social criteria. The final proposed route and AGIs have been located to strike the optimum balance between the relevant socio-economic, environmental and technical factors. The route has been designed to have a minimum negative impact on:

- areas of high biodiversity value
- sites of cultural heritage and religious value.

Consequently, the route will avoid the majority of:

- sensitive landscape receptors, which are often associated with natural scenic landscapes
- sensitive visual receptors, which are often associated with natural, cultural or religious value.

The pipeline will also be buried and will not be visible along its entire length.

Location-Specific Mitigation Measures

Location: Side Slope Areas with Permanent Benching

Visual Intrusion of Project Components into Landscape

Impact: Change of views and landscape character due to permanent benching of RoW in side-slope areas

Route optimisation has been undertaken to limit traversing steep side slopes, see Section 3.4.3.2.

8.8.3.2 Construction

Generic Mitigation Measures

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character and views caused by project components

The soil management plan, reinstatement plan and biodiversity management plan will include measures that contribute to the management of the change of landscape character.

Soil handling, soil reinstatement and revegetation measures are key to mitigation of landscape and visual impacts. These are described in Section 2.4.3 and the soil and biodiversity VEC impact assessments (Sections 8.2, 8.3, 8.4 and 8.5). The measures include erosion control, replacement of excavated soil following construction, natural revegetation, implementation of a tree replanting strategy and monitoring of the re-establishment of vegetation.

Although the pre-mitigation impact on both landscape and views is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and local in extent but the magnitude is reduced from medium to small.

Disposal of Surplus Subsoil and Aggregate

Impact: Permanent change of views as a result of disposal of surplus subsoil and aggregate

The soil management plan, reinstatement plan, waste management plan and biodiversity management plan will include measures that contribute to the management of permanent change of views.

The impact of disposal of excess spoil from the trench will be eliminated by treating surplus spoil that cannot be spread on the RoW as waste. Environmental and social evaluations, including landscape and visual, will be undertaken to identify suitable offsite disposal sites for waste soil and rock and appropriate management measures implemented. All temporary soil and rock disposal sites will be reinstated, unless instructed otherwise by the regulatory authorities, in accordance with pre-entry agreements with landowner and location-specific reinstatement plans will be prepared and implemented.

Although the pre-mitigation impact on views is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain very long term and local in extent, but the magnitude is reduced from medium to small.

Location-Specific Mitigation Measures

Location: Side Slope Areas with Permanent Benching

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character due to permanent benching of RoW in side slope areas

Impact: Change of views in areas of permanent benching of RoW in side slope areas affecting views from small settlements, farms and unsealed roads

The soil management plan, reinstatement plan, waste management plan and biodiversity management plan will include measures that contribute to the change of views and landscape character.

Areas where benching is required will be re-contoured to original profiles. Side casting in areas of steep terrain will be prohibited and mitigation such as installation of fences or geotextile fabric on steep slopes will reduce the risk of soil slippage.

In areas of permanent benching, recontouring will be sympathetic and in keeping with pre-construction profiles where this does not cause risk to pipeline. The waste management plan will identify reuse and disposal options for surplus rock.

Although the pre-mitigation impacts on both landscape and views are considered not significant, the application of the above measures will further reduce impacts; the residual impacts on both landscape and views will be very long term and local in extent but the magnitude is reduced from medium to small.

Location: Pumping Stations

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character due to construction and commissioning of the AGIs

Impact: Change of views due to construction and commissioning of the AGIs

The soil management plan, reinstatement plan and the biodiversity management plan will include measures that will contribute to the control of impacts associated with loss of habitat.

The pre-mitigation impacts on both landscape and views are considered not significant. The application of the above measures will not further reduce these medium or small magnitude and local extent impacts.

8.8.3.3 Operation

Generic Mitigation Measures

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character and views caused by project components

The reinstatement plan and the biodiversity management plan will include measures that will contribute to the control of impacts associated with loss of habitat.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and local in extent, but the magnitude is reduced from medium to small.

Location-Specific Mitigation Measures

Location: Pumping Stations

Visual Intrusion of Project Components into Landscape

Impact: Change of landscape character due to operation of the AGIs

Impact: Change of views due to operation of the AGIs

No specific landscape and visual mitigation measures for the PSs are proposed as the pre-mitigation impact is not significant. The residual landscape and visual impact will remain the same.

8.8.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on landscape after mitigation measures have been implemented.

8.8.4.1 Generic and Location-Specific Impacts

Table 8.8-1 summarises the potential generic landscape impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.8-2 summarises specific impacts.

No significant impacts were predicted pre-mitigation due to careful route and site selection. The implementation of the mitigation measures described in Section 8.8.3 will further reduce impacts. No significant residual landscape and visual impacts are predicted.

8.8.4.2 Ecosystem Services

Section 6.4.2.4 identifies ecosystem services associated with landscape. Landscape has the potential to provide cultural ecosystem services, including nonmaterial benefits from the sense of wellbeing and value provided to people by living in an attractive environment. However, stakeholders did not perceive proposed project infrastructure as negative visual intrusions in the landscape (see Section 7.6.3) and the PS AOIs do not attract tourists.

Table 8.8-1 Landscape – Generic Impacts

Aspect	Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
					M	D	E	S	SS
Visual intrusion of project components into landscape	Change of landscape character and views caused by project components	C&O	-	Biodiversity Management Plan Reinstatement Plan Soil Management Plan	4	2	2	2	10
Disposal of surplus subsoil and aggregate	Permanent change of views as a result of disposal of surplus subsoil and aggregate	C	-	Soil Management Plan Reinstatement Plan Waste Management Plan Biodiversity Management Plan	4	5	2	2	13

* NOTES: C= construction; O= operation; C&O= construction and operation; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity (which may be a range); SS= significance score: Y = stakeholder concern; Yes; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.8-2 Landscape – Location-Specific Impacts

Location	Aspect	Potential Impact	Impact Detail	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
							M	D	E	S	SS
Side slope areas with permanent benching	Visual intrusion of project components into landscape	Change of landscape character	Permanent benching of RoW in side slope areas	C	-	Reinstatement Plan Soil Management Plan	4	5	2	2	13-
		Change of views	In areas of permanent benching of RoW in side slope areas affecting views from small settlements, farms and unsealed roads	C	-	Reinstatement Plan Soil Management Plan	4	5	2	2	13
PS1 and PS2	Visual intrusion of project components into landscape	Change of landscape character	Construction and commissioning of the AGIs	C	-	Reinstatement Plan	6	2	2	2	12
			Operation of the AGIs	O	-	Reinstatement Plan Pollution Prevention Plan	6	4	2	2	14
		Change of views	Construction and commissioning of the AGIs	C	-	Reinstatement Plan	4	2	2	2	10
			Operation of the AGIs	O	-	Reinstatement Plan Pollution Prevention Plan	4	4	2	2	12

* NOTES: C= construction; O= operation; C&O= construction and operation; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity (which may be a range); SS= significance score: Y = stakeholder concern; Yes; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.8.5 Transboundary Project Impacts

There are no transboundary project impacts.

8.8.6 Cumulative Impacts

8.8.6.1 Context

The baseline condition of landscapes which the EACOP project traverses, the trends and sensitivity to change are described in Section 6.4.2.4; project residual impacts are summarised in Section 8.8.4.

The landscape and visual receptors are characterised as having low sensitivity. This is a result of the degradation of the natural scenic value of much of the landscape by human activity.

The direct pre-mitigation and residual EACOP project impacts on landscape and visual receptors are not significant, although the duration of impacts from the pumping stations are long term.

The criterion for assessing whether the cumulative impacts are significant is that the limit of acceptable change is not exceeded. The limit of acceptable change is for AOIs to maintain their characteristic rural landscape quality.

Developments in the project landscape AOI are confined to PS1. They are described and mapped in Appendix H:

- associated facilities:
 - o Tilenga Project - feeder pipeline (AF01)
 - o Kingfisher Oil Project - feeder pipeline (AF02)
- third-party developments:
 - o Kabaale International Airport (UG04)
 - o transmission line to Kabaale Airport (UG05)
 - o Kabaale refinery (UG07)
 - o Hoima–Buloba pipeline (UG08)
 - o Lot 4 R4 (Kabaale – Kiziranfumbi) road upgrade (UG19).

8.8.6.2 Cumulative Impacts

Landscape and Visual Receptors of PS1

The landscape around PS1 AOI has been modified by human activity and although rural in nature, the landscape has lost most of its natural scenic value. It has been ranked as being of low sensitivity.

Associated Facilities

Potential cumulative impacts are predicted on landscape character and visual receptors where PS1 and the Tilenga Project and Kingfisher Oil Project feeder pipelines AOIs overlap around KP0.

The Tilenga Project and Kingfisher Oil Project pipelines will have similar impacts to those described in Section 8.8.2. For the EACOP project, PS1 will be partly

screened by landform and existing vegetation. Intervisibility with the EACOP project will therefore be limited and the overall industrialising nature small in magnitude and within the limit of acceptable change.

Third-Party Developments

Potential cumulative impacts are predicted on landscape character and visual receptors where the third-party developments listed above and PS1 share an AOI. It is predicted that the Hoima–Buloba pipeline (UG08) will have similar impacts to those described in Section 8.8.2, the Kabaale-Kiziranfumbi road (UG19) is an upgrade to an existing road, and the proposed airport and refinery in the Kabaale Industrial Park (UG04, UG05, UG07) will be major developments in the area. There will be intervisibility with PS1 from small settlements, farms and unsealed roads from where the developments will be experienced as industrialising features. The overall industrialising nature will be large in magnitude, but the contribution of EACOP and the associated facilities is small.

The cumulative impact will change the characteristic rural quality of the landscape and receptors, outside the limit of acceptable change, so the cumulative residual impact will be significant. The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants.

8.8.6.3 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts on landscape.

8.9 Air Quality

This section includes potential impacts on ambient air quality during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts associated with air quality, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.9.1 Key Sensitivities and Considerations

The air quality baseline conditions are described in Section 6.4.2.5 as well as:

- air quality key valued environmental components (VEC) and their sensitivity ranking based on the relevant tables in Appendix D

- key considerations for the air quality impact assessment.

The sensitivity ranking of air quality VECs ranges from very low to very high dependent on the level of each type of substance relative to PES, and the potential for exposure.

Key considerations include:

- much of the project traverses sparsely populated and infrequently occupied areas
- there is capacity in the atmospheric environment for gaseous emissions without risking harmful levels being reached
- moderate to high levels of airborne fine PM were consistently detected by the baseline survey, and in some cases background levels of PM exceed Project Environmental Standards (PES) and draft national standards.

8.9.2 Potential Project Impacts

8.9.2.1 Construction

The impacts to air quality from all project construction activities are from similar activities and often use similar equipment. Consequently, the impacts and generic mitigation measures are similar.

Generic Impacts

The nature and quantity of atmospheric emissions from construction activities depend on the type of activity, the prevailing weather conditions and the effectiveness of management measures.

Three sources of emissions have the potential for environmental effects:

- release of gases, exhausts and vapours to atmosphere from combustion of fuel in construction equipment and vehicles
- release of gases, exhausts and vapours to atmosphere during refuelling
- dust emissions from site activities.

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Reduced air quality from combustion of fuel in construction equipment and vehicles

The operation of equipment and vehicles powered by internal combustion engines results in the emission of exhaust gases containing the substances nitrogen oxides (NO_x), sulphur dioxide (SO₂), volatile organic compounds (VOC), particulate matter less than 10 and 2.5 µm in diameter (PM₁₀ and PM_{2.5}) and carbon monoxide (CO). The quantities emitted depend on factors such as engine type, service history, usage pattern and fuel composition.

Movements of vehicles (carrying pipe, equipment, materials and people) and nonroad mobile machinery such as excavators, dozers and graders will cause exhaust emissions. These emissions are considered not significant, as vehicle and machinery movements will be short term, localised and intermittent.

Emissions will be generated from the operation of construction equipment including compressors and generators.

Exhaust emissions before mitigation are considered not significant owing to the short-term nature and medium magnitude of impact associated with these emission sources.

Impact: Hydrocarbon vapour emissions from refuelling operations causing reduced air quality

Minor releases of hydrocarbon vapour emissions will occur from the refuelling of vehicles at filling stations in the construction camps and mobile bowzers on the pipeline spreads, and the refilling of the tanks and bowzers from fuel tanker trucks. Most vehicles and machinery will be diesel powered. Diesel storage and handling causes far less vapour generation than the equivalent operations with gasoline, as diesel is much less volatile. The use of diesel fuel will therefore mostly remove evaporative losses of hydrocarbons. Before mitigation, the impacts associated with these emissions are considered small and short term. They are considered not significant.

Dust

Impact: Nuisance from dust emissions from construction site activities

Dust emissions from construction activities will be variable in nature and depend on the type and extent of the activity, the soil type and its moisture content, road surface conditions and weather conditions. Dry weather and higher wind speeds will generate more dust.

Activities with the greatest potential to cause dust emission are expected to occur during earthworks and include:

- excavating (including ripping and blasting)
- haulage
- tipping and stockpiling
- levelling and landscaping
- other vehicle movements.

Stockpiling and movement of construction materials can also potentially cause dust emissions.

Once airborne, dust will travel downwind before settling. The distance travelled depends primarily on wind speed and particle size. Smaller particles and stronger winds cause greater dilution effects but create deposition over a larger area. Dust impacts typically occur within a few hundred metres of the dust emission.

Dust generated from construction activities is mainly of a particle size greater than the PM₁₀ fraction that is of most concern in terms of human health impacts.

Project dust emissions will be transient and localised. The impacts will be short term and, before mitigation, will be of medium magnitude. They are therefore considered not significant.

The potential effects of dust include nuisance for affected local residents, the impairment of the biological function of plants and animals through smothering or

other means, and effects on human health from particles that are small enough to enter the lungs.

Whether dust deposition becomes a nuisance is subjective. It depends on a variety of factors including the sensitivity of nearby locations, the frequency of any deposit occurring and the nature of the dust. Owing to this subjectivity, there are no statutory limits or widely used standards for dust deposition.

Location-Specific Impacts

Location: All MCPYs and Hydrotest Sections

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Emissions of gaseous substances from operation of generators causing reduced air quality from operation of generators

Impact: Emissions of fine particulate matter causing reduced air quality from operation of generators

Air emissions at each main camp and pipe yard (MCPY) will be generated primarily from the operation of diesel-powered generators to produce electricity for the camp and from the use of vehicles at and near the camp.

Mobile, diesel-powered compressors will provide power to produce compressed air used to dry the interior surface of each pipeline section after hydrotesting; each drying period will last two to three days.

The impact to air quality from the above emissions is considered not significant owing to the small magnitude and short duration.

Dust

Impact: Nuisance from mobilisation of dust by project vehicles

The movement of vehicles to, from and around the MCPYs will generate dust. Vehicle-related dust generation will be similar to that described in the generic impact section.

The impact to air quality from the above emissions is considered not significant owing to the small magnitude and short duration.

8.9.2.2 Operation

Generic Impacts

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Exhaust emissions from vehicles causing reduced air quality during operation

The generic impacts during operation will be from vehicle use to move people, materials and equipment for operations and maintenance works.

Vehicle movements will occur for short periods at each location and be widely dispersed and hence of small magnitude; therefore, the generic operational impacts on air quality are considered not significant.

Dust

Impact: Nuisance from mobilisation of dust by project vehicles.

The movement of vehicles to, from and around the AGIs will cause dust generation. Vehicle-related dust generation will be similar to that during construction, although it will be limited to designated access roads and site roads.

Vehicle movements will occur for short periods at each location and be widely dispersed and hence of small magnitude; therefore, the generic operational impacts on air quality are considered not significant.

Location-Specific Impacts

Location: PS1 and PS2

Release of Gases, Exhausts and Vapours to Atmosphere

Location-specific air quality impacts during operation will occur later in the life of the project when the use of oil heaters at the pumping stations will contribute to project-related emissions to atmosphere. The fuel for these stationary combustion emission sources will be crude oil from the pipeline. The expected magnitudes of emissions were not considered sufficient to warrant quantitative assessment, e.g., by dispersion modelling¹².

Impact: Increased NO₂ concentrations at ground level from operation of bulk heaters (long and short term).

Owing to the relatively small quantities of emissions of NO₂ from the bulk heaters at PS1 and PS2, the impact is considered a medium magnitude before mitigation, and the effects of NO₂ emissions from PS1 and PS2 during operation from bulk heaters are considered not significant.

Impact: Increased PM₁₀ and PM_{2.5} concentrations at ground level from operation of bulk heaters (long and short term)

Owing to the relatively small quantities of emissions of particulate matter from the bulk heaters at PS1 and PS2, the impact is considered a medium magnitude before mitigation, and the effects particulate matter emissions from PS1 and PS2 during operation from bulk heaters are considered not significant.

8.9.3 Mitigation Measures

This section describes impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect air quality.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management

¹² This is a deviation from the scoping report. When the scoping was undertaken, power generation was included at PS1 and PS2. Power generation results in higher emissions, requiring quantitative assessment. Optimisation of the project design eliminated the need for power generation at PS1 and PS2, reducing the emissions from these AGIs.

plans and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.9.3.1 Design

The project will design the operations combustion equipment to comply with national regulations and project emission standards.

8.9.3.2 Construction

Generic Impacts

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Reduced air quality from combustion of fuel in construction equipment and vehicles

The pollution prevention plan will include measures that contribute to the management of this impact.

Project vehicles, plant and equipment will be in good condition, regularly maintained and appropriate for the task being undertaken.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude will be reduced from medium to small while duration will remain short term.

Impact: Hydrocarbon vapour emissions from refuelling operations causing reduced air quality

The pollution prevention plan will include measures that contribute to the management of this impact.

A refuelling procedure will be developed and implemented which will include measures to limit loss of fuel or vapours to the environment.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude will be reduced from small to negligible while duration will remain short term.

Dust

Impact: Nuisance from dust emissions from construction site activities

The pollution prevention plan and the transport and road safety management plan will include measures that contribute to the management of this impact.

Dust will be managed where necessary by means such as covering fine materials and wetting roads where appropriate. Project speed driving limits will be enforced, and awareness training will be provided to project personnel.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the magnitude will be reduced from medium to small while duration will remain short term.

Location-Specific Impacts

Location: All MCPYs and Hydrotest Sections

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Emissions of gaseous substances causing reduced air quality from operation of generators

Impact: Emissions of fine particulate matter causing reduced air quality from operation of generators

The pollution prevention plan will include measures that contribute to the management of these impacts.

Combustion equipment will be designed to meet national regulations and project standards regarding air quality and emission limits and will be in good condition, regularly maintained and appropriate for the task being undertaken.

Although the pre-mitigation impacts are considered not significant, application of the above mitigation measures will further reduce impact; the magnitude will be reduced from medium to small while duration remains short term.

Dust

Impact: Nuisance from mobilisation of dust by project vehicles

The pollution prevention plan and the transport and road safety management plan will include measures that contribute to the management of this impact.

Dust will be managed where necessary by means such as covering fine materials and wetting roads where appropriate. Project speed driving limits will be enforced, and awareness training will be provided to project personnel.

Although the pre-mitigation impact is considered not significant, application of the above measures will further reduce the impact; the magnitude will be reduced from small to negligible while duration remains short term.

8.9.3.3 Project Operation

Generic Impacts

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Exhaust emissions from vehicles causing reduced air quality during operation

The pollution prevention plan will include measures that contribute to the management of this impact.

Project vehicles, plant and equipment will be in good condition, regularly maintained and appropriate for the task being undertaken.

Although the pre-mitigation impact is considered not significant, application of the above measures will further reduce impact; the magnitude will be reduced from small to negligible.

Dust

Impact: Nuisance from mobilisation of dust by project vehicles.

The pollution prevention plan and the transport and road safety management plan will include measures that contribute to the management of this impact.

Dust will be managed where necessary by means such as covering fine materials and wetting roads where appropriate. Project speed driving limits will be enforced, and awareness training will be provided to project personnel.

Although the pre-mitigation impact is considered not significant, application of the above measures will further reduce impact; the magnitude will be reduced from small to negligible.

Location-Specific Impacts

Location: PS1 and PS2

Release of Gases, Exhausts and Vapours to Atmosphere

Impact: Increased NO₂ concentrations at ground level from operation of generators and bulk heaters (long and short term)

The pollution prevention plan will include measures that contribute to the management of this impact.

Equipment will be in good condition, regularly maintained and appropriate for the task being undertaken

The project will design combustion plant to comply with national regulations and project emission standards. Equipment will be in good condition, regularly maintained and appropriate for the task being undertaken.

Although the pre-mitigation impact is considered not significant, application of the above measures will further reduce impact; the magnitude of impact will reduce from medium to small.

Impact: Increased PM₁₀ and PM_{2.5} concentrations at ground level from operation of generators and bulk heaters (long and short term)

The pollution prevention plan will include measures that contribute to the management of this impact.

The project will design combustion plant to comply with national regulations and project emission standards. Equipment will be in good condition, regularly maintained and appropriate for the task being undertaken.

Although the pre-mitigation impact is considered not significant, application of the above measures will further reduce impact; the magnitude will be reduced from medium to small.

8.9.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on air quality after mitigation measures have been implemented.

Table 8.9-1 summarises the potential generic air quality impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.9-2 summarises location-specific impacts.

No significant residual air quality impacts are predicted.

Table 8.9-1 Air Quality – Generic Impacts

Aspect	VEC	Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Release of gases, exhausts and vapours to atmosphere	Air Quality	Reduced air quality from combustion of fuel in construction equipment and vehicles	C	–	Pollution Prevention Plan	4	2	2	2–4	10–12
Release of gases, exhausts and vapours to atmosphere	Air Quality	Hydrocarbon vapour emissions from refuelling operations causing reduced air quality	C	–	Pollution Prevention Plan	2	2	2	1	7
Release of gases, exhausts and vapours to atmosphere	Air Quality	Exhaust emissions from vehicles causing reduced air quality during operation	O	–	Pollution Prevention Plan	2	4	2	2–5	10–13
Dust	Air Quality	Nuisance from dust emissions from construction site activities	C	–	Pollution Prevention Plan Traffic and Road Safety Management Plan	4	2	2	1–3	9–11
Dust	Air Quality	Nuisance from mobilisation of dust by project vehicles	O	–	Pollution Prevention Plan Traffic and Road Safety Management Plan	2	4	2	1–3	9–11

NOTES: C = construction; O = operation; C&O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity (which may be a range as described in Section 6.4.2.5); SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

Table 8.9-2 Air Quality – Location-Specific Impacts

Location	Aspect	Potential Impact	Impact Detail	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
							M	D	E	S	SS
All MCPYs and hydrotest sections	Release of gases, exhausts and vapours to atmosphere	Emissions of gaseous substances causing reduced air quality from operation of generators		C	–	Pollution Prevention Plan	4	1-2	2	1–3	8–11
All MCPYs and hydrotest sections	Release of gases, exhausts and vapours to atmosphere	Emissions of fine particulate matter causing reduced air quality from operation of generators		C	–	Pollution Prevention Plan	4	1-2	2	2–5	9–13
All MCPYs and hydrotest sections	Dust	Nuisance from mobilisation of dust by project vehicles		C	–	Pollution Prevention Plan Traffic and Road Safety Management Plan	2	4	2	1–5	9–13
PS1, PS2	Release of gases, exhausts and vapours to atmosphere	Increased NO ₂ concentrations at ground level from operation of bulk heaters (long and short term)		O	–	Pollution Prevention Plan	4	4	2	1	9

NOTES: ¹ Only the part of the mitigation measure relating to the location of machinery and activity away from receptors is relevant in these cases.

C = construction; O = operation; C&O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity (which may be a range as described in Section 6.4.2.5); SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

Table 8.9-2 Air Quality – Location-Specific Impacts

Location	Aspect	Potential Impact	Impact Detail	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
							M	D	E	S	SS
PS1, PS2	Release of gases, exhausts and vapours to atmosphere	Increased PM _{2.5} and PM ₁₀ concentrations at ground level from operation of bulk heaters (long and short term)		O	–	Pollution Prevention Plan	4	4	2	3	11

NOTES: C = construction; O = operation; C&O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity (which may be a range as described in Section 6.4.2.5); SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

8.9.5 Transboundary Project Impacts

None of the impacts described above are transboundary, except for the limited occurrence of construction work immediately adjacent to the Uganda–Tanzania border, where low levels of emissions will cross the border. Based on prior experience and professional judgement, effects will not occur beyond around 300 m from the source activities.

No construction facilities or operational phase AGIs are close enough to national borders for their emissions to have a discernible transboundary impact.

8.9.6 Cumulative Impacts

8.9.6.1 Context

The baseline condition of air quality in the EACOP project's AOI, the trends and sensitivity to change are described in Section 6.4.2.5. Residual project impacts are summarised in Table 8.9-1 and Table 8.9-2.

Air quality is characterised as having moderate sensitivity to NO_x, VOC, CO and SO₂ emissions, and low to very high sensitivity to changes in PM for which measured baseline levels are moderate to high, and in some cases exceed the PES.

The primary, construction-related project impacts are reductions in air quality from dust emissions from construction activities, exhaust emissions from equipment and vehicles and emissions from refuelling operations. These are predicted to be transient and limited in extent to the immediate vicinity and residual impacts are therefore considered not significant. The primary project operation impacts are reductions in air quality from the operation of generators and bulk heaters at the pumping stations.

The criterion for assessing whether the cumulative impacts are significant is that the limit of acceptable change is not exceeded. The limit of acceptable change is that no PES is exceeded because of the combined effects of the project and other developments.

Associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H.

8.9.6.2 Cumulative Impacts

Associated Facilities

Potential cumulative impacts are possible on air quality where the EACOP project AOI overlaps the AF AOI. This occurs around KP0 where the EACOP PS1 and pipeline route are close to the Tilenga and Kingfisher feeder pipelines.

Construction timeframes for the Tilenga feeder and Kingfisher pipelines are not confirmed but likely to occur in a similar timeframe to EACOP. If the construction activities are conducted concurrently generating emissions to air, this could lead to

potential direct cumulative impacts on the ambient air quality and indirect impacts on communities within 300 m of the right-of-way at KP0.

The EACOP project and the associated facilities construction activities will be transient. Therefore, the overlap with of construction schedules would be for a short period.

Information from the Kingfisher and Tilenga projects indicate that similar mitigation measures to those proposed in Section 8.9.3 will be implemented. To manage the construction-phase cumulative impact, the project will ensure that the proponents of the associated facilities are made aware of the construction schedule to reduce disruption.

With the mitigation measures, it is predicted that the residual cumulative impacts will be within the limit of acceptable change, and therefore not significant.

Third-Party Developments

Potential cumulative impacts are possible on air quality where the EACOP project and the third party developments construction AOIs overlap, see Table 8.9-3.

Table 8.9-3 Air Quality –Third-Party Developments

ID	Third-Party Development	Nearest KP or Where Third-Party Development Crosses EACOP	Potentially Affected Communities
UG05	Transmission line to Kabaale airport	KP12	Up to 20 communities within the overlapping AOI identified by satellite imagery
UG08	Hoima-Buloba pipeline	Is parallel to EACOP KP0–5	Affecting the same communities as EACOP at KP0–5
UG19	Lot 4 Kabaale – Kiziranfumbi (R4) road upgrade	KP12	Up to 20 communities within the overlapping AOI identified by satellite imagery
UG20	Buhimba-Kakumiro road upgrade	KP39.5	Up to 10 communities within the overlapping AOI identified by satellite imagery
UG22	Bulima-Kabwoya road upgrade	KP19	Up to 10 communities within the overlapping AOI identified by satellite imagery
UG34	Transmission line extension	KP133	Up to 15 communities within the overlapping AOI identified by satellite imagery

Table 8.9-3 Air Quality –Third-Party Developments

ID	Third-Party Development	Nearest KP or Where Third-Party Development Crosses EACOP	Potentially Affected Communities
UG41	Kyotera – Rakai road upgrade	KP258	Up to 20 communities within the overlapping AOI identified by satellite imagery
UG44	ICT infrastructure	KP223 and 269.5	Up to 15 communities within the overlapping AOI identified by satellite imagery

Construction timeframes for the third-party developments are not known at the time of writing. Although unlikely, a worst-case scenario has therefore been assumed that if the construction activities are conducted concurrently generating emissions to air, this could lead to potential direct cumulative impacts on the ambient air quality and indirect impacts on communities. The EACOP project and the third-party development construction activities will be transient therefore the overlap with third-party projects in construction schedules would be for a short period of time.

If during the course of project construction timeframes for third party developments become known, the project will engage with the third party developers and planning authorities to schedule activities to avoid overlap.

With the mitigation measure implemented, it is predicted that the residual cumulative impacts will be within the limit of acceptable change, and therefore not significant.

There are no residual cumulative impacts from operation of the AGIs or underground pipeline.

8.9.6.3 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts on air quality.

8.10 Acoustic Environment

This section describes potential impacts on the terrestrial acoustic environment during commissioning, construction and operation of the EACOP project and associated mitigation measures to be adopted.

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operation impacts, those from construction facilities and those from the pipeline and AGIs. For impacts from noise and vibration, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If before the aggregation a construction facility or pipeline and AGIs impact was greater than the other, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in

the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.10.1 Key Sensitivities and Considerations

The acoustics baseline conditions are described in Section 6.4.2.6, as well as:

- acoustics key valued environmental components (VEC) and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the acoustics impact assessment.

The acoustic baseline study identified very low to high sensitivity VECs with none ranked as very high.

The noise environment across the majority of the AOIs, particularly around AGIs is dominated by human induced sources such as road traffic, farming and general human interactions.

For the acoustic VEC, regardless of magnitude, unless there is a current or proposed receptor (i.e., an existing or proposed dwelling) there is no impact.

Further information about receptors is presented in Section G2.2.3 of Appendix G2.

8.10.1.1 Approach to Quantifying Impacts

Section G2.2 of Appendix G2 provides information and methodology on the quantitative modelling undertaken to support this acoustic impact assessment.

Noise

Construction and operational noise have been predicted using internationally recognised computer modelling software (SoundPlan V7.4). This software can account for environmental parameters including meteorological conditions, ground absorption, terrain, structures (dwellings and barriers). Tables G2.2-10 and G2.2-11 in Appendix G2 describe how each of these parameters has been defined in the model.

Operational noise from aboveground installations (AGI) and main camp pipe yards (MCPY) has been predicted across the AOI using engineering layouts and equipment information. Given the large number of potential receptors, operational noise levels are predicted across the area rather than at specific receptors, although the number of receptors within specific operational-noise bands is identified (see Figures G2.1–G2.8 in Appendix G2).

Construction noise is transient for the pipeline right-of-way (RoW). The model predicts the construction noise for each construction activity across the AOI based on all equipment being in the worst-case position (i.e., tracking along the RoW and within AGI boundaries with the highest possible noise level).

Traffic noise has been predicted using internationally accepted algorithms and is quantified and reported as change in noise rather than predictions of absolute levels (see Section G2.2.6.5 of Appendix G2 for assumptions).

Vibration

Vibration calculation methods are presented in Section G2.2.7 of Appendix G2. They evaluate construction generated vibration (including rock breaking and traffic movements; no blasting is required in Uganda). Predictions are based on empirical formula using construction activity specifications (i.e., rock hammer weight) and specified distances between the source and prediction points. Assumptions are made, including the ground conditions and other environmental parameters (see Table G2.2-12 of Appendix G2).

8.10.2 Potential Project Impacts

8.10.2.1 Construction

Where similar construction equipment and activities are used in different parts of the project, the noise impacts and generic mitigation measures are similar and therefore assessed in the same way.

Construction activities are expected to change the noise environment close to the works. The level to which the existing noise environment is affected depends on the project noise source levels and distances between the source and receptors. Construction noise can also change or add a new noise character to the existing noise environment. Therefore, regardless of the level of change, the change in character is likely to make the construction noise noticeable by local receivers.

A change in the noise environment will have a primary impact on people within the AOI. The impacts include sleep and rest disturbance, lack of concentration and, according to the World Health Organization (WHO), may cause cardiovascular and psychophysiological effects, reduce performance and provoke annoyance responses and changes in social behaviour'. Although less research is available, the same effects can apply to the wildlife that frequents (for food, security, water and reproduction) or inhabits the area.

Secondary impacts on humans, which can include longer-term health or social effects associated with elevated noise levels in an inhabited environment, are considered in Section 8.18 and secondary impacts on wildlife are considered in Section 8.3.

Quantification of construction noise impacts is presented in Section G2.3.1.3 (development of MCPYs), Section G2.3.1.5 (access roads) and Section G2.3-1 (pipeline construction) of Appendix G2. The results show that construction noise will be audible, but short in duration.

Generic Impacts

Noise

Impact: Disturbance or nuisance from noise from construction on the RoW

The construction activities associated with development of the RoW are expected to use standard construction methods. The noise sources include trenchers, excavators, dozers, dump trucks and graders.

Noise levels are predicted to range between 50 dB(A) and 70 dB(A) $L_{Aeq,T}$. When compared with the baseline noise environment, levels are in general higher than the existing ambient noise environment (compared with $L_{eq,1hr}$) and are likely to be perceptible because of the different character to the existing environment and increase over the baseline L_{A90} . No exceedances of the PES are predicted.

Noise levels are predicted to be of a very large magnitude and are likely to be perceptible. Owing to the transient and intermittent nature of RoW construction, the impacts on the acoustic environment before mitigation are considered not significant.

Impact: Disturbance or nuisance from noise from traffic movement

Many vehicles are required for the construction of all project components. These vehicles will use existing roads and new permanent or temporary access roads.

The movement of vehicles may generate noise levels above the existing noise environment. This is particularly the case for new roads where a new source will be introduced into the area with the potential to change the noise character. The level of impact is determined by the magnitude of exposure, which relates to variables including vehicle numbers, speed, type and load; road condition (including surface); and the distance between the noise receptors and the noise source (the road). For traffic-related noise, it is noted that a 3-dB change is typically required to be perceivable by humans, and for this to occur a 100% increase in traffic would be required. Similarly, a 1 dB increase in traffic noise represents a 25% increase in traffic, whereas a 20% reduction represents a 1 dB reduction.

Primary road-traffic impacts will be similar to those for fixed-source noise. However, due to the intermittent nature of vehicle movements, the fluctuation in noise levels can be greater than for fixed-noise emissions. The constant change in noise level from traffic movements has potentially more impact on human and wildlife health and sleep disturbance than a steady-state, high-noise environment.

Quantification of access-road use (to facilitate construction) is presented in Section G2.3.1.5 of Appendix G2. The movement of construction traffic will have the potential to increase the baseline noise environment by up to 10 dB for new access roads, and up to 5 dB for existing. No exceedances of PES are predicted.

Owing to the transient and intermittent nature of construction traffic at any one location, the impacts on the acoustic environment before mitigation are not significant.

Impact: Disturbance or nuisance from noise during commissioning of the pipeline

Commissioning, hydrostatic-testing, pigging and pipeline-drying facilities will require the operation of pumps, compressors and blowers. Use of this equipment will introduce new, high-magnitude noise sources into the environment which will operate continuously for 24–48 hours.

The locations at which these activities will occur are not yet known. However, a generic quantitative assessment, undertaken to determine the impact, is presented in Section G2.3.2 of Appendix G2. This assessment predicts a level of 68 dB(A) 10 m from the noise source (assuming local acoustic screening is included in the site layout). No exceedances of PES are predicted.

The modelling predicts the magnitude of the impact could be very large. However, owing to the transient and intermittent nature of commissioning noise, the impacts on the acoustic environment before mitigation are not significant.

Vibration

Impact: Disturbance, nuisance or cosmetic/structural damage from vibration

Standard excavation and trenching techniques will be unsuitable for some relatively short sections of the RoW because of local ground conditions or buried obstructions. At these locations, rock breakers may be required. The locations at which other rock-breaking techniques may be required will be identified as the project progresses.

The primary impacts associated with the use of rock-breaking equipment will be the exposure to low-level vibration. The vibration may be felt by people less than 20 m from the rock-breaking equipment. However, the equipment typically used will not startle people or cause damage to structures. There is a potential secondary social impact associated with these new experiences considered in Section 8.15.

Quantification of rock-breaking vibration is presented in Section G2.4.1.1 of Appendix G2.

Owing to the transient and intermittent nature of rock breaking at any one location, the impacts from vibration are considered not significant.

Location-Specific Impacts

Location: All MCPYs

Noise

Impact: Disturbance or nuisance from noise generation during development of construction facilities

The construction activities associated with development of the MCPYs and access roads are expected to use standard construction methods. The noise sources include excavators, dozers, dump trucks and graders.

Noise levels at the fenceline of the MCPYs and access roads are predicted to range between 40 dB(A) and 65 dB(A) $L_{Aeq,T}$. When compared with the baseline noise environment, levels are in general higher than the existing ambient noise environment (compared with $L_{eq,1hr}$) and are likely to be perceptible because of the different character to the existing environment and increase over the baseline L_{A90} .

During the construction of MCPY1-3, the noise levels from some activities have the potential to exceed the 'very large' magnitude ranking at up to 22 receptors at any one MCPY, where receptors are classed as 'high sensitivity'. At MCPY4, no receptors have been identified within 100m, and the magnitude of impact at this location is predicted to be negligible.

Noise levels are likely to be perceptible and of a very large magnitude. However, owing to the transient and intermittent nature of construction impacts, the impacts on the acoustic environment before mitigation are considered not significant. No exceedances of the PES are predicted.

Vibration

Impact: Disturbance or damage due to vibration generation during development of construction facilities

The expected construction methods at the MCPYs and coating facility are not expected to introduce sources of vibration with the potential to be perceptible within the AOI. The magnitude of any impact will be small, and the impact is considered not significant.

Location: All MCPYs

Impact: Disturbance or nuisance from operation of the MCPYs

Construction facility operation will add to the noise environment in the immediate vicinity. However, the level to which it affects the existing noise levels depends on noise source magnitude and distances of receptors from the source. In addition to affecting the baseline magnitude, construction noise can change or add a new noise character to the existing environment.

Although these facilities are required for the construction phase, they have an operational character to them, with fixed noise sources (e.g., generators and water treatment plants).

The impacts of a change in the noise environment will have a primary effect on the users of the area exposed to the change (as described in Section 8.10.2.1).

Although less research is available, the same effects can apply to wildlife that frequents (for food, security, water and reproduction) or inhabits the area.

Secondary impacts can include the longer-term health or social effects associated with elevated noise levels in human- and wildlife-inhabited environments. These impacts are described in Sections 8.15 and 8.18 for human environments and 8.3 for wildlife environments.

Quantification of likely noise generated through construction facility operation is presented in Section G2.3.1.3 of Appendix G2. During the operation of the MCPYs noise levels are predicted to range between 40 dB(A) and 65 dB(A) $L_{Aeq,T}$. When compared with the baseline, noise environment levels are in general higher than the existing ambient noise environment (compared with $L_{eq,1hr}$) and are likely to be perceptible because of the different character to the existing environment and increase over the baseline L_{A90} .

At MCPY1-3 the magnitude of impacts has the potential to be very large. However, owing to their short-term operation, the impacts of MCPY1-3 operation on the acoustic environment before mitigation are considered not significant. At MCPY4, no receptors have been identified within 100m, and the magnitude of impact at this location is predicted to be negligible.

No exceedances of PES are identified at MCPY locations.

Vibration

Impact: Disturbance or damage due to vibration generation during development of construction facilities

The expected construction methods at the MCPYs and coating facility are not expected to introduce sources of vibration with the potential to be perceptible within the AOI. The magnitude of any impact will be small, and the impact is considered not significant.

Location: All MCPYs

When construction has been completed and after decommissioning, the leases will be surrendered and the MCPYs may be transferred to the government with some structures left in place or removed. Noise impacts will occur only if structures are removed and then the impacts described below apply.

Noise

Impact: Disturbance or damage due to noise generation during decommissioning of construction facilities

Where structures are to be removed at the end of their use by the project, the machines and equipment used and nature of operations are expected to be similar to those used for construction. The impacts on the acoustic environment from decommissioning are therefore expected to be similar to those for disturbance from noise from traffic movement, and disturbance or nuisance from noise generation during development of construction facilities described above. Identification and assessment of acoustic impacts will be included in the decommissioning plan.

Location: All MCPYs

Vibration

Impact: Disturbance or damage due to vibration generation during decommissioning of construction facilities

Where structures are to be removed at the end of their use by the project, the machines and equipment used and nature of operations are expected to be similar to those used for construction. The impacts of vibration from decommissioning are therefore expected to be similar to those for disturbance from vibration from traffic movement, and disturbance or nuisance from vibration during construction of construction facilities. Identification and assessment of vibration impacts will be included in the decommissioning plan.

8.10.2.2 Operation

Generic Impacts

Noise

Impact: Disturbance or nuisance from noise from traffic movement

The generic impacts during operation will be restricted to operational vehicle movements. These operations will be widely dispersed, at a low intensity and

transient at each location. Therefore, generic operational impacts on the acoustic environment are expected to be not significant.

Location-Specific Impacts

Location-specific acoustic impacts during operation have been identified. These relate to the operation of bulk oil heaters at PS1 and PS2. These stationary noise sources will affect the areas surrounding the AGIs.

The level of impact depends on the noise source level and distances between the receivers and the source. In addition to affecting the baseline noise levels, operational machines noise can change or add a new noise character to the existing environment.

The existing noise environment across the AOI was found not to be influenced by industrial noise. Therefore, noise from the operation of the pumping stations is likely to add a new noise character to the existing baseline environment.

Quantification of likely noise generated through operation of the pumping stations is presented in Section G2.3.3. of Appendix G2. The levels and impacts reported below are taken from Appendix G2 and represent the range of operational noise predictions across each AOI, before the application of specific mitigation measures.

Before mitigation, pumping-station operation is predicted to have a significant impact on the existing baseline environment and, in some circumstances, the noise levels are predicted to exceed PES.

Location: PS1 and PS2

Noise

Impact: Increase in existing baseline noise environment causing disturbance and nuisance

PS1 and PS2: quantitative assessment in Section G2.3.3.1 of Appendix G2 predicts pre-mitigation noise levels of 40–55 dB(A) LAeq,T in the 1 km study area around PS1 and PS2. Night-time impacts from noise are predicted to be of large magnitude with noise levels predicted to exceed the night-time PES for receptors.

Predicted noise levels in the AGI AOI are mostly higher than baseline ambient noise levels and, being of different character to baseline noise, are likely to be perceptible. The greater the distance from the AGIs the less perceptible the noise will be; receptors typically habituate to noise over time.

At PS1, due to the potential exceedance of the PES during both daytime and night-time periods, impacts are considered significant before mitigation is applied.

At PS2, due to the potential exceedance of the PES during night-time periods only, impacts are considered significant before mitigation is applied.

8.10.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect the acoustic environment.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plans and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.10.3.1 Design

Generic Mitigation Measures

To limit the impacts of noise generated by project activities, the design process will continue to minimise the impact of noise emissions through appropriate design. This includes giving preference to the selection of low noise and vibration emitting equipment and construction techniques, specifying equipment mitigation devices as standard where these are available (for example, exhaust muffler), and laying out sites to maximise distance and acoustic screening between noisy equipment and sensitive receptors.

Location-Specific Mitigation Measures

Modelling results predict that before mitigation PES at receptor locations will be exceeded in the AOI of PS1 and PS2 during the operational phase, which is a function of project design. Further design mitigation is being progressed during detailed engineering to ensure that meeting PES will be the project target for noise emissions at any receptor.

8.10.3.2 Construction

Generic Mitigation Measures

Noise

Impact: Disturbance or nuisance from noise from construction on the RoW

The pollution prevention plan will include measures that contribute to the management of noise impacts.

Noise emissions will be reduced by giving preference to low noise emitting equipment, acoustic screening and, where necessary, undertaking additional assessment to identify other mitigation that may be required. Equipment will be serviced and maintained on schedule.

Meeting PES will be the project target for noise emissions.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Impact: Disturbance or nuisance from noise from traffic movement

The pollution prevention plan and the transport and road safety management plan will include measures that contribute to manage noise emissions from traffic movement.

To limit the impacts of noise generated by traffic movements, measures to ensure project vehicles are in good condition, regularly maintained and appropriate for the task will be implemented. Where possible, new access roads will be constructed a minimum of 100 m from sensitive receptors, such as schools. Speed limits will be enforced, night-time driving will be by exception and vehicle movements will be restricted to defined access routes. There is a potential secondary social impact associated with these new experiences considered in Sections 8.15 and 8.18.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to large.

Impact: Disturbance or nuisance from noise during commissioning of the pipeline

The pollution prevention plan will include measures that contribute to the management of commissioning noise impacts.

Noise emissions will be reduced by giving preference to low noise emitting equipment, acoustic screening and, where necessary, undertaking additional assessment to identify other mitigation that may be required. Equipment will be serviced and maintained on schedule.

Meeting PES will be the project target for noise emissions.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Vibration

Impact: Disturbance, nuisance or cosmetic/structural damage from vibration

The pollution prevention plan and the stakeholder engagement plan will include measures that will manage vibration impacts.

To minimise the impact of vibration the project will give preference to the selection of low vibration emitting equipment and require additional assessments to be undertaken where activities generating high levels of vibration are near sensitive receptors. Where damage to property from project activities has been identified, the project will complete repairs or compensate as appropriate; repairs will be on a like-for-like or better basis. The compensation framework will be included in the RAP.

Communities will have access to the project grievance procedure to register concerns regarding disturbance or damage from vibration.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Location-Specific Mitigation**Location: All MCPYs****Noise**

Impact: Disturbance or nuisance from noise generation during development of construction facilities

The pollution prevention plan will include measures that contribute to the management of noise impacts.

Noise emissions will be reduced by giving preference to low noise emitting equipment, acoustic screening and, where necessary, undertaking additional assessment to identify other mitigation that may be required. Equipment will be serviced and maintained on schedule.

Meeting PES will be the project target for noise emissions.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude at MCPY1-3 will reduce from very large to small. Magnitude at MCPY4 will remain negligible.

Vibration

Impact: Disturbance or damage due to noise or vibration generation during development of construction facilities

The pollution prevention plan and the stakeholder engagement plan will include measures that contribute to the management of vibration impacts.

Vibration will be reduced by preferentially selecting low vibration generating equipment undertaking additional assessments where activities generating high levels of vibration are near sensitive receptors. Where damage to property from project activities has been identified, the project will complete repairs or compensate as appropriate; repairs will be on a like-for-like or better basis.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Location: All MCPYs**Noise**

Impact: Disturbance or nuisance from operation of the MCPYs

The pollution prevention plan will include measures that manage MCPY noise impacts.

During operation of the MCPYs preference will be given to the selection of low noise emitting equipment. Power plants and equipment will be kept in good condition, regularly maintained and appropriate for the task being undertaken.

Meeting PES will be the project target for noise emissions.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short

term and intermittent while magnitude at MCPY1-3 will reduce from very large to small. Magnitude at MCPY4 will remain negligible.

Location: All MCPYs**Noise**

Impact: Disturbance or damage due to noise generation during decommissioning of construction facilities

The pollution prevention plan will include measures that contribute to the management of this impact.

The impacts to the acoustic environment during decommissioning are expected to be similar to those during construction. The mitigation measures within the pollution prevention plan, particularly those described under generic impacts in Section 8.10.2.2 will apply.

The pre-mitigation impact for the development of construction facilities is considered not significant. Similarly, the pre-mitigation impact for decommissioning construction facilities is considered not significant and the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Vibration

Impact: Disturbance or damage due to noise or vibration generation during development of construction facilities

The pollution prevention plan and the stakeholder engagement plan will include measures that contribute to the management of vibration impacts.

Vibration will be reduced by preferentially selecting low vibration generating equipment undertaking additional assessments where activities generating high levels of vibration are near sensitive receptors. Where damage to property from project activities has been identified, the project developer will complete repairs and/or compensate as appropriate; repairs will be on a like-for-like or better basis.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

Impact: Disturbance or damage due to vibration generation during decommissioning of construction facilities

The pollution prevention plan and the stakeholder engagement plan will include measures that contribute to the management of this impact.

The impacts to the acoustic environment during decommissioning are expected to be similar to those during construction. The mitigation measures within the pollution prevention plan, particularly those described under generic impacts in section 8.10.3.2 will apply.

Although the pre-mitigation impact for the development of construction facilities is considered not significant, and similarly, the pre-mitigation impact for decommissioning construction facilities is considered not significant, the application

of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to small.

8.10.3.3 Project Operation

Generic Mitigation

Noise

Impact: Disturbance or nuisance from noise from traffic movement

The pollution prevention plan and the transport and road safety management plan will include measures that contribute to the management of this impact.

The generic impacts during operation will be restricted to operational vehicle movements. Speed limits will be enforced, night time driving will be by exception and vehicle movements will be restricted to defined access routes. Additionally, project vehicles will be in good condition, regularly maintained and work appropriate.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will remain short term and intermittent while magnitude will reduce from very large to large.

Location-Specific Mitigation

Location: PS1 and PS2

Noise

Impact: Increase in existing baseline noise environment causing disturbance and nuisance from operation of the pump stations

The pollution prevention plan will include measures that contribute to the management of noise emissions from the PSs.

During operation of these AGIs, preference will be given to the selection of low noise emitting equipment. Power plants and equipment will be kept in good condition, regularly maintained and appropriate for the task being undertaken.

Meeting PES will be the project target for noise emissions.

The implementation of the mitigation measures will reduce the magnitude of impact from large to small; the residual impact will be not significant.

8.10.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on the acoustic environment after mitigation has been implemented.

Table 8.10-1 summarises the potential generic acoustic impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation.

Table 8.10-2 summarises location-specific impacts after mitigation.

No significant residual acoustic environment impacts are predicted.

Table 8.10-1 Acoustic Environment – Generic Impacts

Aspect	VEC	Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Noise	Acoustic Environment	Disturbance or nuisance from noise from construction on the RoW	C	-	Pollution Prevention Plan	4	1	2	4	11
Noise	Acoustic Environment	Disturbance or nuisance from noise from traffic movement	C&O	–	Pollution Prevention Plan Transport and Road Safety Management Plan	8	1	2	5	16
Vibration	Acoustic Environment	Disturbance, nuisance or cosmetic / structural damage from vibration	C	–	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11

NOTES: C = construction; O = operation; C/O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity; SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

Table 8.10-2 Acoustic Environment – Location-Specific Impacts

Location	Aspect	VEC	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
							M	D	E	S	SS
MCPY1-3	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during development of construction facilities	C	–	Pollution Prevention Plan	4	1	2	4	11
MCPY4	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during development of construction facilities	C	–	Pollution Prevention Plan	2	1	2	4	9
MCPY1-3	Vibration	Acoustic Environment	Disturbance or damage due to vibration generation during development of construction facilities	C	–	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
MCPY4	Vibration	Acoustic Environment	Disturbance or damage due to vibration generation during development of construction facilities	C	–	Pollution Prevention Plan Stakeholder Engagement Plan	2	1	2	4	9
MCPY1-3	Noise	Acoustic Environment	Disturbance or nuisance from operation of MCPY1–3	C	–	Pollution Prevention Plan	4	2	2	4	12
MCPY4	Noise	Acoustic Environment	Disturbance or nuisance from operation of MCPY4	C	–	Pollution Prevention Plan	2	2	2	4	10
MCPY1-3	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during decommissioning of construction facilities	C	–	Pollution Prevention Plan	4	1	2	4	11

NOTES: C = construction; O = operation; C/O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity; SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

Table 8.10-2 Acoustic Environment – Location-Specific Impacts

Location	Aspect	VEC	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
							M	D	E	S	SS
MCPY4	Noise	Acoustic Environment	Disturbance or nuisance from noise generation during decommissioning of construction facilities	C	–	Pollution Prevention Plan	2	1	2	4	9
MCPY1-3	Vibration	Acoustic Environment	Disturbance or damage due to vibration generation during decommissioning of construction facilities	C	–	Pollution Prevention Plan Stakeholder Engagement Plan	4	1	2	4	11
MCPY4	Vibration	Acoustic Environment	Disturbance or damage due to vibration generation during decommissioning of construction facilities	C	–	Pollution Prevention Plan Stakeholder Engagement Plan	2	1	2	4	9
Pumping Stations (PS1-PS2)	Noise	Acoustic Environment	Increase in existing baseline noise environment causing disturbance and nuisance from operation of the pump stations and MST.	O	–	Pollution Prevention Plan	4	4	2	4	14

NOTES: C = construction; O = operation; C/O = construction and operation; M = magnitude of impact; D = duration of impact; E = extent of impact; S = sensitivity; SS = significance score; – = no stakeholder concern was recorded. See Appendix D for the tables used to rank magnitude and sensitivity and Section 5 for the methodology used to calculate the significance score.

8.10.4.1 Further Emissions Management Design

Preliminary acoustic modelling results for operations at PS1 and PS2 predict significant impacts at receptors within the AOI before mitigation, significant being more than PES.

As a result, further design mitigation is being assessed to reduce the impacts to not significant levels and the pollution prevention plan includes a commitment that meeting PES will be the project target for noise emissions. The regulator will be updated on the progression of mitigation results following detailed design assessment.

8.10.5 Transboundary Project Impacts

At the time of writing, there are no transboundary project impacts.

8.10.6 Cumulative Impacts

8.10.6.1 Context

The baseline condition of acoustic environment in the EACOP project's AOI, the trends and sensitivity to change are described in Section 6.4.2.6. Residual impacts are summarised in Table 8.10-1 and Table 8.10-2.

Although the landscape and environment changes throughout the acoustics AOI, the baseline noise sources are similar due to the scarcity of fixed structures or substantial transport network; the main sources of noise are:

- wind through vegetation
- insects, birds and amphibians
- traffic (with a high proportion of small-engine motorbikes, some cars and more trucks when close to sealed roads)
- human interactions
- farming (mostly hand tools, some livestock movements).

As such, the noise environment across the acoustics AOI does not vary considerably and is consistent with the levels expected in a rural environment away from major road networks, towns and industry. Based on the acoustic survey, engagement with stakeholders and the trend in condition and sensitivity to change, the sensitivity of the acoustic environment for AGIs, construction facilities, the RoW and access roads across the AOI has been ranked from low to high.

The criterion for assessing whether cumulative impacts are significant is that the limit of acceptable change is not exceeded. The limit of acceptable change is that no PES is exceeded because of the combined effects of the project and other developments.

Associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H.

8.10.6.2 Cumulative Impacts

Associated Facilities

Potential cumulative impacts are possible on the acoustic environment where the EACOP project AOI overlaps the AF AOI. This occurs around KP0 where the EACOP PS1 and pipeline route converge with the Tilenga Project and Kingfisher Oil Project feeder pipelines. Construction timeframes for the Tilenga Project and Kingfisher Oil Project feeder pipelines are not confirmed but are likely to occur in a similar timeframe to the EACOP project.

The EACOP project and the associated facilities construction activities will be transient therefore the overlap of construction schedules would be for a short period.

To manage the cumulative impact, the project will ensure that the proponents of the associated facilities are made aware of the construction schedule to reduce disruption. With the additional mitigation measure implemented, noise is not likely to exceed the PES and the residual cumulative impact will be within the limit of acceptable change, and therefore not significant.

Third-Party Developments

Potential cumulative impacts are possible on the acoustic environment where the EACOP project and the third-party development AOIs overlap, see Table 8.10-3.

Table 8.10-3 Acoustic Environment –Third-Party Developments

ID	Third-Party Development	Nearest KP or Where Third-Party Development Crosses EACOP	Potentially Affected Communities
UG05	Transmission line to Kabaale airport	KP12	Up to 20 communities within the overlapping AOI identified by satellite imagery
UG08	Hoima-Buloba pipeline	Is parallel to EACOP KP0–5	Affecting the same communities as EACOP at KP0–5
UG19	Lot 4 Kabaale – Kiziranfumbi (R4) road upgrade	KP12	Up to 20 communities within the overlapping AOI identified by satellite imagery
UG20	Buhimba-Kakumiro road upgrade	KP39.5	Up to 10 communities within the overlapping AOI identified by satellite imagery
UG22	Bulima-Kabwoya road upgrade	KP19	Up to 10 communities within the overlapping AOI identified by satellite imagery
UG34	Transmission line extension	KP133	Up to 15 communities within the overlapping AOI identified by satellite imagery
UG41	Kyotera – Rakai road upgrade	KP258	Up to 20 communities within the overlapping AOI identified by satellite imagery

Table 8.10-3 Acoustic Environment –Third-Party Developments

ID	Third-Party Development	Nearest KP or Where Third-Party Development Crosses EACOP	Potentially Affected Communities
UG44	ICT infrastructure	KP223 and 269.5	Up to 15 communities within the overlapping AOI identified by satellite imagery

Construction timeframes for the third-party developments are not known at the time of writing. In the unlikely worst-case scenario where noise-generating construction activities are conducted concurrently, there could be cumulative impacts on communities.

The EACOP project and the third-party development construction activities will be transient therefore the overlap with third party projects in construction schedules would be for a short period of time.

If during the course of project construction timeframes for third-party developments become known, the project will engage with the third-party developers and planning authorities to schedule noise-generating activities to avoid overlap.

With these mitigation measures implemented, noise is not likely to exceed the PES and the cumulative impact will be within the limit of acceptable change and therefore not significant.

Cumulative impacts will not occur for vibration and blasting because the impacts are based on a single event rather than a combination of events.

There are no residual cumulative impacts from operation of the AGIs and the underground pipeline.

8.10.6.3 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts on the acoustic environment.

8.11 Economy

This section describes potential impacts on the Ugandan economy, subsequently referred to as benefits, during construction, commissioning and operation of the EACOP project and associated enhancement measures to be adopted. This assessment has focused on:

- employment
- provision of goods and services
- contribution to the economy.

8.11.1 Key Sensitivities and Considerations

The economic baseline conditions are described in Section 6.4.3.6, as well as:

- economic key valued and environmental components (VECs) and their sensitivity ranked based on the relevant tables in Appendix D

- key considerations for the economy impact assessment.

Sensitivity in the economy area of influence (AOI) is included in the various livelihood activities discussed in Sections 8.12 and 8.13.

Key considerations include:

- major projects create employment opportunities
- international projects may provide training and capacity building of the Ugandan workforce and local companies to satisfy Uganda's local content policy.

8.11.2 Project Benefits

8.11.2.1 Construction

Employment

The project is expected to create three categories of employment¹³:

- direct employment - employees and principal contractors
- indirect employment - subcontractors and suppliers
- induced employment - employment generated by increased spending by businesses and households earning an income from the project.

Benefit: The generation of national employment opportunities leading to an increase in household income and an improvement in living standards.

This may lead to direct and indirect impacts.

It is estimated that, on average, some 2000 direct construction jobs may be generated in Uganda over three-year construction phase, of which 1800 may be skilled and semi-skilled and 200 unskilled. It is estimated that 1200 workers will be nationals.

Information on the anticipated wage bill is not available. Assuming that all national workers earn the Ugandan average annual wage estimated at USD 2000 (UGX 7.56 million) (above the Ugandan average wage of USD 1600 due to the nature of jobs: industrial services mainly semi-skilled), employment of 1,200 national workers during construction will generate an annual income of USD 2.4 million (UGX 9.06 billion) (USD 7.2 million of the whole construction period) (UGX 27.2 billion).

¹³ The ICMM (2011) defines the various employment categories as follows in the Mining: Partnership for Development Toolkit

- Direct employment by the operation includes those staff that are on the payroll and contractors permanently based on site;
- Indirect employment comprises contractor employees working remotely for the operation (i.e., those staff on the contractors' payrolls who are employed to fulfil contracts at the operation), employees working at the operation's suppliers and at any contractor's suppliers or subcontractors whose employment is attributable to business generated by the operation, and employment generated in the region by (community) social investment activities, including local business development, in which the pipeline operation is a participant; and
- Induced or "multiplier" employment in local communities generated by the spending of direct and indirect employees, such as employment in local businesses and services (e.g., shops, transport and public services).

In addition to direct jobs, the project will create indirect and induced employment in other sectors such as logistics and supply chains, catering and security. Opportunities will increase as local businesses develop the capacity to supply goods and services during the construction and operation phases (local content) (IMF 2014).

Induced employment generation may be relatively restrained for this project for several reasons:

- The EACOP project is very capital (rather than labour) intensive, implying that for every USD in capital expenditure (Capex), a smaller proportion than predicted by multipliers accrues to labour remuneration.
- The project has a relatively high “leakage”, as some goods and services that are not available locally at the required standard must be sourced internationally (e.g., pipe manufactured to international standards, highly skilled pipeline construction supervisors).

MacGillivray et al. (2017) calculated that the average employment multiplier in developing countries is 7.8 (i.e., each direct worker is associated with (generates) more than seven indirect and induced jobs). Based on this multiplier, direct Uganda-based employment by the project may generate:

- approximately 9500 indirect and induced short-term employment opportunities in Uganda during construction
- at an average annual Ugandan wage of USD 1600 (UGX 6.04 million) (which overestimates income in the informal sector), indirect and induced employment generates an annual income of approximately USD 15 million (UGX 56.7 billion) during construction (USD 45 million for the whole period) (UGX 170 billion)
- during construction, the EACOP project may generate jobs (through direct, indirect and induced employment) for a total of approximately 10,700 Ugandans, 11% of whom will be directly employed
- the project may, therefore, generate total annual household income of USD 17.4 million (UGX 65.7 billion) (direct construction income of USD 2.4 million (UGX 9.06 billion) plus indirect and induced income of USD 15 million (UGX 56.7 billion) (USD 52 million (UGX 197 billion) for the three year period)
- people who benefit directly or indirectly from the project also support several dependants. Based on the average household size of 4.7 persons in Uganda (UBOS 2014a) and assuming one income earner per household, each income earner supports, on average, 3.7 dependants. Income from direct, indirect and induced employment (or reduced underemployment) for 10,700 nationals during construction could therefore benefit 39,590 dependants.

Provision of Goods and Services

Benefit: Project procurement providing opportunities for national businesses

This may lead to direct and indirect impacts.

Uganda's Oil and Gas Local Content Regulations prescribes that goods and services must be preferentially procured from local providers. Local content requirements will be fully integrated into EACOP's contracting and procurement strategy. The project is developing a local content plan to guide the implementation process.

- It is assumed that 40% of Capex, approximately USD 95 million (UGX 358.9 billion) annually, will be spent on goods and services procured nationally over the three-year construction period.
- Project activities comprise fairly standard civil works (e.g., construction camps and access road upgrades). It is expected that suitably qualified businesses in Uganda will participate in the execution of these project components. Capacity of national companies may be a challenge if the project is implemented simultaneously with other major infrastructure projects envisaged by the government.
- Regional changes in the demand for consumer goods have the potential to increase inflation; however, this is not expected to occur at a national scale and is assessed in Section 8.12.

Based on the multipliers stated in the next section, the estimated annual indirect and induced output is approximately USD 130 million (UGX 491 billion).

Contribution to Economy

Benefit: Contribution to national economy from investment

This may lead to direct and indirect impacts.

It is assumed that:

- the total Capex for the construction of the 1143 km EACOP is USD 3.5¹⁴ billion (UGX 13.2 trillion); nearly USD 700 million (UGX 2.64 trillion) (20% of the total) will be expended on the 296 km of pipeline in Uganda
- assuming that 40% of Capex is spent on nationally procured goods and services, direct annual in-country spending will amount to approximately USD 95 million per year (UGX 358.9 billion) (USD 285 million (UGX 1.07 trillion) for the three year construction period)
- the Bank of Uganda (2016) calculated output multipliers for different sectors of the Ugandan economy, to analyse the national income generated from a unit of investment in different sectors. Sectors that will directly benefit from the EACOP project have relatively high multipliers; these include industry (2.5) and services (2.25). This implies that for each USD 1 (UGX 3777.75) invested in these sectors, a further USD 1.5 (UGX 5666.6) and USD 1.25 (UGX 4722.2) of indirect and induced output will be generated in the economy by the multiplier effect¹⁵. Applying an averaged multiplier of 2.37 for the above two sectors, direct EACOP Capex expended in Uganda generates and contributes an additional annual indirect and induced amount of USD 130 million (UGX 491 billion) (USD 390 million (UGX 1.47 trillion) for the three-year construction period).

¹⁴ All EACOP related values are in 2016 terms

¹⁵ For comparison, a World Bank (2006) study on developing countries estimated a broad rural output multiplier of 2.5 and an urban output multiplier of 2, given the higher import content (leakage) of urban output that reduces the multiplier effect.

The total direct, indirect and induced economic impact of EACOP's Capex on the Ugandan economy amounts to an estimated USD 225 million (UGX 850 billion) per annum for the three-year construction period (USD 675 million) (UGX 2.6 trillion), equivalent to 2.5% of 2015 Gross Domestic Product (GDP).

These estimates apply primarily to the formal (measured) economy. Due to the importance of the informal economy in Uganda, the project will also increase demand (and therefore production) in the informal economy. The benefits of economic growth include increased income (including in the local informal economy), lower unemployment and underemployment and increased tax base and revenues.

Multipliers are typically derived through an evaluation of backward and forward linkages of economic sectors with other sectors (e.g., procurement, household expenditure). However, the indirect and induced economic stimulus of the EACOP project is likely to exceed the value provided by multipliers, as the EACOP project more generally results in:

- improved infrastructure, notably upgraded and new access roads
- exposure of a large workforce and associated businesses to technical training and work opportunities to international standards.

The World Bank (2017) specifically concluded that FDI in the oil sector could help support the recovery of growth. Other aspects deemed critical to drive growth are strong performance in the industrial sector and investment in large infrastructure projects that will also boost manufacturing and services, notably tourism (AfDB et al. 2016). The EACOP project has the potential to contribute toward several these critical aspects.

Benefit: Changes to the fiscal balance

This may lead to direct and indirect impacts.

During construction, the EACOP project is not expected to generate substantial government revenue and income. The Government of Uganda and Tanzania have agreed to offer several fiscal incentives to the project. It is expected that the contractors will contribute to the fiscal balance in the order of magnitude of several tens of USD millions over the construction period.

The wage bill and income distribution are not known, but Ugandan wages from direct EACOP employment are estimated at USD 2.4 million (UGX 9.06 billion) annually during construction. If all incomes are taxed at the maximum tax rate of 30% (URA 2018), this will yield government revenue of USD 800,000 (UGX 3.02 billion) per annum during the three-year construction phase (USD 2.4 million (UGX 9.06 billion) for the three year construction period). Additional income will be derived from indirect and induced wages; many may, however, lie below tax thresholds.

Government expenditure might increase during this phase to finance the national equity share and any supporting infrastructure.

Although it is too preliminary to estimate corporate or income tax on local businesses that will provide goods and services to EACOP, due to numerous factors involved in the determination of these figures, this is contribution to the

national economy and benefit to government by increasing the fiscal balance. The same applies to companies down the value chain (or through the multiplier effect) that will be required to pay Value Added Tax (VAT).

8.11.2.2 Operation

The following benefits, described for construction, are also applicable to operation:

Employment

Pipeline operation will require a workforce of 16 people, of whom approximately 11 workers (approximately 70% of the workforce) may be nationals in the first ten years, increasing to at least 14 workers (approximately 85% of the workforce) after 10 years. The percentage of skilled professionals is expected to increase during operations.

Assuming all workers earn a Ugandan average annual wage of USD 2000 (UGX 7,56 million) employment of 14 national workers generates an annual income of approximately USD 28,000 (UGX 105.8 million) during the operational life of the pipeline.

Indirect and induced employment opportunities from the project may generate approximately 110 long-term employment opportunities during operation. At an average annual Ugandan wage of USD 1600 (6.04 million), indirect and induced employment generates an annual income of USD 176,000 (UGX 664.8 million) during operation (USD 204,000 (UGX 771 billion) for direct, indirect and induced).

Provision of Goods and Services

Benefit: Project procurement providing opportunities for national businesses

This may lead to direct and indirect impacts.

During operation, in Uganda EACOP procurement will be associated with maintenance activities for a total operating expenses (Opex) of approximately USD 25 million (UGX 94.4 billion) of which approximately 70% would be resourced locally (USD 17 million (UGX 64.2 billion)). The local content of operation phase procurement is expected to be higher, and to increase over time as national suppliers acquire the required tools and skills.

Based on the previously stated multipliers (2.37) the estimated indirect and induced output is USD 24 million (UGX 90.67 billion).

Contribution to Economy

Benefit: Contribution to national economy from investment

This may lead to direct and indirect impacts.

The total direct, indirect and induced economic effect of EACOP Opex on the Ugandan economy amounts to an estimated USD 41 million (UGX 154.9 billion) per annum for the duration of pipeline operation.

In addition, if the pipeline can in future be utilised by other regional oil producers, as envisaged in the original announcements by the Ugandan and Tanzanian governments (The Observer 2017), EACOP could be of wider regional economic importance.

Benefit: Changes to the fiscal balance

This may lead to direct and indirect impacts.

The application of taxes on profits and other taxes will be reviewed by the Governments of Uganda and Tanzania as and when the pipeline company structure is finalised. This government income stream from taxes has not been quantified in the assessment. As an equity partner, the government will derive income from its equity share of the tariff and profits from pipeline operation (or incur losses if the pipeline is not profitable). The income cannot be estimated based on the currently available information.

In addition, it is expected that certain taxes waived during the construction period (such as VAT, corporate income tax and import duties) will become effective and generate additional income for the government during the operational life of the pipeline.

The wage bill and income distribution are not known, but Ugandan wages from direct EACOP employment are estimated at USD 200,000 (UGX 755.6 million) annually during operation. If all incomes are taxed at the maximum tax rate of 30% (URA 2018), this will yield government revenue of approximately USD 60,000 (UGX 226.7 million) per annum during operation.

Although revenue from the pipeline will not grow to be a substantial contribution to the budget, it will likely be large and counteract a possible longer-term decline in government grants and concessional loans. Given the exhaustibility of oil reserves, the boost to the national economy will be finite, but likely long-term, assuming Ugandan oil production is sustained in the foreseeable future (IMF 2014).

Summary of Benefits

Table 8.11-1 summarises the project annual economic benefits:

Table 8.11-1 Project Annual Economic Benefits

Benefit	Construction	Operation
Employment	9,500 direct, indirect or induced jobs USD 15.2 million (UGX 57.1 billion)	
Provision of goods and services	USD 38 million (UGX 142.3 billion) (direct)	USD 23 million (UGX 86.5 billion)
Revenue		
Contribution to the national economy	USD 95 million (UGX 357.3 billion) 0.9% of 2015 GDP	USD 54 million (UGX 203 billion) 0.2% of 2015 GDP
Changes to fiscal balance	USD 570,000 (UGX 2.1 billion)	positive (taxes)

8.11.3 Enhancement Measures

This section describes the enhancement measures, listed in Table 8.11-2 that will be applied to enhance benefits to the economy.

8.11.3.1 Design

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to land and property such as minimising impacts on businesses and infrastructure. The selected Kabaale, Uganda to Tanga, Tanzania pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available.

8.11.3.2 Construction

Generic Enhancement Measures

Employment

Benefit: The generation of national employment opportunities leading to an increase in household income and an improvement in living standards

Provision of Goods and Services

Benefit: Project procurement providing opportunities for national businesses

The procurement and supply chain management plan, local content plan and the labour management plan will include measures that collectively contribute to the support of project opportunities for national businesses.

The procurement and supply chain management plan will be developed to maximise the purchase of goods and services from within Uganda and include, as appropriate, enterprise and capacity development.

8.11.3.3 Operation

Provision of Goods and Services

Benefit: Project procurement providing opportunities for national businesses.

The procurement and supply chain management plan, local content plan and the labour management plan will include measures that collectively contribute to the support of project opportunities for national businesses.

The procurement and supply chain management plan will be developed to maximise the purchase of goods and services from within Uganda and include, as appropriate, enterprise and capacity development.

Table 8.11-2 Economy – Generic Enhancements

Aspect	Potential Impact	Phase	High Stakeholder Concern	Enhancement and Mitigation Measures	Residual Impact				
					M	D	E	S	SS
Employment	The generation of national employment opportunities leading to an increase in household income and an improvement in living standards.	C	Y	Local Content Plan	B				
Provision of goods and services	Project procurement providing opportunities for national businesses.	C/O	Y	Local Content Plan	B				
Contribution to economy	Contribution to national economy from investment.	C/O	Y		B				
Contribution to economy	Changes to the fiscal balance	C/O	-		B				

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.11.4 Transboundary Project Impacts

Section 8.12.5.2 describes the local economic impacts from transboundary, mainly informal, trade.

8.11.5 Cumulative Impacts

Cumulative impacts are not considered for the economic VEC, as it is not feasible to acquire residual economic impact information on the myriad of projects that are being developed in Uganda much less predict their contribution to employment, provision of goods and services and contribution to the economy.

8.12 Local Economy (Nonland-Based Livelihoods)

This section describes potential impacts on the local economy (nonland-based livelihoods) during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.12.1 Key Sensitivities and Considerations

The local economy (nonland-based livelihoods) baseline conditions are described in Section 6.4.3.7, as well as:

- local economy (nonland-based livelihoods) key valued environmental components (VECs) and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the local economy (nonland-based livelihoods) impact assessment.

Sensitivity in the local economy (nonland-based livelihoods) AOI is ranked as potentially positive for VECs such as small business owners, who may benefit from an increase in business activities caused by a growing population, new developments and associated increase in construction activities. Employees in informal businesses are ranked as potentially positive VECs due to the potential increase in opportunities to start or expand a business. Sex workers are ranked as highly sensitive due to their vulnerability to physical abuse and communicable diseases. The impacts on sex workers are discussed in Section 8.18 and Section 8.19.

Key considerations are:

- for small local companies to benefit from major projects they need to meet standards which are often absent. This may lead to business and trade opportunities being usurped by outsiders
- women and young people seem to have fewer paid work opportunities and so the lack of start-up capital for the small business entrepreneur is more keenly felt by women and young people
- good road conditions between rural communities and urban centres are crucial for business owners to source supplies and market their goods.

Section A11.4.5 in Appendix A11 identifies that the local economy (nonland-based livelihoods) does not provide ecosystem services. It does, however, rely on

ecosystem services which are described in land-based livelihoods (see Section 8.13).

The key human rights considerations relevant to the local economy (nonland-based livelihoods) relate to a variety of workers' rights, including the right to non-discrimination, freedom from child labour, freedom from forced labour, freedom of association, right to just and favourable working conditions, and the right to work in a healthy and safe environment. Other human rights that are relevant to local economy (nonland-based livelihoods) are the right to an adequate standard of living and women's rights. International standards for responsible business require that labour standards are respected by companies and that they use their leverage to ensure that contractors and suppliers also respect labour rights (see Section 4).

8.12.2 Potential Project Impacts

8.12.2.1 General

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operational impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on the local economy (nonland-based livelihoods) the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.12.2.2 Construction

Generic Benefits

Employment

Benefit: The generation of project local employment opportunities

During construction, approximately 2,000 workers, out of which 10% are unskilled, will be required per spread (refer to Section 2). The pipeline will be constructed near population centres (listed in Table 2.4-2, Section 2) where the inhabitants will have the opportunity to obtain project employment. PACs near the MCPYs will be particularly well placed to benefit from employment.

Increased income may enhance a household's standard of living, their capacity to pay school and healthcare fees and invest in existing or future livelihood activities (i.e., small-scale trade and agro-processing). This may improve the long-term prospects of children, household food security and nutrition.

Benefit: The provision of training and skill development opportunities within employment

A key constraint to growth in Uganda is the availability of requisite industrial skills. The project will recruit unskilled labour from PACs where possible. Training will equip local workers with transferable skills that are in demand by the Ugandan

economy (see Section A11.4.3.1 in Appendix A11), thereby enhancing their future employment prospects and ultimately leading to a larger skilled workforce. Equipping local workers with construction skills such as site clearance and operating plant machinery will be particularly beneficial given national labour shortages in this sector.

Provision of Goods and Services

Benefit: Project procurement providing opportunities for local businesses

A variety of materials will be sourced locally during pipeline construction including gravel, sand, cement, murram and fencing. In addition, the main camps and pipe yards (MCPYs), designed to accommodate up to 1000 people, will require supplies (e.g., food, fuel, medication). Providing goods and services to the project would enable local businesses to boost their income earnings and profit margins during the construction period, resulting in multiplier effects and overall benefits to the local economy. Increased incomes of local workers may also lead to increased spending in the PACs, benefiting local enterprises.

The informal, unregulated and small-scale nature of local businesses, lack of business expertise, market access and power supply may, however, hamper local businesses in meeting project standards and requirements.

In addition, women and young people seem to have fewer paid work opportunities and so the lack of start-up capital for the small business entrepreneur may be more keenly felt by these groups.

It should be noted that increased incomes may not necessarily be used for the benefit of workers' households. Increased access to cash by men in the PACs could lead to an increase in the incidence of social ills such as substance abuse and a rise in GBV with regards to spouses and children (see Section 8.19).

There may be an impact on human rights if the project does not exercise due diligence as it provides these opportunities for local businesses to minimise the risks of adverse impacts on workers' rights (through contractual requirements about minimum working conditions, screening, auditing of local businesses and so forth) and to use its leverage to train and encourage local businesses to respect the appropriate working conditions.

There may be another impact on workers' rights, for instance due to excessive working hours because of time pressures, or due to late payment of workers because of long payment terms for contractors.

The impacts are considered beneficial, while acknowledging the importance of mitigation measures to be put in place to protect workers' rights.

Benefit: Improvements in road conditions for business owners and public transport

The pipeline has been routed, as much as possible, near existing infrastructure, thereby minimising the need for the development of new roads. To accommodate increased volumes of traffic generated by the project, access roads will be upgraded and widened to ensure two-way traffic can pass. It is expected that PACs will benefit from road upgrades and widening. The creation of a smaller number of new access roads may benefit some PACs by improving their access to markets, social services and neighbouring communities.

Poor road conditions are a significant challenge for business owners and public transport providers in the PACs; they increase travel time and costs considerably (see Section 8.17). Improvements in road conditions would allow business owners and public transport providers to travel faster and transport passengers and goods at lower costs.

The impacts are considered beneficial. The assessment of this impact assumes that the government will maintain the roads.

Generic Impacts

Employment

Potentially affected communities (PACs) are characterised by poverty, high unemployment and limited formal employment opportunities. Education levels and technical skills in particular sectors (i.e., formal training in construction) are low. Households have limited income streams and financial security and are therefore, sensitive to external shocks. Business owners and civil servants (i.e., teachers) reported fluctuating incomes and low salaries. PACs have high expectations from the project in terms of job and training opportunities.

The baseline context with respect to specific human rights context related to just and favourable working conditions includes:

- lack of awareness of labour rights. There is a low level of awareness of worker rights in PACs. Furthermore, there are low levels of understanding of a non-discriminatory work culture, such as with a mixed gender workforce
- no contracts and unregulated working conditions. The majority (90%) of the labour force is not covered by legislation as they operate in the informal economy where workplace activities are largely unregulated (DTCIDC 2016). Basic rights and protections against child labour, forced labour, right to paid leave, maternity leave, economic exploitation and rights to work in safe and healthy working conditions among others therefore remain predominantly unenforced, according to a 2016 report of the Uganda Consortium on Corporate Accountability
- use of middlemen. In particular, middlemen are used to find workers for projects and those middlemen withhold entire salaries from workers for months of work
- unionisation and collective bargaining. Workers in PACs stated that they have limited power to negotiate with their employers, which prevents them from working in fair conditions. There is no culture of unionisation or collective bargaining. Trade union density is estimated to be around 3% of the total workforce. Many workers are illiterate and the laws governing the labour sectors are difficult for them to understand or manage, which makes them vulnerable. There are concerns in PACs that the work for the project will be difficult and poorly paid. Based on previous negative work experiences, workers fear they will not have any negotiating power
- child labour. It is estimated that approximately 2 million children were engaged in child labour; of the 2 million child labourers, it was reported that 507,000 were exposed to hazardous work. The most dangerous forms of forced labour include commercial sexual exploitation, commercial agriculture, mining, construction and armed conflicts. Children reportedly face abuse, sexual exploitation, sexually transmitted diseases (STDs), early pregnancy, exposure to chemicals, carrying heavy loads, unpaid work and long hours. Child labour

has been linked to high school dropout rates, particularly in the context of artisanal and small-scale mining (ASM). Children who may be particularly vulnerable to child labour include those who come from low-income families, live in mining areas or orphans

Impact: Loss of employment after project construction phase

This may lead to direct and indirect impacts.

Employment with the project may cause lack of attention to, or possible abandonment of, existing subsistence livelihood activities during the period of employment of household members, in particular crop growing and livestock rearing. Achieving the level of agricultural productivity established before project employment may require time, during which, household food security and nutrition may be compromised if replacement income sources are not available.

This may cause an economic shock at household level and a drop in the standard of living, which could potentially increase social ills such as alcohol abuse and gender-based violence (GBV). This could affect the right to health of women.

There may also be an impact on the following human rights: the human right to work if the notice process for retrenchment is inadequate; the human right to an adequate standard of living due to loss of income and benefits; and the right to social security if employers have not provided the necessary social security benefits or contributed to private unemployment insurance schemes.

Generally low levels of financial literacy may prevent construction workers in the PACs from preparing financially for the termination of their employment contracts. The income generated by project employment may be used for immediate gratification or to buy items on credit, rather than saving for or investing in the future, or to bridge the post-project unemployment period, during which replacement livelihoods will need to be developed. Retrenched employees may also be faced with a lack of funds to honour credit repayments. However, not all retrenched workers will necessarily experience the impacts described above.

The impacts will be short-term and will affect some households within the PACs. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Impact: Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities

This may lead to direct and indirect impacts.

The stakeholder engagement processes identified that, across all stakeholder categories, there are unrealistically high expectations of the project's capacity to provide employment opportunities. This was particularly accentuated at PAC level where there are few or no formal employment opportunities. Unmet expectations at PAC level could be further compounded by the potential Project Induced In-Migration (PIIM) of workers and other opportunistic job seekers, who will increase competition for employment opportunities (described below).

There may be an impact on the human right to non-discrimination because of real or perceived unfairness in how employment opportunities are allocated. While the rights of migrant workers and their families should be considered in the allocation of

employment opportunities, this must be balanced by commitments to local hiring and national immigration and employment requirements.

Experience with large-scale projects globally indicates that unmet expectations could cause tensions at the local level, which, if not addressed satisfactorily, could potentially lead to some blockages or protests. If disregarded, relations could deteriorate further over time and culminate in clashes between PACs and migrants seeking access to work or other project benefits, or, in an extreme case, between PACs and project security personnel or local security forces. Dissatisfied communities may voice their grievances on local radio or social media platforms. While local radios remain the main source of information in PACs, sites such as YouTube and Twitter are growing in popularity in Uganda (see Section A11.4.10.1 in Appendix A11) and could be used by disgruntled PAC members to express grievances and garner support, spreading the dissatisfaction to a wider audience. As such, a localised upset could quickly escalate and reverberate over the AOI.

The impacts will be short-term and will affect districts. Due to their short-term nature, before mitigation the impacts are considered not significant.

Impact: Competition over employment opportunities

This may lead to direct and indirect impacts.

High unemployment rates may lead to competition over project employment opportunities in the PACs. Uganda has a young and mobile population with movements of people to other subcounties, districts and regions as well as people entering from neighbouring countries in search of employment (see Section A11.4.2.1 in Appendix A11). Migration to PACs by non-residents and non-nationals seeking project employment may heighten competition for job opportunities and raise tensions between the groups. It is quite possible that migrant job seekers could have gained skills in other large-scale projects, which will be an advantage in seeking project positions. As such, they could potentially out-compete local job seekers. The recruitment of foreign nationals may also lead to jealousy among locals who perceive that foreign workers are taking 'their' jobs. This may also result in conflicts between different groups.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: Diversion of workers gaining employment from the project away from existing local businesses or public-sector jobs

This may lead to direct and indirect impacts. The risk that children will be diverted from schooling to backfill in subsistence agriculture is discussed in Section 8.13, or to find employment in the supply chain is described below as the next impact.

Low salaries and fluctuating income earnings may motivate public sector workers and business owners in PACs to seek project employment, particularly if the wages offered are more favourable. Pupil to teacher ratios reported in schools in the PACs are already high (see Section A11.4.3.1 in Appendix A11) and, as such, there may be negative outcomes for the quality of education received by children if teachers find employment with the project and are not replaced. There may therefore be an

impact on children's human right to education. Considering that local health facilities are already understaffed (see Section A11.4.11.1 in Appendix A11), project employment of local health personnel may negatively impact local health services. There may therefore be an impact on the right to health.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: School drop outs seeking employment in the project supply chain

This may lead to direct and indirect impacts.

Baseline data shows that low school attendance rates are common among both boys and girls. Boys are generally attracted by potential income earning activities, while girls are engaged in household chores. The project may entice children, particularly boys, to loiter near project works. In plantation agriculture and pastoralist communities, and areas where artisanal and small-scale mining (ASM)¹⁶ activities have been identified, the risk of child labour may be higher given the presence of an already existing labour pool of children who have left school and have entered the workforce.

There may be an impact on the human right that prevents child labour as well as the right to education.

The impacts will be long-term and will affect PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Provision of Goods and Services

Commercial activity in the PACs consists predominantly of informal, small-scale enterprises that trade in agricultural produce, daily necessity goods and basic services.

Impact: Inflation and effects on supply owing to project procurement

This may lead to direct and indirect impacts.

Project procurement of goods locally to worksites may cause price inflation and lead to a shortage in supplies.

The impacts will be short-term and will affect districts. Due to their short-term nature, before mitigation the impacts are considered not significant.

Impact: Restriction of access to small businesses, street vendors and local markets during construction

This may lead to direct and indirect impacts.

Markets and enterprises are on roadsides and at intersections in PACs. During construction, customer access may be temporarily obstructed by construction activities, causing loss of income to vendors.

¹⁶ Artisanal and small-scale mining (ASM) refers to mining practised by individuals, groups or communities often informally (illegally). Extractive activities are often undertaken without mechanisation but when affordable simple technologies are used. Health and safety provisions are often overlooked in informal ASM and environmental degradation is consequential to the activities. Child labour is commonly engaged in informal ASM activities.

The impacts will be transient and will affect entire PACs. Due to their transient nature and small extent, before mitigation the impacts are considered not significant.

From a human rights perspective there may be an impact, on a very temporary basis, on the right to work and on the right to an adequate standard of living of the small business owners and street vendors.

Temporary Road Closure

Business owners rely on the road network between PACs and urban centres to source supplies and market goods.

Impact: Increased transportation costs and travel time with economic consequences

This may lead to direct and indirect impacts.

The pipeline has been routed as much as possible near the existing road network, thereby minimising the need for the development of new roads. This means some existing roads which serve local communities will be upgraded. There are also 23 main road crossings by the pipeline in Uganda, which may also create some form of temporary obstruction.

Upgrading of the existing roads and other construction activities may temporarily interfere with business owners who purchase supplies in urban centres, farmers selling their produce at district markets and public transport providers, particularly motorbike taxis. Alternative routes (if available) to urban centres may increase the cost and time needed to source supplies. This may have negative outcomes for business operating hours and product prices, potentially reducing business competitiveness and customer bases.

From a human rights perspective, there may be an impact on the right to health and education through temporary reduced access to healthcare and education facilities.

The impacts will be transient and will affect entire PACs. Due to their transient nature and small extent, before mitigation the impacts are considered not significant.

Location-Specific Benefits

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic benefits are also applicable to the eight PACs near the two pumping stations. However, the benefit of improvements in road conditions for business owners and public transport (related to provision of goods and services), may be more pronounced in the following PACs:

- Kayere (KP0, approximately 0.6 km away from PS1)
- Katooke (KP1.5, approximately 1.7 km away from PS1).

These PACs are characterised by poor and sometimes impassable roads. Given the poor road conditions, these PACs may particularly benefit from the development of new access roads or upgrades to roads by the project.

The impacts are considered beneficial.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs. However, the impact of competition over employment opportunities may be more pronounced in the following PACs:

- Katikara Trading Centre (KP41, the nearest urban area to MCPY1, approximately 1.8 km away)
- Kyenda (KP125.5, the nearest urban area to MCPY2, approximately 2.5 km away)
- Sembabule Market Zone (KP190, the nearest urban area to MCPY3, approximately 4 km away).

These PACs are densely populated and growing in size (see Appendix A11 Attachment A11.2) and demand for jobs is high. Many local businesses are already present. These PACs are more likely to experience PIIM than neighbouring PACs near the project, which are considerably smaller and offer fewer goods and services.

The impacts will be short-term and will affect the entire PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location: Right-of-Way (RoW): PACs Close to Pipeline Crossings of Major Roads

The potential generic impacts are also applicable to the 46 PACs close to pipeline crossings of major roads. However, the impact of temporary road closure, leading to increased transportation costs and travel time with economic consequences, may be more pronounced in the following PACs:

- Buswabwera (KP61, on the Nkooko – Nalweyo road, approximately 0.3 km from major pipeline road crossing)
- Kabulasoke (KP111, on the Kyenda – Debeza road, approximately 1.15 km from major pipeline road crossing)
- Kagoma (KP124.5, on the Mityana – Mubende road, approximately 0.27 km from pipeline highway crossing)
- Kyenda (KP125.5, on the Mityana – Mubende road, approximately 1.6 km from major pipeline road crossing)
- Kyengera (KP160.5, on the Maddu – Makole road, approximately 0.12 km from major pipeline road crossing)
- Nsambya (KP189, on the Sembabule – Lwendale road, approximately 0.5 km from major pipeline road crossing)
- Bukulula (KP240, on the Lwamagwa – Makonndo road, approximately 1.22 km from major pipeline road crossing)

- Lukoma (KP287.5, on the Masaka – Mutukula road, approximately 1 km from major pipeline road crossing).

These PACs are on main roads and close to points where they will be intersected by the pipeline. The pipeline crossing of these roads during construction may disrupt traffic flows and obstruct routes used by business owners, public transport providers and other PAC members.

The impacts will be short-term and will affect the entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Location: RoW: Mutukula Town, Kyotera District, KP295.5

Mutukula town, at the border between Uganda and Tanzania, has experienced rapid population growth in recent years, driven predominantly by the in-migration of economic migrants from other parts of Uganda and neighbouring countries, including Tanzania, Burundi and Rwanda. Mutukula is more likely to incur PIIM during pipeline construction than neighbouring PACs, which are considerably smaller and offer fewer goods and services.

The demand for jobs in Mutukula is already high. Consultation undertaken for the project indicated that local stakeholders have higher expectations from the project than other PACs in terms of generation of employment and business opportunities and broader socio-economic development. Baseline studies revealed that restaurants, hotels and petrol stations have already been established in anticipation of the project. With higher expectations, residents of Mutukula may feel greater dissatisfaction than stakeholders in other PACs if expectations are not met.

The potential generic impacts are also applicable to the border town of Mutukula. However, the following impacts may be more pronounced in this PAC:

Employment

Impact: Dissatisfaction arising from unmet expectations
and

Impact: Competition over employment opportunities

The impacts will be short-term and will affect the entire PAC. Due their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations.

8.12.2.3 Operation

Personnel during operations will be employed in accordance with national and project requirements. In addition, a set of management measures will apply (described in Section 8.12.3).

Generic Benefits

The following potential generic benefit, described for construction, is also applicable during pipeline and AGI operation:

Provision of Goods and Services

Benefit: Improvements in road conditions for business owners and public transport

It is expected that road upgrades during the construction period will continue to benefit the PACs during pipeline operation.

The impacts are considered beneficial. The assessment of this impact assumes that the government will maintain the roads.

Generic Impacts

The following potential generic impact, described for construction, is also applicable during pipeline and AGI operation:

Employment

Impact: School drop outs seeking employment in the project supply chain

This may lead to direct and indirect impacts.

The project may continue to entice children, particularly boys, for maintenance of the RoW. In plantation agriculture and pastoralist communities, and areas where ASM activities have been identified, the risk of child labour may be higher given the presence of an already existing labour pool of children who have left school and engaged in such activities.

There may be an impact on the human right that prevents child labour as well as the right to education.

The impacts will be long-term and will affect some individuals in the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation.

8.12.3 Enhancement and Mitigation Measures

This section describes the avoidance and mitigation measures that will be applied to the aspects and activities that could affect the local economy (nonland-based livelihoods).

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.12.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to the local economy (nonland-based livelihoods) such as minimising impacts on local businesses and infrastructure. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available.

Location-Specific Mitigation Measures

There are no location-specific design mitigation measures for the construction facilities, pipeline and AGIs.

8.12.3.2 Construction

Generic Enhancement Measures

Employment

Benefit: The generation of project local employment opportunities

The procurement and supply chain management plan, labour management plan and the stakeholder engagement plan will include measures that collectively support local employment opportunities.

As part of the tendering process (sub) contractors will be required to include initiatives in their proposal aimed at increasing local employment. There will be a recruitment procedure approved by the project that is open to all, transparent, non-discriminatory and promotes local content by preferentially employing local people.

Benefit: The provision of training and skill development opportunities within employment

The procurement and supply chain management plan and the labour management plan will include measures that collectively support skills development within the workforce through compliance with project human resources policies and procedures. On-the-job training will be provided to enable local workers to gain new or improved skills while working on the project. Risk-based worksite training and daily toolbox meetings addressing health and safety concerns will provide additional on-the-job training.

Provision of Goods and Services

Benefit: Project procurement providing opportunities for local businesses

The procurement and supply chain management plan and the labour management plan will include measures that collectively contribute to the support of project opportunities for local businesses.

The procurement and supply chain management plan will be developed to maximise the purchase of goods and services from within Uganda and include, as appropriate, enterprise and capacity development.

Generic Mitigation Measures**Employment**

Impact: Loss of employment after project construction phase

The procurement and supply chain management plan, labour management plan and the stakeholder engagement plan will include measures that will contribute to the management of loss of employment after project construction phase.

A campaign focused on providing realistic community expectations with regard to livelihood options and employment opportunities and financial management workshops for workers to raise levels of financial literacy will be implemented. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should try to maintain their existing livelihoods and prepare for the termination of their employment.

A retrenchment plan will be prepared, using the principles in the International Finance Corporation's Good Practice Note No. 4: Managing Retrenchment, 2005.

Although the pre-mitigation impact is considered not significant, the application of the above measures will further reduce impact; the residual impact will still have a site-based extent and long duration, although the magnitude is reduced to negligible.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact will be not significant.

Impact: Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities

and

Impact: Competition over employment opportunities

The labour management plan and stakeholder engagement plan will include measures that will contribute to the control of these impacts.

The project will set targets for local recruitment and establish employment offices in the districts traversed by the project.

A public awareness programme communicating employment and training opportunities and a PIIM management plan aiming to reduce the number of people that arrive into PACs will be developed.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impacts will be not significant.

Impact: Diversion of workers gaining employment from the project away from existing local businesses or public-sector jobs

The procurement and supply chain management plan, labour management plan and stakeholder engagement plan will include measures that will contribute to the control of diversion of workers gaining employment from the project away from existing local businesses or public-sector jobs.

Before construction, a benchmarking exercise gathering data on average incomes in the private and public sector will be undertaken. This data will be used to identify salary levels for the construction workforce that avoid disparities with local businesses/public sector salaries.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impacts will be not significant.

Impact: School drop outs seeking employment in the project supply chain

The procurement and supply chain management plan, monitoring and reporting plan, labour management plan and stakeholder engagement plan will include measures that contribute to the control of this impact.

The stakeholder engagement plan will include provisions to address school drops outs seeking employment in the project supply chain through an awareness campaign targeting schools in PACs, particularly in areas where ASM activities have been identified.

The following management measures will be included in the procurement and supply chain management plan, labour management plan and the stakeholder engagement plan:

- a transparent recruitment procedure
- regular meetings with supply chain workers to address human and labour rights
- no employees will be hired, directly or indirectly, under the age of 18 years
- stakeholders concerned about child labour will be encouraged to use the grievance mechanism
- evaluations of (sub) contractors' human rights record related to labour and working conditions will be conducted.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impacts will be not significant.

Provision of Goods and Services

Impact: Inflation and effects on supply owing to project procurement

The procurement and supply chain management plan will include measures that contribute to the control of this impact.

Before construction, a benchmarking exercise of local prices for goods will be undertaken and used to identify and monitor appropriate prices so that large price disparities between project-procured and local goods prices are avoided.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact will be not significant.

Impact: Restriction of access to small businesses, street vendors and local markets during construction

The resettlement action plan, monitoring and reporting plan and stakeholder engagement plan will include measures that contribute to the control of this impact.

A resettlement strategy outlining procedures related to loss of assets and livelihood restoration has been developed. Based on the resettlement strategy, the resettlement action plan or livelihood restoration plan will identify PAPs and the

procedures related to compensation for loss of assets as well as livelihood restoration.

The stakeholder engagement plan keeps stakeholders informed about project activities and evaluates and responds to concerns.

Application of these mitigation measures will reduce the magnitude of impact from medium to negligible and the residual impact will be not significant.

Temporary Road Closure

Impact: Increased transportation costs and travel time with economic consequences

The infrastructure and utilities management plan and the stakeholder engagement plan will include measures that contribute to the control of this impact.

All construction activities that can interfere with local transportation will be communicated to local authorities and affected communities at least 72 hours beforehand.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact will be not significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic enhancement and mitigation measures are also applicable to the 20 PACs near the four MCPYs. The additional specific mitigation measure is recommended for Katikara Trading Centre (KP41), Kyenda (KP125.5) and Sembabule Market Zone (KP190):

Employment

Impact: Competition over employment opportunities

The stakeholder engagement plan and the PIIM management plan will contribute to the control of competition over employment opportunities for Katikara Trading Centre (KP41), Kyenda (KP125.5) and Sembabule Market Zone (KP190).

The project will conduct ongoing monitoring of Katikara Trading Centre (Kakumiro district), Kyenda (Mubende district) and Sembabule Market Zone (Sembabule district) and liaise with authorities to review social changes in the towns, enhance existing interventions or develop additional interventions if required.

Application of these mitigation measures will reduce the magnitude of impact from very large to medium and the residual impacts will be not significant.

Locations: RoW: PACs Close to Pipeline Crossings of Major Roads

The generic enhancement and mitigation measures are also applicable to the 46 PACs close to pipeline crossings of major roads.

Locations: RoW: Mutukula Town, Kyotera District, KP295.5

The generic enhancement and mitigation measures are also applicable to the border town of Mutukula. The additional specific mitigation measures required for Mutukula are:

Employment

Impact: Dissatisfaction arising from unmet expectations

and

Impact: Competition over employment opportunities

The following location-specific mitigation will be included in the stakeholder engagement plan and the PIIM management plan to contribute to the control of competition over employment opportunities and dissatisfaction arising from unmet expectations for Mutukula.

Ongoing monitoring and liaising with authorities to review social changes in Mutukula (Kyotera district) where additional interventions aimed at competition over employment and dissatisfaction resulting from unmet expectations will be developed to support existing interventions.

Application of these mitigation measures will reduce the magnitude of impact from very large to medium and the residual impact will be not significant.

Locations: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic enhancement and mitigation measures are also applicable to the eight PACs near the two pumping stations.

8.12.3.3 Operation**Generic Mitigation Measures**

Employment

Impact: School drop outs seeking employment in the project supply chain

The procurement and supply chain management plan, monitoring and reporting plan, labour management plan and stakeholder engagement plan will include measures that contribute to the control of this impact.

The stakeholder engagement plan will include provisions to address school drop outs seeking employment in the project supply chain through an awareness campaign targeting schools in PACs, particularly in areas where ASM activities have been identified.

The following management measures will be included in the procurement and supply chain management plan, labour management plan and the stakeholder engagement plan:

- a transparent recruitment procedure
- regular meetings with supply chain workers to address human and labour rights
- no employees will be hired, directly or indirectly, under the age of 18 years

- stakeholders concerned about child labour will be encouraged to use the grievance mechanism
- evaluations of (sub) contractors' human rights record related to labour and working conditions will be conducted

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impacts will be not significant.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts during pipeline and AGI operation, no mitigation measures are required.

8.12.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on the local economy (nonland-based livelihoods) after mitigation measures have been implemented.

Table 8.12-1 summarises the potential generic local economy (nonland-based livelihoods) impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.12-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on the local economy (nonland-based livelihoods) will be not significant.

8.12.4.1 Ecosystem Services

Section A11.4.5 in Appendix A11 identifies that the local economy (nonland-based livelihoods) does not provide ecosystem services. No ecosystem services have therefore been considered. The ecosystem services that the local economy (nonland-based livelihoods) relies upon are described in land-based livelihoods (Section 8.13).

Table 8.12-1 Local Economy (Nonland-Based Livelihoods) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Employment	The generation of project local employment opportunities	C	Y	Procurement and Supply Chain Management Plan Labour Management Plan Stakeholder Engagement Plan	B				
Employment	The provision of training and skill development opportunities within employment	C	Y	Procurement and Supply Chain Management Plan Labour Management Plan	B				
Provision of Goods and Services	Project procurement providing opportunities for local businesses	C	Y	Procurement and Supply Chain Management Plan Labour Management Plan	B				
Provision of Goods and Services	Improvements in road conditions for business owners and public transport	C & O	Y		B				
Employment	Loss of employment after project construction phase	C	N	Procurement and Supply Chain Management Plan Labour Management Plan Stakeholder Engagement Plan	4	2	1	5	12
Employment	Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities	C	Y	Project-Induced In-Migration Management Plan Labour Management Plan Stakeholder Engagement Plan	4	2	3	5	14

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.12-1 Local Economy (Nonland-Based Livelihoods) – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Employment	Competition over employment opportunities	C	Y	Project-Induced In-Migration Management Plan Labour Management Plan Stakeholder Engagement Plan	4	2	2	5	13
Employment	Diversion of workers gaining employment from the project away from existing local businesses or public-sector jobs	C	N	Procurement and Supply Chain Management Plan Labour Management Plan Stakeholder Engagement Plan	4	2	2	4	12
Employment	School drops outs seeking employment in the project supply chain	C & O	Y	Procurement and Supply Chain Management Plan Monitoring and Reporting Plan Labour Management Plan Stakeholder Engagement Plan	4	4	1	4	13
Provision of Goods and Services	Inflation and effects on supply owing to project procurement	C	-	Procurement and Supply Chain Management Plan	4	2	3	3	12
Provision of Goods and Services	Restriction of access to small businesses, street vendors and local markets during construction	C	-	Resettlement Action Plan Monitoring and Reporting Plan Stakeholder Engagement Plan	2	1	2	3	8
Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	4	1	2	5	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.12-2 Local Economy (Nonland-Based Livelihoods) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Kayere (KP0)	Provision of Goods and Services	Improvements in road conditions for business owners and public transport	C	Y		B				
Katooke (KP1.5)	Provision of Goods and Services	Improvements in road conditions for business owners and public transport	C	Y		B				
Katikara Trading Centre (KP41)	Employment	Competition over employment opportunities	C	Y	Project-Induced In-Migration Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Kyenda (KP125.5)	Employment	Competition over employment opportunities	C	Y	Project-Induced In-Migration Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Sembabule Market Zone (KP190)	Employment	Competition over employment opportunities	C	Y	Project-Induced In-Migration Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Buswabwera (KP61)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.12-2 Local Economy (Nonland-Based Livelihoods) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Kabulasoke (KP111)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Kagoma (KP124.5)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Kyenda (KP125.5)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Kyengera (KP160.5)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Nsambya (KP189)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Bukulula (KP240)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.12-2 Local Economy (Nonland-Based Livelihoods) – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Lukoma (KP287.5)	Temporary Road Closure	Increased transportation costs and travel time with economic consequences	C	-	Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	2	2	5	15
Mutukula town (KP295.5)	Employment	Dissatisfaction arising from unmet expectations over the scale and duration of project local employment opportunities	C	Y	Stakeholder Engagement Plan Project-Induced In-Migration Management Plan	6	2	2	5	15
Mutukula town (KP295.5)	Employment	Competition over employment opportunities	C	Y	Stakeholder Engagement Plan Project-Induced In-Migration Management Plan	6	2	2	5	15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.12.5 Transboundary Project Impacts

8.12.5.1 Generic Transboundary Project Impacts

No generic transboundary project impacts have been identified in relation to the local economy (nonland-based livelihoods).

8.12.5.2 Location-Specific Transboundary Project Benefits

Location: RoW: Mutukula Town, Kyotera District, Uganda (KP295.5), Mutukula Town, Missenyi District, Tanzania (KP296)

The following location-specific transboundary project benefits have been identified in Mutukula town (Uganda and Tanzania) during construction.

Employment

Benefit: The generation of project local employment opportunities

The international border between Uganda and Tanzania at Mutukula is extremely porous; people migrate daily and weekly between the two countries to trade in basic goods and services. These movements are largely unregulated with customs being predominantly concerned with monitoring truck movements. The migration of agricultural labour to and from the areas surrounding Mutukula on a seasonal basis is also known to occur.

Tanzanian nationals living close to the border with Uganda may benefit from the generation of local employment opportunities by the project. Nationals from other neighbouring countries (i.e., Rwanda, Burundi) may also benefit as they have also been known to migrate to the area for economic reasons. The history of cross border migration in Mutukula and the surrounding area has led to the development of social ties and family connections; these may facilitate the movement of people from Tanzania and other countries to work on the project in Uganda.

Benefit: The provision of training and skill development opportunities within employment

Nationals from Tanzania (and other neighbouring countries), who successfully gain employment on the project in Uganda, may also benefit from the training and skill development opportunities it will bring.

Provision of Goods and Services

Benefit: Project procurement providing opportunities for local businesses

Traders in Mutukula, which straddles the Uganda – Tanzania border, may also benefit from opportunities to provide goods and services to the project or additional spending by the construction workforce in the town; this may enhance their business activities and income earnings as a result.

The potential for generation of project local employment opportunities, provision of training and skill development opportunities within employment and project procurement opportunities will be enhanced through the measures described in Section 8.12.3.

8.12.5.3 Location-Specific Transboundary Project Impacts

No location-specific transboundary project impacts have been identified in relation to the local economy (nonland-based livelihoods).

8.12.6 Cumulative Impacts

8.12.6.1 Context

Section 6.4.3.7 describes the baseline condition of the local economy (nonland-based livelihoods), the trends and sensitivity to change. Table 8.12-1 and Table 8.12-2 summarise project residual impacts.

Although agriculture is the most important livelihood for the population in the districts traversed by the AOI of the EACOP project, trade in retail merchandise and agricultural produce and the provision of goods and services, including transport, are also important (DDPs 2015). There are presently few formal employment opportunities in the PACs and most PACs lack skilled and semiskilled workers.

The residual project impacts that may contribute to cumulative impacts are:

- provision of employment (mainly unskilled)
- skills development
- opportunities for business development from project procurement
- diversion of local people from existing local business and public-sector jobs
- retrenchment after the completion of construction
- children dropping out of school to seek employment in the project supply chain
- inflation due to project procurement of goods and services.

The cumulative impacts may be experienced in the districts, counties and subcounties within the shared AOI of the EACOP project, the associated facilities and third-party developments. The associated facilities and third-party developments are shown in the cumulative impacts matrix, described and mapped in Appendix H. These are:

- associated facilities:
 - o Tilenga Project (AF01)
 - o Kingfisher Oil Project (AF02)
- third-party developments:
 - o transmission line from the Tilenga Project Central Processing Facility (CPF) to Kabaale (UG0A)
 - o Kabaale International Airport (UG04)
 - o transmission lines to Kabaale Airport (UG05)
 - o refinery (UG07)
 - o Hoima-Buloba pipeline (UG08)
 - o Lot 4 R4 Kabaale-Kiziranfumbi road upgrade (UG19)
 - o Buhimba to Kakumiro road upgrade (UG20)
 - o construction camp for Bulima–Kabwoya road (UG21)
 - o transmission line extension (UG34)
 - o ICT infrastructure installation (UG44).

No threshold is required for the beneficial impacts of employment, training and local purchasing.

The preferred condition for the other potential impacts is that PACs maintain an adequate standard of living by returning to their pre-employment livelihoods or through alternative employment opportunities following retrenchment, that children stay in school, and that project induced inflation is curbed.

The predicted cumulative impacts should be interpreted with caution as data on construction schedules, labour and purchasing needs for third party developments are not confirmed at the time of writing.

8.12.6.2 Cumulative Impacts

Associated Facilities

The cumulative impacts for this VEC have been assessed for the construction phase only because the operational phase workforce is minimal for the EACOP project, Tilenga Project feeder pipeline and Kingfisher Oil Project feeder pipeline.

Potential cumulative impacts are predicted based on the premise that the EACOP project and the Tilenga Project feeder pipeline and Kingfisher Oil Project feeder pipeline have concurrent or consecutive construction phase timelines. The pipelines converge at PS1 around KP0 in Buseruka subcounty, Hoima district. For the local economy VEC, cumulative impacts are predicted with the Tilenga Project and Kingfisher Oil Project.

Potentially, Hoima district and Hoima municipality will experience cumulative impacts on several VECs from the EACOP, Tilenga, Kingfisher projects and several third-party developments in the area. Hoima municipality is the largest urban centre within the projects' shared AOI and will therefore play an important role in the provision of goods and labour.

Local Economic Boost

Hoima municipality is likely to benefit from a general economic boost due to the cumulative impacts from employment, training and purchasing associated with the Tilenga, Kingfisher and the EACOP projects.

If the projects were implemented consecutively the economic boost may be less intense but would occur over a longer duration.

The PACs which may experience a major economic boost (including development of new enterprises and services and increase in material standard of living of a significant number of households) as a result of the cumulative impact of employment, training and purchasing are: Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5), see Figure 8.12-1.

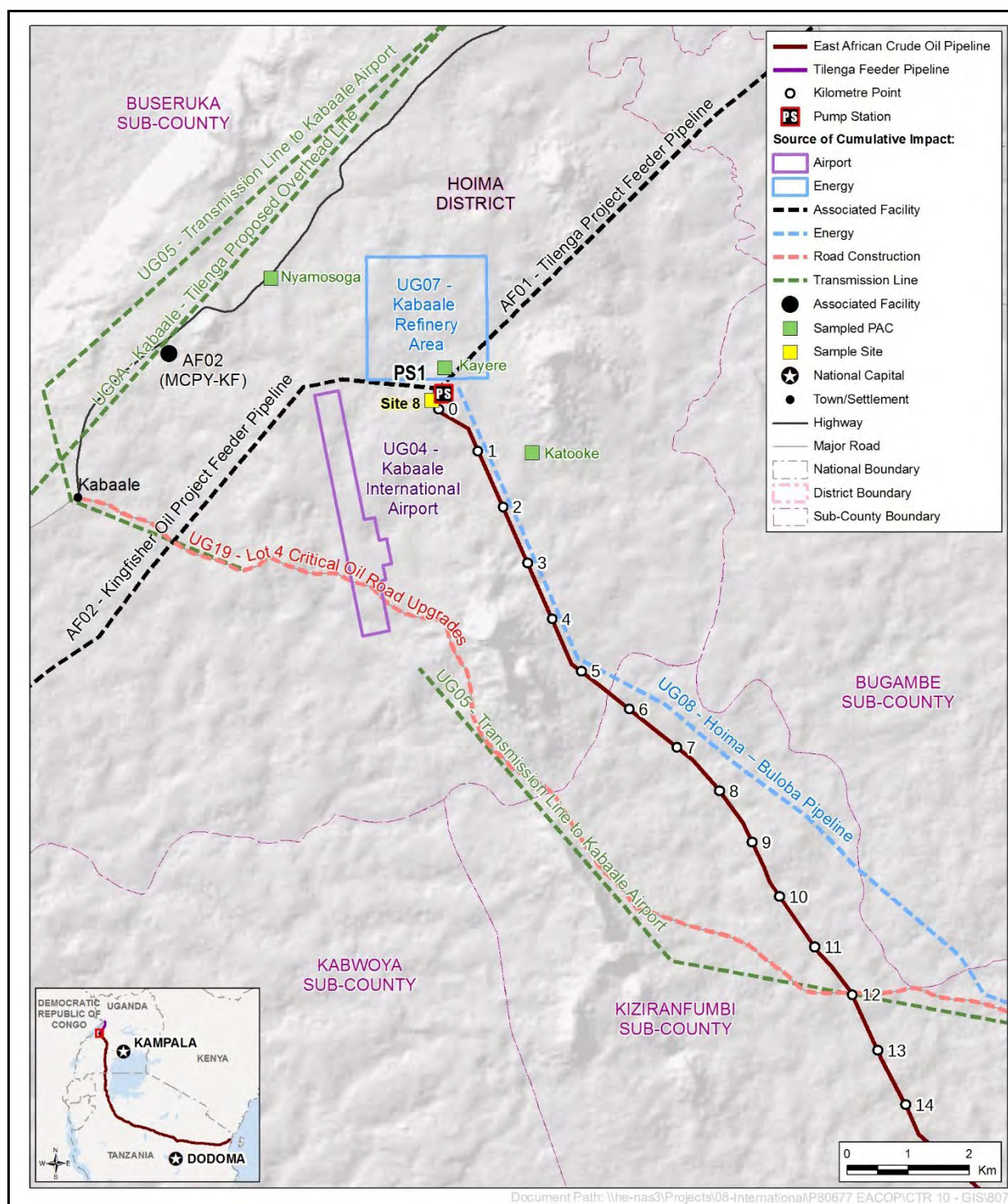


Figure 8.12-1 Cumulative Impacts: Hoima District

The projects may lead to PIIM, which in turn will lead to increased indirect employment opportunities and additional spending, resulting in additional cumulative local economic benefits.

The economic boost in Hoima municipality and affected PACs (indicated above) may also lead to an overestimation of 'financial opportunity' among school going youth, causing them to leave school in search of employment or informal business

opportunities. The potentially increased pool of jobs may also entice public sector employees away from their employment in search of higher salaries with the Tilenga, Kingfisher and the EACOP projects. The presence of all three projects would cause an impact greater than the impact caused by the EACOP project alone.

The associated facilities will implement measures similar to those described in Section 8.12.3, therefore with the mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Inflation

Purchasing by the Tilenga, Kingfisher and the EACOP projects combined may cause inflation in the Hoima district of a larger magnitude than inflation caused by the EACOP project alone. This impact would be felt during the construction period but could continue into operations.

The project will undertake a benchmarking assessment on the inflation of goods within PACs if construction phases with the AFs coincide. The results of benchmarking will be shared with the proponents of the Tilenga Project and Kingfisher Oil Project.

With the mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Economic Decline After Construction

The PACs in Hoima district that may experience an economic boom as a result of cumulative impacts on employment, purchasing and training, as well as PIIM generally linked to a boom, may experience a 'bust' after completion of the construction period of the EACOP, Tilenga, and Kingfisher projects. However, both the Tilenga Project and Kingfisher Oil Project will employ operational workforces large enough to retain a proportion of the local workforce.

It is not yet known if the EACOP, Tilenga and Kingfisher, projects will be constructed consecutively or concurrently. The cumulative impact will be more pronounced and involve a larger number of households if the construction schedules of the projects are concurrent. If the projects were implemented consecutively, the economic 'bust' would be less intense as the downturn would be spread over a longer period and a proportion of local workers could be absorbed by the operational workforces.

The project will ensure that the proponents of the associated facilities are made aware of the construction schedule in Hoima district so that construction activities can be strategically planned to manage the cumulative impacts.

With the mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Retrenchment and Re-employment

Construction schedules are not confirmed but if the construction schedules of the EACOP project and associated facilities partially overlap or are consecutive, work

experience and potentially enhanced skills may provide retrenched EACOP project employees with enhanced opportunities for employment with the associated facilities. The EACOP project may also provide opportunities for retrenched workers from the associated facilities if its construction period ends before or during the construction phase of the associated facilities.

The project will engage associated facility proponents and appropriate government agencies to consider options for management measures to address the cumulative impacts. This may include collaboration to optimise opportunities for re-employment of retrenched employees.

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Third-Party Developments

Potential cumulative impacts on the local economy are predicted where the EACOP project and third-party developments have concurrent or consecutive construction timelines and require significant labour forces, construction materials and supplies. The third-party developments' construction timeframes are not confirmed at the time of writing but, for this assessment, it has been assumed that the construction phases will have similar timeframes. The EACOP project in Uganda will include 2000 workers including 200 locally recruited unskilled workers. For the third-party developments, where the workforce is known these figures have been used; where they are not known, the workforce has been estimated.

The cumulative impact of the third-party developments are similar to those of the associated facilities and are summarised below:

- local economic boost
- inflation
- economic decline post construction
- retrenchment.

The third-party developments and the subcounties that may be impacted are shown in Table 8.12-3.

Table 8.12-3 Cumulative Impacts: Local Economy (Non Land-based Livelihoods)

ID	Project	Nearest KP	MCPY/AGI	PAC/Subcounty Potentially Impacted	Labour Force Notes
UG0A	Transmission line from the Tilenga CPF to Kabaale	0	PS1, approximately 3.5 km from UG0A	Buseruka subcounty, Hoima district	No data available, but it is estimated that the workforce will be smaller than for EACOP
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district	Up to 4000 workers and therefore greater than EACOP

Table 8.12-3 Cumulative Impacts: Local Economy (Non Land-based Livelihoods)

ID	Project	Nearest KP	MCPY/AGI	PAC/Subcounty Potentially Impacted	Labour Force Notes
UG05	Transmission lines to Kabaale Airport	12	PS1, approximately 3.9 km from UG05 Crosses EACOP at KP12	Buseruka subcounty, Hoima district	20 workers and therefore smaller than EACOP
UG07	Refinery	0	PS1, approximately 0.2 km from UG07	Buseruka subcounty, Hoima district	No data available but it is estimated that the workforce will be greater than for EACOP
UG08	Hoima-Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 is parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Kisiita subcounty, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba, Buseruka and Kiziramfumbi subcounties, Hoima district	No data available but assumed to be similar to the EACOP spread
UG19	Lot 4 R4 Kabaale-Kiziranfumbi road upgrade	0–19	PS1, approximately 3.2 km from UG 19	Buseruka subcounty, Hoima district	No data available but it is estimated that the workforce will be similar to that of EACOP.
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Kisiita and Nalweyo subcounties, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba and Kiziramfumbi subcounties, Hoima district	250 workers and therefore similar to EACOP
UG21	Construction camp for Bulima-Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from pipeline	Kiziranfumbi subcounty, Hoima district	30 workers and therefore smaller than for EACOP
UG34	Transmission line extension	133	UG34 crosses MCPY2	Kitenga subcounty and Mubende town council, Mubende district	30 workers and therefore smaller than for EACOP

Table 8.12-3 Cumulative Impacts: Local Economy (Non Land-based Livelihoods)

ID	Project	Nearest KP	MCPY/AGI	PAC/Subcounty Potentially Impacted	Labour Force Notes
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses EACOP at KP223	Kakuuto subcounty, Kyotera district Kibanda subcounty, Rakai district	No data available but it is estimated that the workforce will be smaller than for the EACOP spread

Hoima municipality may experience an economic boost, inflation and potential downturn as a result of third party developments.

The following PACs within the overlapping project AOIs may experience a substantial economic boost (including development of new enterprises and services and increase in material standard of living of a substantial number of households) caused by the cumulative impact of employment, training and purchasing:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the EACOP project and the refinery, the transmission line from Tilenga Project CPF to Kabaale, Kabaale international airport, the transmission lines to Kabaale airport, the Hoima-Buloba pipeline and the R4 Kabaale-Kiziranfumbi road upgrade. It is estimated that EACOP will be a smaller contributor to the benefits accruing from the economic boost of the developments, compared to the other projects.
- Kabaale-Kyabicwe (KP35), Kisenyi (KP40), Kakende (KP29.5) and Katikara (KP41) caused by the EACOP project and the Hoima-Buloba pipeline, and the Buhimba to Kakumiro road upgrade. It is estimated that the beneficial impacts of the projects will be similar.
- Kalembe (KP122), Kyenda (125.5), Lugala (KP124), Mijunwa (KP127.5) Kagoma (KP124.5) and Mubende town caused by the EACOP project and the transmission line extension. It is estimated that EACOP will be the major contributor to the benefits accruing from the economic boost of the two developments.
- Nabigasa (KP283), Kabugimbi (KP282), Bigada (KP281.5), Kabonera (KP284.5) and Lukoma (KP287.5) caused by the EACOP project and the ICT infrastructure installation. It is estimated that EACOP will be the major contributor to the benefits accruing from the economic boost of the two developments

These PACs may also experience inflation and economic downturn post construction and have potential opportunities for re-employment with the different developments, if construction timelines are sequential.

The project will engage proponents of third party developments and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include development and implementation of awareness campaigns in schools and communities to ensure:

- that the short-term nature of employment opportunities is communicated effectively
- collaboration to optimise opportunities for re-employment of retrenched employees
- liaising on the construction schedules to reduce disruption.

With the mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

8.12.6.3 Cumulative Transboundary Impacts

There are no cumulative transboundary impacts on local economy (non-landbased livelihoods).

8.13 Land-Based Livelihoods

This section describes potential impacts on land-based livelihoods during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.13.1 Key Sensitivities and Considerations

The land-based livelihoods baseline conditions are described in Section 6.4.3.8, as well as:

- land-based livelihoods key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the land-based livelihoods impact assessment.

Sensitivity in the land-based livelihoods AOI is ranked as follows:

- crop farming households engaged in subsistence and commercial crop farming are deemed very highly sensitive, owing to their limited access to alternative sources of income caused by remote location, lack of education, skills and experience. Female headed households are even more sensitive due to their particularly pronounced lack of access to alternative income sources. Also ranked very highly sensitive are landless farm labourers on subsistence farms; without their wages, potential impacts will be felt on household food and nutritional status as well as cash for living, education and health care.
- commercial farmers farming large-scale crops (e.g., coffee, tea) are deemed moderately sensitive as they generally have access to cash reserves and alternatives. Agro pastoralists are ranked as moderately sensitive as they have diversified income streams across crop farming and livestock rearing. Crop buyers and agro processors are ranked as moderately sensitive; they are dependent on one income stream but are likely to have access to credit facilities based on the business. Intermediaries who purchase goods at farm gates are also ranked as moderately sensitive; road access is critical for movement of goods to market in a timely manner.
- livestock owners (and their families) not undertaking crop farming in conjunction with livestock keeping are ranked very highly sensitive because a reduction in free movements of large herds may cause reduced access to pasture and water sources. Also ranked very highly sensitive VECs are hired herdsmen, who have little or no education and no alternative livelihood means.

- livestock owners (and their families) who undertake crop farming in conjunction with livestock rearing are considered moderately sensitive; they are less vulnerable to loss of livestock than those who rely solely on livestock rearing. Also ranked moderately sensitive are commercial ranch owners; as their operations are large-scale, they are more resilient to external shocks with the exception of disease, climatic change and a shortage of labour.
- women involved in ASM are considered very highly sensitive as they have less access to productive capital than men and may be relying on ASM as a sole livelihood. Miners who are engaged as casual labour and pursue ASM as a sole occupation are deemed very highly sensitive; these VECs do not have access to land for farming or livestock as an alternative livelihood and are therefore highly vulnerable. Children involved in ASM are very highly sensitive since they are exposed to safety risks and may lack access to education as a result of mining activities. Non Ugandan nationals engaged in ASM are very highly sensitive; these people hold no identity papers and have no legal standing in Uganda.
- pit owners are considered moderately sensitive; they may be moderately vulnerable to a loss of income but are likely to be more resilient if relocated owing to the relatively cash-rich nature of pit ownership.
- female firewood collectors are deemed highly sensitive VECs due to their dependency on natural resources; biomass reserves are already decreasing and women have to walk long distances to collect firewood. Wild food users are also deemed highly sensitive VECs as plants supplement diets and are used during hungry months when households may not have sufficient access to food.
- medicinal plant users are moderately sensitive as, without access to plants, there may be limited means to treat illnesses in an affordable manner.
- sensitivity for hunters is considered to be low; they are generally not reliant on the animals they hunt for food or as a source of income. Sensitivity for beekeepers is also considered to be low; beekeeping activities predominantly supplement farming activities, rather than representing sole livelihood strategies. Sensitivity for fibres and grass collectors is further considered to be low; fibres and grass are widespread and their availability will not be significantly impacted by the project.

Key considerations are:

- crop farming:
 - o in the sample PACs crop farming is mostly undertaken on household land holdings. The impacts of failed crops or loss of land can last for several years as seedlings and seeds are produced each season for the subsequent season
 - o crop farming in the sample PACs is generally rain fed, low input and low output; therefore, harvests are vulnerable to pests, diseases and climatic variability
 - o farmer groups have relatively low participation but are the government's preferred means of contact
 - o labour shortages may affect household agricultural capability; children miss school when they are required to complete farm work, which may be exacerbated if household members are drawn away to temporary construction jobs
 - o access to markets is a major challenge for crop farmers in rural areas. With poor road conditions and limited market information, farmers are dependent

- o on selling goods in a timely manner locally or to middlemen buying at the farm gate. Any interruptions in the supply chain will affect their ability to market goods and receive a cash income
 - o women are notably disadvantaged in crop farming with limited education, access to land holdings, capital to improve farming activities, constraints with household duties and no alternative livelihood opportunities
 - o human rights to adequate food and standard of living are sustained.
- livestock rearing:
 - o livestock rearing activities in the sample PACs are under pressure due to shortage of land and water resources
 - o localised nomadic pastoralism within and between villages is undertaken in the sample PACs during the dry seasons
 - o livestock diseases are common and increased movements of vehicles and people could increase the spread of diseases
 - o owners of large herds in the sample PACs often do not have diversified income
 - o human rights of access to food and a decent standard of living are maintained.
- ASM:
 - o large construction projects may require substantial quantities of construction materials, which would increase the pressure on existing sources of supply with the potential for increased cost of construction materials, opening of new (licensed and unlicensed) borrow pits and surplus of borrow material
 - o due to the informal and hence often covert nature of ASM activities, it is difficult to assess the precise location of ASM sites at any particular time
 - o PACs' human rights to a decent livelihood, safety and security.
- natural resources use:
 - o communities, especially poorer households, are dependent on natural resources for the provision of wild food, traditional medicine and firewood for cooking
 - o a growing population and urban demand for firewood and charcoal has reduced their availability in the AOI
 - o there is a decline in the bee population due to habitat destruction in favour of crop farming and animal grazing. Additional removal of land cover may affect the bee population further
 - o PACs' human rights to a decent livelihood and food security.

Sections A11.4.6.1, A11.4.6.2, A11.4.6.3 and A11.4.6.4 in Appendix A11 identify ecosystem services associated with land-based livelihoods in the AOI. The following ecosystem services have been considered:

Crop farming provisioning services:

- food for basic survival of the population
- income from selling surplus crops to pay for education, clothes and health-related items as well as other basic needs
- jobs for farm labourers
- products for agro-processing activities.

Crop farming is undertaken throughout the AOI in PACs, sometimes being their only source of food.

In the sample PACs, most of the farming is subsistence and the agricultural produce is consumed within the family with a small portion being sold at the local market.

Livestock rearing provisioning services:

- rural income from selling livestock
- food security for families and future generations (if managed in a sustainable manner)
- financial security (livestock rearing is part of a diversification strategy to ensure some cash will be available when other means of income fail).

Livestock rearing cultural services:

- preservation of cultural heritage and traditional knowledge where livestock rearing is inter-generational.

Key points to note are that within the districts traversed by the AOI, livestock are used both for subsistence and sale. Livestock rearing in the sample PACs is predominantly sedentary with grazing on owned or rented land, while a form of localised nomadism takes place due to increasingly unpredictable rains, particularly in the Kyankwanzi, Buseruka and the Sango Bay areas.

Land provides a provisioning service as a resource for livestock keeping. It provides grazing resources, water sources, ground for movement and habitation of livestock herds and trees for shelter and medicinal herbs.

ASM provisioning services:

- income from sale of minerals and construction materials (e.g., sand, clay, gravel)
- materials for dwellings and shelter
- salt for livestock and domestic consumption.

ASM is an abiotic provisioning ecosystem service undertaken throughout the AOI by sample PACs primarily in the dry season.

Natural resources use provisioning services:

- energy for cooking and food security
- construction materials for shelter
- income from selling natural resources
- traditional medicine.

Natural resources are obtained from a variety of ecosystems within or near the PACs including forests, wetlands and pasture rangelands. As such, these natural resources play a vital role in subsistence of rural communities. With an increasing population and a high demand and reliance on natural resources, continued protection of and access to these resources is essential.

The main human rights that are relevant to land-based livelihoods are the right to an adequate standard of living, women's rights and children's rights as vulnerable groups. International standards for responsible business also provide that

individuals should receive adequate compensation when deprived of their means of livelihood. Adequate compensation requires that displaced persons are provided with compensation for loss of assets at full replacement cost and other assistance to help them improve or at least restore their standards of living or livelihoods (see Section 4).

8.13.2 Potential Project Impacts

8.13.2.1 Construction

Generic Benefits

Use of Road Network

Within PACs, surplus agricultural produce and livestock is marketed either at farm gates (to bulk buyers) or at weekly or daily local and district markets. Temporary disruption of access to markets are discussed in Section 8.12. Farm gate sales are particularly advantageous to livestock owners as they can avoid the administrative legalities enforced at livestock markets. Baseline data indicates that marketing of produce and livestock is a major challenge, especially in rural areas, due to inadequate road infrastructure. Roads often become impassable during the two rainy seasons. Consequently, produce spoils because it cannot reach markets in time and costs of transportation are inflated, reducing farmers' profits.

Benefit: Improved ability to sell agricultural produce to nearby markets for farmers and traders

The project will improve the conditions of some murram roads and construct new roads for project access to the pipeline RoW and AGI facilities, which will be advantageous to rural communities. With improved road conditions, marketing of agricultural produce may increase and may lead to increased revenue for producers in the AOI.

Generic Impacts

Impeded Movement of Animals

Livestock are intrinsic to the livelihoods of rural PAC households. Livestock rearing of cattle, goat and sheep is a largely sedentary activity. Pasture lands used are either in fenced areas on privately owned land or on communal village land. Nomadic pastoralist practices have largely disappeared but localised movement of livestock is still practiced in some parts of the AOI (see Section A11.4.6.2 in Appendix A11).

Impact: Due to access restrictions, livestock cause damage to crops

This may lead to direct and indirect impacts.

Trenching and the creation of new access roads could temporarily limit or restrict access routes to grazing areas and watering points. This will force livestock herders to seek alternative routes or sites, potentially entering farming areas when doing so. This may cause crop damage, increase the number of conflicts or exacerbate existing conflicts between livestock owners and crop farmers. Access restrictions

may also force livestock herders to enter areas protected for their biodiversity values when seeking alternative routes or sites.

The impacts will be short-term and will affect some individuals within the PACs. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Accidents Due to Open Excavations

Livestock in PACs often roam free.

Impact: Livestock falling into excavations

This may lead to direct and indirect impacts

Livestock could fall into excavations, such as the pipeline trench, causing injury or death. PACs do not have easy access to veterinary services for injured livestock. Loss of livestock may impact on a household's food security, collateral for loans and cash income.

The impacts will be medium-term and will affect some households within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Loss/Severance of Land and Disruption to Land-Based Livelihoods

PAC households are reliant on agricultural land for crop farming, forests and scrubland for natural resources, grassland for livestock rearing and areas suitable for ASM.

Impact: Permanent loss of land used for crop farming

This may lead to direct and indirect impacts.

Permanent land acquisition of approximately 300 ha will cause loss or severance of agricultural land. Baseline data indicates that there is substantial dependency on land used for commercial and subsistence crop farming, the latter of which is undertaken in nearly every PAC. Mixed farming activities consist of growing variations of perennial and annual cash crops, trees (fruit and tree plantations) and/or subsistence crops. Women are particularly engaged in crop farming and use the income generated to reinforce household food security and pay for their children's education and health care. Without access to land, a household's livelihood, food security and well-being could be severely affected.

From a human rights perspective there may be an impact on the rights related to land.

Baseline data further indicates that there is increasing scarcity of land and replacement land for economically displaced individuals may not be as productive as previous land holdings.

The impacts will be very long-term and will affect some households within the PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Temporary loss of grazing land

This may lead to direct and indirect impacts.

Livestock rearing in the PACs is predominantly sedentary with grazing on owned, rented or customary land. There are few alternative areas available to graze cattle without entering protected areas or causing disruptions to other land holders or users. Livestock farming is reliant on grazing land to feed animals, with few or no supplements provided.

Acquisition of land used for grazing within the RoW will result in reduced access to grazing land for livestock during construction.

From a human rights perspective there may be an impact on the rights related to land.

The impacts will be short-term and will affect some households within the PACs who depend on livestock rearing. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Impact: Increased traffic leading to spread of animal diseases

This may lead to direct and indirect impacts.

Livestock diseases are prevalent in the districts traversed by the AOI, partially due to a lack of veterinary services and some livestock owners lacking the means to afford veterinary services. Project vehicles and people will be moving across districts, potentially spreading disease (such as foot and mouth disease) on car tyres and shoes. An increase in livestock disease may negatively impact on the food security and cash income of households depending on livestock rearing for a major proportion of their livelihoods.

The impacts will be medium-term, will affect districts and may have transboundary implications (discussed in Section 8.13.5.1). Due to their medium-term nature and medium extent, before mitigation the impacts are considered not significant.

Impact: Permanent loss of access to artisanal mining sites

This may lead to direct and indirect impacts.

ASM of construction materials (e.g., sand, stone and clay) occurs throughout the AOI. Gold ASM is undertaken in the districts of Kakumiro, Kyankwanzi and Mubende. Operations are usually non-mechanised, though simple technologies may be applied with minimal economic outlay. ASM engages many people to perform manual labour, including women and children. Participation of experienced miners from neighbouring countries (e.g., Tanzania, Rwanda and the DRC) is also common. ASM is undertaken in a largely uncontrolled manner, without a licence and often without the knowledge of the authorities.

With few alternative employment opportunities, ASM is poverty-driven and provides an important livelihood strategy for several households in the PACs. With permanent loss of access to ASM sites through permanent land acquisition for the project, households may experience a decrease in cash income and food security.

Furthermore, as it may be difficult to keep individuals involved in ASM away from known mineral deposits (particularly gold), there could be impacts related to interactions between PACs and project security personnel (see Section 8.19).

The impacts will be long-term and will affect some individuals within the PACs who depend on ASM. Young artisanal miners and women, who often turn to mining

activities because they do not have access to land for farming or livestock rearing and lack alternative livelihood opportunities, are deemed very highly sensitive VECs. Due to their very large magnitude and high sensitivity, before mitigation the impacts are considered significant.

Impact: Permanent loss of natural resources

This may lead to direct and indirect impacts.

All households in PACs rely on natural resources including biomass fuel such as firewood or charcoal (for cooking), wood (for house construction), grasses (for thatched roofing and fodder for livestock), wild plants (to supplement food and human and animal medicine), non-wood fibres such as papyrus (for mats and screens) and insects and animals (for food and honey).

Baseline studies found varying degrees of reliance on natural resources for food security, medicine, shelter and income generation. However, the poorest members of PACs are most reliant on natural resources, often due to a lack of access to land to grow crops. There is a pronounced reliance on biomass fuels (firewood and charcoal) for cooking as there are no affordable alternatives. Medicinal plants are particularly relied on in remote rural areas where access to health care is limited.

Population growth and overexploitation is leading to a decrease in available natural resources, particularly biomass fuel.

Permanent loss of access to natural resources, caused by project land acquisition, could affect those relying on natural resources.

The impacts will be long-term and will affect entire PACs. Poorer households (e.g., landless, widowed, single female and elderly headed households) who are particularly dependent on natural resources may be more vulnerable. Owing to their small extent, before mitigation the impacts are considered not significant.

Impact: Reduction in honey production due to loss of habitat

This may lead to direct and indirect impacts.

Most PACs have at least one household involved in apiculture, which is undertaken alongside crop farming and livestock rearing activities. Apiculture is widespread in the project AOI but is particularly prevalent in Gomba, Mubende, Sembabule, Lwengo and Kyotera districts. However, baseline studies indicate a decline in the bee population, which is partially due to loss of habitat.

From a human rights perspective there may be an impact on the right to an adequate standard of living.

Further habitat degradation could be compounded by dust created along the RoW, access roads or rural roads used by construction vehicles, particularly during the two dry seasons when traffic is more likely to create dust. Vibrations, generated by construction activities, may also affect bee populations (described in Section 8.10). A decline in honey production will result in loss of income for households involved in apiculture.

The impacts will be medium-term and will affect some individuals within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Disruption to Surface Water Catchments

Crop cultivation in the PACs is mainly rain fed as few farmers have irrigation infrastructure. However, crop farmers are also reliant on other water sources such as rivers, dams and wells, which are drainage fed. During dry periods, water is collected from these sources and (mostly) manually transported to agricultural plots with containers to drip irrigate seedlings.

Livestock owners are reliant on catchment areas for their animals. These sources of water are not always reliable throughout the year and alternative sources often have to be accessed with permission from land holders.

These water sources are also used in some PACs by household members for washing clothes and, to a lesser extent, for drinking water.

Impact: Temporary disruption to surface water

This may lead to direct and indirect impacts.

Disruption of surface water catchment areas could affect irrigation, livestock water points and sources of water used by households. Disruptions could lead to both lack of water and flooding, resulting in direct impacts on crop cultivation and livestock rearing and indirect impacts on food security and income generation.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

From a human rights perspective there may be an impact on the right to water and an adequate standard of living in relation to farmers and irrigation.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs, except for impacts related to temporary loss of grazing land. The land acquired for the MCPYs will be acquired permanently by the government and leased to the project. It has been assumed that the land will not be returned to agricultural use when the lease ends. Therefore, the following specific impact is applicable to the 20 PACs near the four MCPYs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of grazing land

This may lead to direct and indirect impacts.

Land acquisition of approximately 70 ha for the MCPYs will cause permanent loss or severance of grazing land.

Livestock farming in the PACs is reliant on grazing land to feed animals, with few or no supplements provided to the animals. Permanent acquisition of grazing land for the MCPYs could result in insufficient grazing land for livestock and could affect the

livelihoods, food security and wellbeing of PAC households engaged in livestock rearing.

The impacts will be very long-term and will affect some households within the PACs. Owing to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

The following generic impacts may be more pronounced in the 20 PACs near the four MCPYs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of land used for crop farming

This may lead to direct and indirect impacts.

Owing to the land acquisition of approximately 70 ha for the MCPYs, permanent loss of crop farming land will be greater at these locations than in PACs near to the RoW. The potential PIIM of economic migrants to the area due to employment opportunities may increase existing pressure on remaining crop land during the construction period.

The impacts will be very long-term and will affect some households within the PACs. Owing to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Permanent loss of natural resources

This may lead to direct and indirect impacts.

Land acquisition of approximately 70 ha for the MCPYs will cause greater permanent loss of natural resources at these locations than in PACs near to the RoW. The potential PIIM of economic migrants to the area due to employment opportunities will increase pressure on natural resources.

The impacts will be long-term and will affect entire PACs. Owing to their moderate sensitivity and small extent, before mitigation the impacts are considered not significant.

The following specific impact is also applicable to the 20 PACs near the four MCPYs:

Employment

Owing to the dearth of formal employment opportunities in PACs, households in rural areas are reliant on crop farming and livestock rearing for food security and cash income. These activities rely primarily on household members for labour.

Impact: Household members seeking employment with the project will no longer be available for land-based livelihood activities

This may lead to indirect impacts.

Household members, who may gain employment with the project, will not be available for household land-based livelihood activities (e.g., crop farming, mining). This may increase the contribution of the remaining spouse (usually the wife) and children to land-based livelihoods. Increased child labour requirements may jeopardise school attendance. Girls are more likely to be withdrawn from school

than boys due to cultural norms. If the woman is employed by the project, girls will more likely be withdrawn from school to fulfil household tasks.

Furthermore, it is possible that households may not return to their previous livelihood activities following the termination of their employment contracts. With new skills and experience on the project, households may pursue alternative work in more urbanised areas instead. Households who can secure work in such areas may benefit from increased income earning opportunities. However, households who are unable to find alternative employment may experience greater insecurity and impoverishment owing to the abandonment of existing subsistence livelihoods during the period of their employment with the project.

Households may leave land untended or under-utilised, causing agricultural production to decline. Any decline in land quality and productivity may necessitate considerable effort and financial investment to recover its previous potential.

Project employment opportunities may also reduce the availability of farm workers and hired herdsmen on cattle ranches and farms. Baseline studies indicate that commercial crop farms, plantations and cattle ranches rely on hired labour, sometimes non-Ugandan, to undertake agricultural and livestock activities that support their commercial operations. In the absence of mechanisation, manual labour is relied upon for productivity of land-based livelihoods.

The impacts will be medium-term and will affect some households within the PACs. Owing to their localised extent, before mitigation the impacts are considered not significant.

Location: RoW: Areas of High Value Crop Cultivation

The potential generic impacts are also applicable to PACs located in areas of high value crop production. The following specific impact is also applicable to these PACs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of land cultivated with high value cash crops

This may lead to direct and indirect impacts.

Cash crops such as tobacco, tea, sugar, maize and high value perennial crops such as coffee are grown in:

- Hoima district (KP0 to KP30)
- Kakumiro district (KP36.6 to KP69)
- Lwengo district (KP225 to KP240).

Project-related land acquisition may cause the permanent loss of agricultural land used to grow high value cash crops within the RoW. This could directly impact upon the livelihoods of households who are engaged in high value crop cultivation.

The impacts will be very long-term and will affect some households within PACs. Hired agricultural labourers, who are fully dependent on the cultivation of cash crops for their livelihoods, will be particularly vulnerable. Due to their very large magnitude and high sensitivity, before mitigation the impacts are considered significant.

Location: RoW: Artisanal and Small-Scale Mining Concentrations

The potential generic impacts are also applicable to PACs where there is a concentration of gold ASM activities. The following specific impact is also applicable to these PACs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of access to artisanal gold mining sites

This may lead to direct and indirect impacts.

Gold ASM¹⁷ provides an alternative livelihood to subsistence farming. The practice is prevalent in:

- the subcounties of Butoloogo and Madudu, Mubende district (KP84 to KP112, bordering Bukuya subcounty)
- Nkooko subcounty, Kakumiro district (KP69 and KP82)
- Ntwetwe subcounty, Kyankwanzi district (KP82).

Project-related land acquisition may cause the permanent loss of access to gold artisanal mining sites within the RoW. This could directly impact upon the livelihoods of households with members engaged in gold ASM.

The impacts will be long-term and will affect some individuals within PACs. The potentially most affected include women and youth involved in mining activities, who have less access to productive capital than men, and casual artisanal miners without access to land. Owing to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location RoW: PACs Close to Livestock Watering Points Identified Within the RoW

The potential generic impacts are also applicable to PACs close to livestock watering points identified within the RoW. The following specific impact is also applicable to these PACs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Temporary loss of access to livestock watering points.

This may lead to direct and indirect impacts.

During G&G environmental permitting surveys, numerous dams and potential watering points for livestock were identified along the RoW including:

- one dam in Kakumiro district (KP53)
- four dams (KP157, KP160, KP160.5 and KP162.5) and one potential animal watering point (KP159) in Gomba district
- five dams (two at KP170.5, KP172, KP185 and KP199) and three potential animal watering points (KP184.5, KP200.5, KP215.5) in Sembabule district
- one potential animal watering point (KP217) in Lwengo district

¹⁷ ASM is undertaken in an uncontrolled and informal manner and prospecting and extraction is itinerant in nature, therefore extraction site locations are disparate and usually only known to the miners.

- one dam (KP288.5) and one potential animal watering point (KP289) in Kyotera district.

During the construction period, access restrictions along the RoW may cause temporary loss of access to these dams and watering points. This could directly impact upon the livelihoods of households engaged in livestock rearing. Households solely reliant on livestock rearing, with no alternative means of income, will be most vulnerable.

The impacts will be short-term and will affect some households within the PACs. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations except for impacts related to temporary loss of grazing land. Land acquisition for the pumping stations will be permanent. Therefore, the following specific impact is applicable to these PACs:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of grazing land

This may lead to direct and indirect impacts.

Permanent land acquisition of approximately 30 ha for the pumping stations will cause permanent loss or severance of grazing land.

Livestock farming in the PACs is reliant on grazing land to feed animals, with few or no supplements provided to the animals. Permanent acquisition of grazing land for the pumping stations could cause insufficient grazing land for livestock and could affect the livelihoods, food security and well-being of PAC households engaged in livestock rearing.

The impacts will be very long-term and will affect some households within the PACs. Households that solely rely on livestock but lack private grazing land, and herders employed by livestock owners (who are often landless), will be most affected. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impacts related to permanent loss of access to artisanal mining sites are also not applicable; no evidence of ASM was found near the pumping stations during the baseline studies.

8.13.2.2 Operation

The land acquired for the MCPYs will be acquired permanently by the government and leased to the project. When construction has been completed, land leased to the project for these construction facilities will be returned to the government. The government will determine how this land will be used in the future. No additional land will be required during the operation phase.

Generic Impacts

There are no generic impacts during pipeline and AGI operation.

Location-Specific Impacts**Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)**

The following specific impact is applicable to the eight PACs near the two pumping stations during operation:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Accidental damage to crops during maintenance activities

This may lead to direct and indirect impacts

During project maintenance activities, accidental damage to crops could occur.

The impacts will be transient and will affect some individuals within the PACs. Due to their transient nature and localised extent, before mitigation the impacts are considered not significant.

8.13.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect land-based livelihoods.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.13.3.1 Design**Generic Mitigation Measures**

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects such as land use. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available. However, it may therefore have had a potentially greater impact on land-based livelihoods.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.13.3.2 Construction

Generic Mitigation Measures

Impeded Movement of Animals

Impact: Due to access restrictions, livestock cause damage to crops

The community health, safety and security plan, stakeholder engagement plan and the monitoring and reporting plan include measures that will manage impeded movement of animals.

Crossing points will be provided across trenches at locations identified to be most appropriate by local people who will be informed of access restrictions. Incidents in conflicts between crop farmers and herders will be monitored, support will be provided to local authorities where required and all stakeholders will have access to the grievance procedure.

Meetings will be held with PAC representatives, when construction is active in their area, to provide updates on construction progress and to receive comments or queries. Leaflets and posters with additional information will be produced consistent with project stakeholder engagement plan guidelines.

Where access restrictions affect land-based livelihoods because of interruption to agricultural production, appropriate compensation will be provided.

Application of these mitigation measures will reduce the magnitude from very large to medium and the residual impact is not significant.

Accidents Due to Open Excavations

Impact: Livestock falling into excavations

The community health, safety and security plan, stakeholder engagement plan and monitoring and reporting plan will include measures that will manage accidents related to open excavations.

A risk assessment will be conducted for excavations and the maximum length of open trench will be defined based on community safety and livestock management patterns. Community awareness programmes will be implemented to ensure community and livestock safety during construction. Inspections of construction activity will include checks for compliance with measures to protect livestock.

Application of these mitigation measures will reduce the magnitude from medium to negligible and the duration from medium-term to short-term. Residual impacts will be not significant.

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of land used for crop farming

Impact: Temporary loss of grazing land

Impact: Permanent loss of access to artisanal mining sites

Impact: Permanent loss of natural resources

Impact: Reduction in honey production due to loss of habitat

The pollution prevention plan, resettlement action plan and monitoring and reporting plan will include measures that contribute to manage land and livelihood related impacts.

A resettlement action plan will describe the procedures related to compensation for loss of assets and livelihood restoration strategies to ensure livelihoods are restored to pre-project levels as a minimum.

Where construction generated dust may affect honey production, dust suppression, adherence to RoW speed limits and sheeting of fine materials being transported or stored on-site will be considered.

For the impact permanent loss of land used for crop farming, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from very long-term to short-term. The residual impact is not significant.

For the impact temporary loss of grazing land, application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact will be not significant.

For the impact permanent loss of access to artisanal mining sites, application of these mitigation measures will reduce the magnitude of impact from very large to small and the duration of impact from long-term to short-term. The residual impact will be not significant.

For the impact permanent loss of natural resources, application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact will be not significant.

For the impact reduction in honey production due to loss of habitat, application of these mitigation measures will reduce the magnitude of impact from small to negligible and the duration from medium-term to short-term.

The residual impact will be not significant.

Impact: Increased traffic leading to spread of animal diseases

The transport and road safety management plan, community health, safety and security plan and the biodiversity management plan will include measures to manage spread of animal diseases.

Measures will include inspections, cleaning and the restriction of movement to defined access roads and demarcated working areas (unless in the event of an emergency).

Application of these mitigation measures will reduce the magnitude from large to small and the residual impact will be not significant.

Disruption to Surface Water Catchments

Impact: Temporary disruption to surface water

The infrastructure and utilities management plan and resettlement action plan will include measures that will contribute to the control of this impact.

Potentially affected landowners, land users and communities will be consulted if there is likely to be any disruption to the existing infrastructure and utility services and their feedback will inform planning of the works. If project activities affect land-based livelihoods because of interruption to irrigation or drainage required for agricultural production, compensation will be provided.

A pre-construction entry survey will be undertaken to document the condition of immovable assets and crops to provide baseline evidence in the event of a claim for damage and agree on temporary measures to be installed (e.g., during disruption to drainage or irrigation, temporary fencing).

Application of these mitigation measures will reduce the magnitude from medium to small and the residual impact will not be significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are also applicable to the 20 PACs near the four MCPYs. The additional specific mitigation measures recommended for these PACs are:

Employment

Impact: Household members seeking employment with the project will no longer be available for land-based livelihood activities

The stakeholder engagement plan and labour management plan will include measures that will contribute to managing employment impacts.

This will include a campaign focused on providing realistic community expectations about livelihood options and employment opportunities and financial management workshops for workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should try to maintain their existing livelihoods and prepare for the termination of their employment.

Application of these mitigation measures will reduce the magnitude from large to small and the residual impact will be not significant.

Children's Rights

An awareness campaign targeting schools at sensitive locations within the project AOI will be developed. This will focus on topics specifically important to children:

- importance of staying in school
- risks of relationships with transient workers, transactional and commercial sex

Right to an adequate standard of living

The project will develop a campaign focused on providing realistic community expectations about livelihood options and employment opportunities.

All stakeholders will be informed on their rights and the project grievance mechanism and their right to use it.

Location: RoW: Areas of High Value Crop Cultivation

The generic mitigation measures are also applicable to PACs in areas of high value crop cultivation. The additional mitigation measures recommended for these PACs are:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of land cultivated with high value cash crops

The resettlement action plan and stakeholder engagement plan will contain measures to manage land and property related impacts.

A resettlement action plan will include the procedures related to compensation for loss of assets and livelihood restoration strategies and is backed-up by the grievance procedure that will be communicated to all stakeholders allowing for the resolution of potential grievances.

Location: RoW: Artisanal and Small-Scale Mining Concentrations

The generic mitigation measures are also applicable to PACs where there is a concentration of gold ASM activities. The additional mitigation measure recommended for these PACs is:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Permanent loss of access to artisanal gold mining sites

The resettlement action plan and stakeholder engagement plan will contain measures to manage land and property related impacts.

A resettlement action plan will include the procedures related to compensation for loss of assets and livelihood restoration strategies and is backed-up by the grievance procedure that will be communicated to all stakeholders allowing for the resolution of potential grievances.

Location: RoW: PACs Close to Livestock Watering Points Identified Within the RoW

The generic mitigation measures are also applicable to PACs close to livestock watering points identified within the RoW. The additional mitigation measure recommended for these PACs is:

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Temporary loss of access to livestock watering points.

The resettlement action plan and stakeholder engagement plan will contain measures to manage land and property related impacts.

A resettlement action plan will include the procedures related to compensation for loss of assets and livelihood restoration strategies and is backed-up by the grievance procedure that will be communicated to all stakeholders allowing for the resolution of potential grievances.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic mitigation measures are also applicable to the eight PACs near the two pumping stations, except for measures related to permanent loss of access to artisanal mining sites. No evidence of ASM was found near the pumping stations during the baseline studies.

8.13.3.3 Operation**Generic Mitigation Measures**

As there are no predicted generic impacts for pipeline and AGI operation, no mitigation measures are required.

Location-Specific Mitigation Measures**Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)**

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Accidental damage to crops during maintenance activities

The stakeholder engagement plan and the resettlement action plan will include measures that address grievances arising from maintenance activities at the pumping stations.

The compensation framework from the RAP will provide compensation rates for damaged crops.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact will be not significant.

8.13.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on land-based livelihoods after mitigation measures have been implemented.

Table 8.13-1 summarises the potential generic land-based livelihoods impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.13-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on land-based livelihoods are considered not significant.

8.13.4.1 Ecosystem Services

Sections A11.4.6.1, A11.4.6.2, A11.4.6.3 and A11.4.6.4 in Appendix A11 identify ecosystem services associated with land-based livelihoods in the AOI. The following ecosystem services have been assessed in Sections 8.13.2 and 8.13.3:

Crop farming provisioning services:

- food for basic survival of the population
- income from selling surplus crops to pay for education, clothes and health-related items as well as other basic needs

- jobs for farm labourers
- products for agro processing activities.

Crop farming is undertaken throughout the AOI in PACs, sometimes being their only source of food.

In the sample PACs, most of the farming is subsistence and the agricultural produce is consumed within the family with a small portion being sold at the local market.

Livestock rearing provisioning services:

- rural income from selling livestock
- food security for families and future generations (if managed in a sustainable manner)
- financial security (livestock rearing is part of a diversification strategy to ensure some cash will be available when other means of income fail).

Livestock rearing cultural services:

- preservation of cultural heritage and traditional knowledge where livestock rearing is inter-generational.

Key points to note are that within the districts traversed by the AOI, livestock are used both for subsistence and for sale. Livestock rearing in the sample PACs is predominantly sedentary with grazing on owned or rented land, while a form of localised nomadism takes place due to increasingly unpredictable rains, particularly in the Kyankwanzi, Buseruka and the Sango Bay areas.

Land provides a provisioning service as a resource for livestock keeping. It provides grazing resources, water sources, ground for movement and habitation of livestock herds and trees for shelter and medicinal herbs.

ASM provisioning services:

- income from sale of minerals and construction materials (e.g., sand, clay, gravel)
- materials for dwellings and shelter
- salt for livestock and domestic consumption.

ASM is an abiotic provisioning ecosystem service undertaken throughout the AOI by sample PACs primarily in the dry season.

Natural resources use provisioning services:

- energy for cooking and food security
- construction materials for shelter
- income from selling natural resources
- traditional medicine.

Natural resources are obtained from a variety of ecosystems within or near the PACs including forests, wetlands and pasture rangelands. As such, these natural resources play a vital role in subsistence of rural communities. With an increasing population and a high demand and reliance on natural resources, continued protection of and access to these resources is essential.

With the implementation of the planned mitigation measures, the residual impact on the above services will be not significant.

Table 8.13-1 Land-Based Livelihoods – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Use of Road Network	Improved ability to sell agricultural produce to nearby markets for farmers and traders	C	Y		B				
Impeded Movement of Animals	Due to access restrictions, livestock cause damage to crops	C	-	Community Health, Safety and Security Plan Stakeholder Engagement Plan Monitoring and Reporting Plan	6	2	1	5	14
Accidents Due to Open Excavations	Livestock falling into excavations	C	Y	Community Health, Safety and Security Plan Stakeholder Engagement Plan Monitoring and Reporting Plan	2	3	1	5	11
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of land used for crop farming	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	4	2	1	5	12
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Temporary loss of grazing land	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	4	2	1	5	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.13-1 Land-Based Livelihoods – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Increased traffic leading to spread of animal diseases	C	-	Transport and Road Safety Management Plan Community Health, Safety and Security Plan Biodiversity Management Plan	4	3	3	4	14
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of access to artisanal mining sites	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	4	2	1	4	11
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of natural resources	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	2	2	2	2	8
Loss/Severance of Land and Disruption to Land-Based Livelihoods	Reduction in honey production due to loss of habitat	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	2	2	1	3	8
Disruption to Surface Water Catchments	Temporary disruption to surface water	C	Y	Infrastructure and Utilities Management Plan Resettlement Action Plan	4	2	2	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.13-2 Land-Based Livelihoods – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plans	Residual Impact				
PACs near the four MCPYs	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of grazing land	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the four MCPYs	Employment	Household members seeking employment with the project will no longer be available for land-based livelihood activities	C	-	Stakeholder Engagement Plan Labour Management Plan	4	3	1	4	12
PACs in areas of high value crop production	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of land cultivated with high value cash crops	C	Y	Resettlement Action Plan Stakeholder Engagement Plan	4	2	1	4	11
PACs where there is a concentration of gold ASM activities	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of access to artisanal gold mining sites	C	Y	Resettlement Action Plan Stakeholder Engagement Plan	4	2	1	4	11
PACs close to livestock watering points identified within the RoW	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Temporary loss of access to livestock watering points	C	Y	Resettlement Action Plan Stakeholder Engagement Plan	4	2	1	4	11

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.13-2 Land-Based Livelihoods – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plans	Residual Impact				
PACs near the two pumping stations	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Permanent loss of grazing land	C	Y	Pollution Prevention Plan Resettlement Action Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the two pumping stations	Loss/Severance of Land and Disruption to Land-Based Livelihoods	Accidental damage to crops during maintenance activities	O	-	Resettlement Action Plan Stakeholder Engagement Plan	4	1	1	5	11

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.13.5 Transboundary Project Impacts

8.13.5.1 Generic Transboundary Project Impacts

Loss/Severance of Land and Disruption to Land-Based Livelihoods

Impact: Increased traffic leading to spread of animal diseases

Livestock diseases are prevalent in PACs, most notably, during baseline studies, foot and mouth disease. During construction, project-related traffic will move across districts and between countries. Because of these movements, animal diseases could be inadvertently spread on vehicle tyres, directly impacting livestock populations and indirectly impacting households whose livelihoods depend on them (particularly those with large herds).

The potential for increased traffic leading to the spread of animal diseases across national borders will be managed through the mitigation measures described in Section 8.13.3. After mitigation has been implemented, the potential residual impact is considered not significant.

8.13.6 Cumulative Impacts

8.13.6.1 Context

Section 6.4.3.8 describes the baseline condition of land-based livelihoods, the trends and sensitivity to change. Table 8.13-1 and Table 8.13-2 summarise project residual impacts.

Most of PAC households are rural and rely on land-based livelihoods, mainly crop farming and livestock rearing for subsistence and cash income. Baseline data indicates increasing pressure on land availability and productivity. Population increases, including in-migration and over-exploitation, is causing a decrease in natural resource availability.

Sensitivity is ranked as very high for households in PACs engaged in subsistence farming, landless farm labourers and female headed households engaged in farming.

EACOP residual project impacts, which may contribute to cumulative impacts include:

- temporary and permanent loss/severance of land and consequent disruption to land-based livelihoods
- disruption of surface water catchments
- increased spread of animal disease.

The cumulative impacts may be experienced in the districts, counties and subcounties within the shared AOI of the EACOP project, the associated facilities and third-party developments. The associated facilities and third-party developments are shown in the cumulative impacts matrices, described and mapped in Appendix H. These are:

- associated facilities:
 - o Tilenga Project (AF01)
 - o Kingfisher Oil Project (AF02)
- third-party developments:
 - o transmission line from the Tilenga Project Central Processing Facility (CPF) to Kabaale (UG0A)
 - o Kabaale International Airport (UG04)
 - o transmission lines to Kabaale Airport (UG05)
 - o refinery (UG07)
 - o Hoima-Buloba pipeline (UG08)
 - o Lot 4 R4 Kabaale-Kiziranfumbi road upgrade (UG19)
 - o Buhimba to Kakumiro road upgrade (UG20)
 - o construction camp for Bulima–Kabwoya road (UG21) Bulima–Kabwoya road upgrade (UG22)
 - o transmission line extension (UG34)
 - o ICT infrastructure installation (UG44).

The preferred condition is for the standard of living of the impacted individuals and households of the PACs to be equal to, or better than, before construction.

8.13.6.2 Cumulative Impacts

Potential cumulative impacts linked to land-based livelihoods are predicted where:

- the EACOP project, the associated facility and/or third-party developments require land used by a particular PAC or household
- traffic from outside the local area is prevalent.

Associated Facilities

Impacts on Permanent and Temporary Loss of Land

For land-based livelihoods it is considered that the Tilenga Project feeder pipeline and Kingfisher Oil Project feeder pipeline components of the Tilenga Project and Kingfisher Oil Project respectively, not the upstream field development components, have the potential for cumulative impacts with EACOP. Cumulative impacts of the EACOP, the Tilenga and Kingfisher projects on land-based resources of PACs (and households within PACs) may lead to:

- insufficient remaining communal grazing land for the PAC to graze its livestock and receive nomadic livestock herds
- insufficient remaining communal land for the PAC to harvest natural resources
- insufficient remaining crop land for the PAC and for some households in particular for fallowing and crop rotation
- insufficient remaining land for land-based livelihood restoration (when required for physical and economic resettlement) within the PAC.
- insufficient access to water sources for the entire PAC. This could affect irrigation, livestock water points and sources of water used by households.

These cumulative impacts may apply to the following PACs:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5)

Information from the Tilenga Project and the Kingfisher Oil Project indicates that mitigation measures similar to those described in Section 8.13.3 will be implemented. In addition, the EACOP project will aim to avoid double economic displacement and where this is unavoidable, resettlement planning will ensure that livelihoods are, as a minimum, restored.

With the mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Increased Traffic Increasing the Spread of Animal Diseases

Vehicles for the construction of the EACOP and feeder pipelines of the Tilenga Project and Kingfisher Oil Project travelling through the same districts over similar timeframes, where cattle are present could potentially increase the spread of animal diseases.

Information from the Tilenga Project feeder pipeline and the Kingfisher Oil projects indicate that mitigation measures similar those described in Section 8.13.3 will be implemented. With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Third-Party Developments

Potential cumulative impacts associated with land-based livelihoods are predicted where the EACOP project and third-party developments have concurrent or consecutive construction phase timelines and where land take is required. The third-party developments' construction timeframes are not confirmed at the time of writing but, for this assessment, it has been assumed that construction will be conducted in similar timeframes.

Impacts on Permanent and Temporary Loss of Land

The third-party developments and the subcounties and districts that may be impacted are shown in Table 8.13-3.

Table 8.13-3 Cumulative Impacts: Land-Based Livelihoods

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG0A	Transmission line from the Tilenga CPF to Kabaale	0	PS1, approximately 3.5 km from UG0A	Buseruka subcounty, Hoima district	No data available

Table 8.13-3 Cumulative Impacts: Land-Based Livelihoods

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district	The airport will be constructed within the 29 km² area of land already acquired by the government for Kabaale Industrial Park. The PAPs from Kabaale industrial area that accepted replacement housing were moved to a homestead in Kizirafumbi subcounty. PAPs that took in kind compensation moved to locations of their choice.
UG05	Transmission lines to Kabaale Airport	12	PS1, approximately 3.9 km from UG05 Crosses EACOP at approximately KP12	Buseruka subcounty, Hoima district	The lines will have a 10 m construction corridor with a 5 m permanent right of way.
UG07	Refinery	0	PS1 approximately 0.2 km from UG07	Buseruka subcounty, Hoima district	The refinery will be constructed within the 29 km² area of land already acquired by the government for the Kabaale Industrial Park. The PAPs from Kabaale industrial area that accepted replacement housing were moved to a homestead in Kizirafumbi subcounty. PAPs that took in-kind compensation moved to locations of their choice

Table 8.13-3 Cumulative Impacts: Land-Based Livelihoods

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG08	Hoima–Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 runs parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Kisiita subcounty, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba, Buseruka and Kiziramfumbi subcounties, Hoima district	No data available
UG19	Lot 4 R4 Kabaale-Kiziranfumbi road upgrades	0–19	PS1, approximately 3.2km from UG 19	For PS1: Buseruka subcounty, Hoima district	The road width will be increased from 4.5 m to a maximum of 12 m. The road will have a maximum RoW of 50 m.
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Kisiita and Nalweyo subcounties, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba and Kiziramfumbi subcounties, Hoima district	The proposed road will be constructed within a 30–50-m wide corridor
UG21	Construction camp for Bulima-Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from pipeline	Kiziranfumbi subcounty, Hoima district	The camp will be constructed on a 1.8-ha area
UG22	Bulima – Kabwoya road upgrade	19	Crosses pipeline at KP19	Kiziranfumbi subcounty, Hoima district	No data available
UG34	Transmission line extension	133	UG34 crosses MCPY2	Kitenga subcounty, Mubende district	The line will have a 10-m right of way
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses the pipeline	Kakuuto subcounty, Kyotera district Kibanda subcounty, Rakai district	No data available

The PACs that may be impacted by temporary or permanent loss of land are:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the EACOP project, the transmission line from the Tilenga Project CPF to Kabaale, the Kabaale international airport, the transmission lines to Kabaale airport, the refinery, the Hoima-Buloba pipeline and the R4 Kabaale-Kizirafumbi road upgrade. In the case of the transmission line from the Tilenga Project CPF to Kabaale, the transmission lines to Kabaale airport, and the Hoima-Buloba pipeline, the EACOP project may be responsible for more land-take than the other projects. The households that accepted replacement housing in the area allocated for the Kabaale Industrial Park which includes the airport and the refinery have already been relocated to a location in Kizirafumbi Subcounty that would not be affected by the EACOP project. For those households that accepted in-kind compensation, there is the potential that they resettled with the EACOP project footprint and may experience loss of severance of land and disruption of livelihoods in the location to which they resettled.
- Katikara (KP41) and Kisenyi (KP40) caused by the EACOP project and the Buhimba to Kakumiro road upgrade. The road upgrade will be the main contributor to the cumulative effect
- Kalembe (KP122) and Kyenda (125.5) caused by the EACOP project and the transmission line extension. EACOP will be the main contributor to the cumulative effect
- Nabigasa (KP283), Kabugimbi (KP282), Bigada (KP281.5) and Kabonera (KP284.5) caused by the EACOP project and the ICT infrastructure installation. Due to lack of data on the ICT project, the contribution of EACOP to the overall cumulative effect could not be identified.

As described for the associated facilities, the project will consider double livelihood resettlement into its resettlement plan to manage the cumulative impact with third party developments.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Increased Traffic Increasing the Spread of Animal Diseases

Vehicles for the EACOP project and the third-party developments travelling through the same districts over similar timeframes, where cattle is present could potentially increase the spread of animal diseases.

Due to lack of sufficient data on routes used by the third-party developments and movement of herds at the time of writing, a more detailed analysis of the affected PACs could not be provided.

8.13.6.3 Cumulative Transboundary Impacts

There are no cumulative transboundary impacts on land-based livelihood.

8.14 River and Lake-Based Livelihoods

This section describes potential impacts on river and lake-based livelihoods during the construction, commissioning and operation of the EACOP project and associated mitigation measure to be adopted.

8.14.1 Key Sensitivities and Considerations

The river and lake-based livelihoods baseline conditions are described in Section 6.4.3.9, as well as:

- river and lake-based livelihoods key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the river and lake-based livelihoods impact assessment.

Sensitivity is ranked as very high for:

- lake fisherfolk who fish full time and are dependent on fishing as a sole livelihood and subsistence activity
- women dependent on lakeshore fishing, who have no alternative means of livelihood and are dependent on fishing from lakeshores for food security and income generation
- landless fisherfolk who fish on rivers, who have limited alternative income generating opportunities other than freshwater fishing
- employees of aquaculture enterprises, who are often landless and exclusively dependent on their jobs.

Sensitivity is ranked as moderate for:

- lake fisherfolk who fish part time and women engaged in fish processing and marketing as part of a multiple livelihood strategy.

Key considerations are:

- lake fishing and aquaculture are small-scale subsistence activities
- those whose livelihoods are dependent on fishing are poor, lack access to credit and hence their resilience is low
- there is pressure on the fisheries sector; increasing crop failures, caused by drought or floods, are forcing crop farmers to look for alternative income sources
- young people are becoming more attracted to fishing activities as the size of farming plots for the younger generations is diminishing, rendering crop farming less profitable
- human rights to access to food and an adequate standard of living for communities.

Section A11.4.7 in Appendix A11 identifies ecosystem services associated with river and lake-based livelihoods in the AOI. The following ecosystem services have been considered:

Provisioning services:

- income from selling catch and fishing equipment
- food to supplement diets
- products for fish processing activities.

Cultural services:

- fishing has been an important activity for generations and is a major part of the PACs' way of life, particularly for the lake fisherfolk.

The main human right that is relevant to river and lake-based livelihoods is the right to an adequate standard of living. International standards for responsible business

also provide that individuals should receive adequate compensation when deprived of their means of livelihood. Adequate compensation requires that displaced persons are provided with compensation for loss of assets at full replacement cost and other assistance to help them improve or at least restore their standards of living or livelihoods (see Section 4).

8.14.2 Potential Project Impacts

8.14.2.1 Construction

Generic Impacts

Restriction of Access to Fisheries

Fishing in lakes, rivers and ponds by PACs is mostly a small-scale subsistence activity. Due to the lack of formal employment opportunities and pressure on land, lake fishing is increasingly undertaken as a full-time occupation in certain PACs around lakes. Others combine lake fishing with land-based livelihood activities such as crop farming and livestock rearing. Increasing dependence on lake fishing for income generation and food security is, however, contributing to a decline in fish stocks.

River fishing is mainly a part time activity. However, landless people or those with plots of land that are too small to be economically viable and support the household are particularly reliant on fishing.

Pond and dam aquaculture is mainly a small-scale part time activity, often undertaken as part of a government scheme and executed alongside farming.

The fisheries sector also provides livelihoods for those engaged in the supply chain, which includes small-scale and industrial fish processing, fish trading, boat-building and trading in fishing equipment.

Impact: Temporary loss of access to fishing grounds (rivers, lakes, dams and ponds) due to temporary road closures and access restrictions across the RoW

This may lead to direct and indirect impacts.

Temporary loss of access to fishing grounds, due to road closure and access restrictions, could impact the food security and cash income of fisherfolk and their households. Those who rely on fishing as a full-time occupation will be particularly vulnerable (usually the landless), as they have no other means of generating an income. Those who rely on aquaculture and the fisheries supply chain as their main livelihood will also be vulnerable (usually the landless) as they have no other income or means of obtaining food security.

The impacts will be short-term and will affect some households within the PACs. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Resettlement

Land acquired permanently for the project may lead to the loss of an aquaculture pond or may require physical resettlement of some households, leading to a loss of access to their pond.

Impact: Permanent loss of access to ponds used for aquaculture due to project land acquisition

This may lead to direct and indirect impacts.

Permanent loss of access to ponds used for aquaculture may impact on the food security and cash incomes of those involved in aquaculture. It may also impact on their access to credit, as ponds may be used for collateral.

The impacts will be very long-term and will affect some households within the PACs. Owing to their localised extent, before mitigation the impacts are considered not significant.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs. The potential reduction in the availability of potable water in PACs due to PIIM is described in Section 8.18. The following specific impact is also applicable to these PACs:

Project Induced In-Migration (PIIM)

Impact: Reduction in local fish stocks due to PIIM

This may lead to direct and indirect impacts.

The potential PIIM of economic migrants to PACs surrounding the MCPYs may lead to a reduction in local fish stocks due to increased fishing activities in local rivers and streams. This may lead to a reduction in food security among PAC households reliant on these watercourses for subsistence.

The impacts will be short-term and will affect some households within the PACs. Owing to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Location: RoW: PACs Close to Pipeline River Crossings

During the construction period, the pipeline will cross the following rivers:

- River Kafu and wetland area (KP36.5)
- Nabakazi River and wetland area (KP114 and KP147.4)
- Katonga River and wetland area (KP165)
- Kibale River and wetland area (KP274).

The potential generic impacts are applicable to the 21 PACs close to pipeline river crossings. The following specific impact is also applicable to these PACs:

Impeded Flow of River or Channel

Impact: Reduction in artisanal fish catches due to changes in water flows and increased levels of sediment during open-cut crossing construction

This may lead to direct and indirect impacts.

Open-cut crossing construction is typically completed over a short period. As a proportion of the total and average movement of sediment in these rivers, the amount of sediment mobilised by construction is likely to be small and short-term. Nevertheless, a temporary increase in levels of suspended sediment may lead to a temporary reduction in fish catch. This may reduce a household's food security and cash income.

The impacts will be short-term and will affect some households within the PACs. The landless with no alternative means of income will be most vulnerable. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations.

8.14.2.2 Operation

Generic Impacts

There are no generic impacts during pipeline and AGI operation.

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation.

8.14.3 Mitigation Measures

This section describes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect river and lake-based livelihoods.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.14.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to river and lake-based livelihoods such as minimising impacts on water bodies and water points/sources. The selected pipeline route was chosen partly because it had the lowest number of constraints of the routing options available.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.14.3.2 Construction**Generic Mitigation Measures****Restriction of Access to Fisheries**

Impact: Temporary loss of access to fishing grounds (rivers, lakes, dams and ponds) due to temporary road closures and access restrictions across the RoW

The resettlement action plan and stakeholder engagement plan will include measures to manage access to fisheries.

A resettlement strategy has been developed to outline procedures related to loss of assets and livelihood restoration. A resettlement action plan or livelihood restoration plan will describe the procedures related to compensation for loss of assets as well as livelihood restoration strategies.

The project will engage and consult with internal and external stakeholders to keep them informed about progress with the project, understand and respond to their concerns and report to them on the project's environmental and social performance.

The project will implement a grievance procedure to provide opportunities for PACs to express grievances and a campaign focused on providing realistic community expectations about livelihood options and employment opportunities to avoid livelihood decisions based on incorrect information.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact is not significant.

Resettlement

Impact: Permanent loss of access to ponds used for aquaculture due to project land acquisition

The resettlement action plan, the stakeholder engagement plan and the monitoring and reporting plan will include measures that will control this impact.

Resettlement action plan procedures will guide compensation for loss of assets and livelihood restoration strategies, and additional measures will be developed where necessary to ensure livelihoods are restored as a minimum to pre-project levels.

The stakeholder engagement plan will identify how to engage and consult with stakeholders to keep them informed on project activities and understand and respond to their concerns. A grievance procedure will provide opportunity to stakeholders to express grievances about project activities.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and duration from very long-term to short-term. The residual impact is not significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are applicable to the 20 PACs near the four MCPYs. The following additional specific mitigation measure is recommended for these PACs:

Project Induced In-Migration (PIIM)

Impact: Reduction in local fish stocks due to PIIM

A PIIM management plan will be developed and implemented with the aim of reducing the number of, and impacts associated with people attracted by job opportunities arriving into PACs.

Application of this mitigation measure will reduce the magnitude of impact from medium to small and the residual impact is not significant.

Location: RoW: PACs Close to Pipeline River Crossings

The generic mitigation measures are applicable to the 21 PACs close to pipeline river crossings. The additional mitigation measures recommended for these PACs are as follows:

Impeded Flow of River or Channel

Impact: Reduction in artisanal fish catches due to changes in water flows and increased levels of sediment during open-cut crossing construction

The pollution prevention plan and reinstatement plan will include mitigations that will manage impacts to PACs close to pipeline river crossings.

Location-specific method statements will be produced for watercourse crossing construction that will incorporate erosion control; sediment control, maintaining environmental base flows downstream of crossings, reinstatement, spill response and the notification of fisherfolk.

Application of these measures will reduce the magnitude of impact from large to small and the residual impact is not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic mitigation measures are also applicable to the eight PACs near the two pumping stations.

8.14.3.3 Operation

Generic Mitigation Measures

As there are no predicted generic impacts during pipeline and AGI operation, no mitigation measures are required.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts during pipeline and AGI operation, no mitigation measures are required.

8.14.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on river and lake-based livelihoods after mitigation measures have been implemented.

Table 8.14-1 summarises the potential generic river and lake-based livelihoods impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation.

Table 8.14-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on river and lake-based livelihoods will be not significant.

8.14.4.1 Ecosystem Services

Section A11.4.7 in Appendix A11 identifies ecosystem services associated with river and lake-based livelihoods in the AOI. The following ecosystem services have been assessed in Section 8.14.2 and Section 8.14.3:

Provisioning services:

- income from selling catch and fishing equipment
- food to supplement diets
- products for fish processing activities.

Cultural services:

- fishing has been an important activity for generations and is a major part of the PACs' way of life, particularly for the lake fisherfolk.

With the implementation of the planned mitigation measures, the residual impact on the above services will be not significant.

Table 8.14-1 River and Lake-Based Livelihoods – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Restriction of Access to Fisheries	Temporary loss of access to fishing grounds (rivers, lakes, dams and ponds) due to temporary road closures and access restrictions across the RoW	C	-	Resettlement Action Plan Stakeholder Engagement Plan	2	2	1	4	9
Resettlement	Permanent loss of access to ponds used for aquaculture due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Monitoring and Reporting Plan	4	2	1	5	12

Table 8.14-2 River and Lake-Based Livelihoods – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYS	PIIM	Reduction in local fish stocks due to PIIM	C	Y	Project-Induced In-Migration Management Plan	4	2	1	3	10
PACs close to pipeline river crossings	Impeded Flow of River or Channel	Reduction in artisanal fish catches due to changes in water flows and increased levels of sediment during open-cut crossing construction	C	-	Pollution Prevention Plan Reinstatement Plan	4	2	1	2	9

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.14.5 Transboundary Project Impacts

No transboundary project impacts have been identified.

8.14.6 Cumulative Impacts

EACOP's contribution to cumulative impacts on the river and lake-based livelihoods VEC is negligible and no further mitigation measures other than those described in Section 8.14.3 are considered necessary.

8.14.6.1 Cumulative Transboundary Impacts

There are no cumulative transboundary impacts on river and lake-based livelihoods.

8.15 Land and Property

This section describes potential impacts on land and property during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.15.1 Key Sensitivities and Considerations

The land and property baseline conditions are described in Section 6.4.3.10, as well as:

- land and property key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the land and property impact assessment.

Sensitivity in the land and property AOI is ranked as very high for female headed households, who are particularly vulnerable due to long standing discrimination that excludes women from owning, inheriting and controlling land. Households and individuals who have been previously displaced and resettled, as a result of other developments in the AOI, are also deemed very highly sensitive.

Landholders without title deeds are considered highly sensitive VECs; without title deeds, landholders will be more vulnerable in terms of rights for compensation. Youths are potentially highly sensitive VECs as a result of having limited access to land outside their customary rights.

Sensitivity is ranked as moderate for livestock owners practicing localised nomadism; without access to land or water, livestock quality and quantity will be adversely affected.

Key considerations are:

- the increasing scarcity of land because of a growing population
- the vulnerability of the majority of landowners due to lack of formal title deeds
- women being disadvantaged in terms of access to land. Compensation for loss of land will mostly be paid to the head of household (men) without spousal consent, leaving women vulnerable in terms of access to that compensation
- the existence of numerous land conflicts exacerbated by shortage of land

- the lack of land management plans which impact on the distribution of land
- the existence of vulnerable groups in terms of land acquisition, such as illegal users of the land, including hunters and natural resource users (see Section 8.13)
- an increase in “land grabbing” schemes used to obtain land unlawfully or under false pretexts, high amounts of land speculation and reports of speculators extorting land from people creates fear and insecurity.

The ecosystem services associated with land have been considered in land-based livelihoods (see Section 8.13).

The key human rights relevant to land and property are the right to own property and the right to an adequate standard of living. Women’s rights and children’s rights should also be considered here as they are identified to be particularly vulnerable groups. International standards for responsible business also provide that individuals should receive adequate compensation when deprived of their land. Adequate compensation requires that displaced persons are provided with compensation for loss of assets at full replacement cost and other assistance to help them improve or at least restore their standards of living or livelihoods (see Section 4).

Resettlement

This section describes the land acquisition and compensation process that will be implemented by the project.

The project will require permanent land acquisition of approximately 300 ha and a Resettlement Strategy (RS) has been developed. The purpose of the RS is to define the overarching principles for land access, compensation and resettlement planning, and is the foundation for the development of Resettlement Action Plans (RAPs) or Livelihood Restoration Plans (LRPs). The Ugandan Government, in coordination with the PPT, will acquire the permanent right of occupancy for project-required land. The Government of Uganda will lease the land to the project.

Land access and resettlement planning for the project will be undertaken in compliance with Ugandan legal and regulatory requirements and international good practice (IGP) as reflected in the International Finance Corporation (IFC) Performance Standard (PS) 5 on Land Acquisition and Involuntary Resettlement. In instances where a given project comprises subprojects or multiple components that cannot be identified before project approval, or that may be implemented sequentially over an extended period, PS5 allows for the prior development of a RS outlining the general principles for resettlement planning.

Project Land

Table 8.15-1 indicates the land required for each project component.

Table 8.15-1 Summary of Project Land Requirements

Project Component	Estimated Affected Area
Construction Facilities	
Four MCPYs	Approximately 74 ha
Construction and Operation	
New access roads to construction facilities, pipeline RoW and AGIs	Approximately 74 ha
Operational Facilities	
Export Pipeline	
30-m-wide RoW	30-m corridor: 888 ha
Additional temporary construction workspace along RoW (estimate)	333 ha
AGIs	
Two PS (includes buffer and construction staging area) (15 ha each with 1 ha in pipeline RoW)	2 x 15 ha outside 30-m RoW = 30 ha
Total project land requirement ¹⁸ (construction and operation)	Approximately 1330 ha

The following land will also be acquired and leased by the project:

- “orphaned land” where the pipeline corridor dissects a field, leaving small portions which are no longer viable to cultivate/use and classed as “uneconomic”.
- temporary land requirements by contractors (e.g., for construction access, establishing of fly camps, storage of equipment and hydrotest water, access to land to undertake site surveys and related activities).

Approximately 72% of land that will be affected by the project is under cultivation (includes plantation areas and pastures).

Legislative and Regulatory Requirements and International Standards

The primary project obligation is to meet national legislative requirements for land acquisition, compensation and resettlement. In addition, international financing standards enshrined in the Equator Principles (EPs) III and the IFC PSs will apply to meet lender requirements. Based on these requirements, the RS has conducted a gap analysis to ensure both national and lender requirements are met. The RS ensures that, where a discrepancy exists between lender requirements (EPs and IFC PSs) and national legislation, the more stringent of the two will be used and/or applied.

Eligibility and Entitlements/Compensation Framework

The RS considers eligibility for compensation and resettlement entitlements. Eligibility is defined as entitlement to compensation and assistance granted to

¹⁸ This excludes “orphaned land” where the pipeline corridor dissects a field, leaving small portions which are no longer viable to cultivate/use and classed as “uneconomic”.

persons, groups of persons, families, or institutions due to displacement resulting from land acquisition, the revocation of rights, and/or the compulsory acquisition of property as a direct result of the project.

Only persons occupying or using an area in the project footprint before the cut-off date (the first date of valuation in a given area) are eligible for compensation for loss of land rights and assets established before this cut-off date. Only these assets will be recorded during the valuation process. Should affected persons not be present during the valuation process, such persons will be requested to provide proof of their presence in the project area during the valuation period, and/or proof of ownership of assets in the project area during that period, to be eligible for compensation.

Assets affected by the project will be valued to determine the compensation due to their owners and/or users. The valuation methodology to be used is prescribed in various acts and regulations which explicitly provide guidance on valuation practices. Different valuation methods are proposed for the various eligibility categories identified, particularly in relation to land, structures, crops and trees and businesses. The selection of the specific valuation method has been guided by the requirement of compliance with Ugandan legislation. Further to the valuation methodologies, options and packages are proposed by the project to ensure that IFC PS5 criteria are fully addressed, particularly to “improve, or restore, the livelihoods and standards of living of displaced persons”.

Entitlements associated with impacts and those impacted are set out in the RS in an eligibility and entitlements framework.

Resettlement Action Plans

Based on the RS the project’s resettlement process will culminate in the development of a suite of RAPs and/or LRPs. The geographical area to be covered by each is determined partly by administrative boundaries, and partly by the timing of required land access for various project components. The RAPs/LRPs proposed thus comprise the following:

- RAP/LRP for MCPYs that need to be prioritised in terms of early land access requirements; and
- RAPs/LRPs for the pipeline RoW and AGIs in each of the districts traversed by the AOI.

8.15.2 Potential Project Impacts

8.15.2.1 Construction

Generic Impacts

Resettlement

Pipeline route selection has been undertaken to minimise disruption to land and property. Nevertheless, on a project of this scale, some physical displacement (loss of shelter or relocation of households) and economic displacement (loss of, or interruption of access to, land or other livelihood resources) for communities is unavoidable.

The estimated project land requirements are summarised above in Table 8.15-1. The number of PAPs, with regards to temporary and permanent resettlement related impacts, is estimated at 300–400 households. These households will be physically displaced, permanently if located within the RoW, MCPY or AGI land requirements. An estimated 1700–3000 households will be economically displaced.

Uganda has four forms of land tenure¹⁹; customary, freehold, mailo and leasehold (see Section A11.4.8.1 in Appendix A11). The majority of households hold their land under customary tenure (approximately 60%), most of which is found in the northern, western and southern parts of the country. Land under this tenure system is communally, jointly or individually owned, often without a supporting title to acknowledge customary ownership.

Even though the laws of Uganda recognise customary tenure as a form of ownership the lack of formal title deeds leaves landowners vulnerable in terms of rights to compensation for loss of land. A lack of formal written documentation also has the potential to exacerbate disputes and generate fraudulent activity.

Availability of land for farming and livestock grazing is limited due to population growth (natural increase and in-migration) and changing land use patterns. In the AOI, the younger generations have limited access to family land due to inheritance protocols making inherited parcels of land too small to make a living. Land value awareness has grown significantly recently and is increasing land registration and sales. As a consequence, less land is being inherited.

Village land is increasingly being purchased by outsiders with greater purchasing power and there has been an increase in the number of fraudulent cases. The sale of land for private use is also impacting on availability of village communal land, which is used for grazing.

Despite policy and legal safeguards formalising the rights of women, children and disabled people's access to land, these groups, in reality, have often inferior land rights, as traditions and customs protect men's control over land. As the value of land increases, male dominance over land-related decisions is likely to increase (see Section A11.4.8.1 in Appendix A11).

From a human rights perspective, there is an additional potential impact if a woman cannot prove that she is married to her partner. Furthermore, numerous households include a complex family situation where multiple women can be partners to the same man. In these cases, women's rights and children's rights can be negatively affected if compensation is not granted to the persons who are entitled to receive it.

Impact: Permanent loss of private land due to project land acquisition

This will lead to direct and indirect impacts.

The project will require approximately 300 ha of land. Those affected by project land acquisition will lose an important asset as it sustains land-based livelihoods such as grazing, crop growing, mining and natural resource use. The impacts associated with loss of land-based livelihoods are described in Section 8.13.

¹⁹ Article 237(3) Constitution of the Republic of Uganda (1995) and Section 2 of the Land Act, Cap 227, Laws of Uganda.

In addition to sustaining livelihoods, land ownership is important as collateral to access loans. One of the major constraints for agricultural development is limited access to credit for farmers. The purchase of agricultural inputs including seeds, fertilisers, pest control supplies and mechanised equipment, depends generally on the availability of credit, which can only be obtained with collateral. Loss of land due to project land acquisition will increase constraints on accessing credit among PAPs²⁰.

Those most affected by permanent loss of rights of occupancy to land are households for which the majority, if not all, of their land is impacted by the project, and households without alternative assets or sources of income. The latter often include female-headed households, the disabled, infirm and elderly individuals.

The impacts will be very long-term and will affect some households within the PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Land speculation by third parties

This may lead to direct and indirect impacts.

Speculation is a common consequence of public disclosure of the need for project driven land acquisition and is often initiated by resourceful individuals with access to privileged information. Acting on such information, speculators may extort land from ignorant or needy landowners (usually parcels held under customary tenure), often at below-market prices and often without consent from family or clan members. Land speculation could be exacerbated by the low rate of land registration in the AOI and may lead to inflation of land prices and commercialisation of land. Speculation may also drive a change in land tenure patterns, particularly a transition from customary ownership to freehold or leasehold tenure systems, which may further reduce access to land for poorer members of PACs.

Due to the large number of unregistered land parcels in the AOI, land is often transferred and registered without consent or due process by individuals who do not share interests in the targeted land (third parties) and who have access to the land administrative system. Legitimate landowners (with customary tenure rights) are thus deprived of their land rights, often without their knowledge. Information from the project indicates that such land disputes may cause significant delays in land acquisition planning and lead to:

- forced eviction of current landowners by outside purchasers (direct or in-direct pressure)
- fraudulent purchase of land
- increased land prices.

The impacts will be long-term and will affect some individuals within the PACs. However, due to their localised extent, before mitigation the impacts are considered not significant.

Impact: Land and property speculation by landowners

²⁰ PAPs are parties affected by loss of assets.

This may lead to direct and indirect impacts.

Expectations of benefits from the project are high. To enhance benefits, potentially affected landowners may participate in speculation through the construction of new structures and/or the division of their own land to allow relatives or new tenants to construct new structures on the land.

This type of speculation may require short-term loans to purchase tenancies and construction materials. A prolonged or delayed compensation process may place those with short term loans in considerable long-term debt if short-term loans are not repaid on time. This situation will be further compounded if interest rates are high.

The impacts will be short-term and will affect some individuals within the PACs. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Impact: New disputes and exacerbation of pre-existing disputes and conflict around land and property

This may lead to direct and indirect impacts.

Conflicts over land are common in the AOI and constitute the highest percentage of both formal and informal disputes reported. Baseline studies revealed that there are currently ongoing land disputes in nearly all the PACs. Within the PACs, conflicts around land predominately relate to:

- crop farmers and pastoralists encroaching on each other's land. The lack of implementation of land management plans contributes to this problem
- land being sold to more than one person, and often being sold without formal title deeds, leaving buyers vulnerable
- family land being sold without the consent of the entire family
- disputes over exact boundaries between plots and even villages.

Land disputes are currently handled by the judiciary system through civil magistrate courts. The overall number of disputes involving land is reportedly increasing.

The acquisition of land and property for the project may cause new disputes and conflicts including:

- intra-family disputes and conflict linked to the sale of family owned land for project facilities (without consent of the entire family)
- disputes and conflicts over land boundaries
- disputes and conflicts over fraudulent land and property purchases related to land being acquired for the project.

Communal land is important for grazing and natural resource collection, in particular for those without or with limited access to private land and those with large herds. The decreasing availability of communal land is leading to competition between those using it. Added to which, the PIIM of opportunistic job seekers may add to existing pressure on land, in particular natural resources. The acquisition of land and property for the project may exacerbate this competition and lead to conflict.

Female-headed households may be more vulnerable to disputes and conflict around land and property as their access to land is generally more restricted (see Section A11.4.8 in Appendix A11).

The impacts will be long-term and will affect some individuals within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Impact: Permanent loss of physical structures due to project land acquisition

This may lead to direct and indirect impacts.

Some PAPs will permanently lose their dwelling, which is an asset and provides shelter. The exact number of PAPs affected is yet to be determined. However, GIS analysis identified 250 structures (not necessarily houses) within the 30m corridor. Within the AGI footprints, an estimated number of 12 structures (not necessarily houses) and 33 plots of agricultural land were identified. Within the footprint of the MCPYs, an estimated number of 15 structures (not necessarily houses) and 28 plots of agricultural land were identified.

The impacts will be very long-term and will affect some households within the PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Permanent loss of local enterprises due to project land acquisition

This may lead to direct and indirect impacts.

Baseline data shows that PACs generally boast some shops that sell daily necessities. These are relied upon by entire PACs, particularly in remote areas, which are not well connected to urban centres.

Land acquisition by the project may lead to the loss of businesses, which are an asset and a source of income for business owners and their employees.

The impacts will be very long-term and will affect some individuals within the PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Loss of community infrastructure (schools, clinics, community halls) due to project land acquisition

This may lead to direct and indirect impacts.

The baseline indicates that community infrastructure is generally poor, with a lack of sufficient schools and clinics to meet local needs. Within the AOI, larger urban settlements are densely populated. The in-migration of working-age people in search of employment opportunities has placed additional pressure on infrastructure (in terms of health, education, water and electricity provision, culture and recreation). Land acquisition by the project may lead to the loss of community structures, which may have a further impact on education, health services and community life.

The impacts will be long-term and will affect entire PACs. Those most likely to be affected are individuals who rely heavily on access to community infrastructure (e.g., children, the elderly, disabled and infirm). Individuals living in dense urban

settlements will be particularly vulnerable given the scale of competition for services and infrastructure. Due to their small magnitude and small extent, before mitigation the impacts are considered not significant.

Impact: Loss of access to informal support networks and social services after physical displacement due to project land acquisition

This may lead to indirect impacts.

Due to a dearth of formal safety networks and services, PAPs are dependent on local social networks and community support. Women in particular rely on savings societies and other support groups.

The resettlement of PAPs may impact upon their informal social networks, which may negatively impact on their quality of life and ability to deal with problems. The most vulnerable PAPs are female-headed households, children, the elderly and infirm. Resettlement may also lead to loss of access to social services for these individuals.

The impacts will be medium-term and will affect some individuals within the PACs. Owing to their small magnitude and localised extent, before mitigation the impacts are considered not significant.

Vibration

There are two main house structures observed in the PACs:

- traditional structures made using wooden joists and uprights, with thatched roofing and adobe walls
- houses, locally called 'improved houses', built with brick walls and zinc or tiled roofing.

Construction phase activities that may cause vibration include:

- access road construction and upgrades
- vehicles transporting construction materials and the labour workforce along access roads
- site clearance, levelling and infrastructure construction and installation
- RoW clearing, grading, trenching and backfilling
- pile installation for AGI construction.

Impact: The generation of vibrations during construction works

This may lead to direct and indirect impacts.

The generation of vibrations during construction may cause physical damage to houses and other structures. Households lacking the means to repair their structures are most vulnerable to this impact. Vulnerable groups for this impact include females, the elderly and widows.

The impacts will be medium-term and will affect some individuals within the PACs. Owing to their localised extent, before mitigation the impacts are considered not significant.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs. However, the following impacts may be more pronounced in these PACs because a larger area of land will be acquired, and potential PIIM into the area from job seekers may place additional pressure on the land.

Resettlement

Impact: Permanent loss of private land due to project land acquisition

This may lead to direct and indirect impacts.

The impacts will be very long-term and will affect entire PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Land speculation by third parties

This may lead to direct and indirect impacts.

The impacts will be long-term and will affect some individuals within the PACs. However, due to their localised extent, before mitigation the impacts are considered not significant.

Impact: Land and property speculation by landowners

This may lead to direct and indirect impacts.

The impacts will be short-term and will affect some individuals within the PACs. Owing to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Impact: New disputes and exacerbation of pre-existing disputes and conflict

This may lead to direct and indirect impacts.

The impacts will be long-term and will affect some individuals within the PACs. Owing to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Permanent loss of physical structures due to project land acquisition

This may lead to direct and indirect impacts.

The impacts will be very long-term and will affect some individuals within the PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Permanent loss of local enterprises due to project land acquisition

This may lead to direct and indirect impacts.

The impacts will be very long-term and will affect some individuals within the PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Loss of access to informal support networks and social services after physical displacement due to project land acquisition

This may lead to indirect impacts.

The impacts will be medium-term and will affect some individuals within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Location: RoW: KP15 to KP22.5, KP75 to KP82.5, KP90 to KP97.5 and KP127.5 to KP135

The potential generic impacts are applicable to the 15 PACs located between these kilometre points. However, the following impacts may be more pronounced in these PACs:

Resettlement

Impact: Permanent loss of private land
and

Impact: Permanent loss of physical structures

These may lead to direct and indirect impacts.

Between these stretches of the pipeline route, there is a higher density of dwellings (14 or more) within the RoW.

The impacts will be very long-term and will affect some individuals within the PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location: RoW: PACs Between KP0.5 and KP15 (Hoima district) and Sembabule Market Zone (KP190)

The potential generic impacts are applicable to the three PACs in Hoima district (from KP0.5 to KP15) and Sembabule Market Zone (KP190). However, the following impacts may be more pronounced in these PACs:

Resettlement

Impact: Land speculation by third parties
and

Impact: New disputes and exacerbation of pre-existing disputes and conflict

These may lead to direct and indirect impacts.

Stakeholder engagement processes and baseline studies revealed that there are particularly high expectations of the potential benefits to be secured through the resettlement process in these PACs, with instances of associated violence.

Speculators reportedly extort land from land holders in these locations, who are desperate for cash, at below-market prices. Speculators are also reported to claim

land to be theirs through the use of false title deeds, resulting in forced eviction of land holders.

The impacts will be long-term and will affect some individuals within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations.

8.15.2.2 Operation

Generic Impacts

There are no generic impacts during pipeline and AGI operation. During the operations phase, no additional land will be required.

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation. Land leased for the MCPYs will be returned to the Ugandan government. There is the potential that the permanent structures in the MCPYs may be left in place after construction, which may lead to benefits for nearby communities (described in Section 8.19).

8.15.3 Mitigation Measures

This section includes the impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect land and property.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.15.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to land and property such as minimising impacts on social and community infrastructure and structures within 50m of the RoW centreline. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.15.3.2 Construction**8.15.3.3 Generic Mitigation Measures****Resettlement**

Impact: Permanent loss of private land due to project land acquisition

Impact: Land speculation by third parties

Impact: Land and property speculation by landowners

Impact: New disputes and exacerbation of pre-existing disputes and conflict around land and property

Impact: Permanent loss of physical structures due to project land acquisition

Impact: Permanent loss of local enterprises due to project land acquisition

Impact: Loss of community infrastructure (schools, clinics, community halls) due to project land acquisition

Impact: Loss of access to informal support networks and social services after physical displacement due to project land acquisition

The resettlement action plan, stakeholder engagement plan, community health, safety and security plan and the monitoring and reporting plan will contain measures to manage land and property related impacts.

A resettlement action plan will include the procedures related to compensation for loss of assets and livelihood restoration strategies and is backed-up by the grievance procedure that will be communicated to all PACs allowing for the resolution of potential grievances.

The Project will deal directly with those having customary rights of occupancy to land; with the compensation process witnessed by appropriate third party to minimise the risk of interference by intermediaries.

The resettlement action plan will ensure PACs will be sensitised to recent land speculation and instances of associated violence and informed of actions that can be taken. Spouses will be consulted and present during the land surveys, entitlement briefings and compensation agreements and both spouses will sign the compensation agreements.

Post-resettlement monitoring of livelihood restoration measures will be implemented, and the project will engage with authorities (security providers in particular) to ensure that in cases where compulsory acquisition is unavoidable no use of force is used to remove people.

The stakeholder engagement plan will identify how the project will engage and consult with stakeholders to keep them informed about project activities, understand and respond to their concerns and report to them.

For the impact permanent loss of private land due to project land acquisition, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from very long-term to short-term. The residual impact is not significant.

For the impact land speculation from third parties, application of these mitigation measures will reduce the magnitude of impact from large to medium and the residual impact is not significant.

For the impact land and property speculation by land owners, application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact is not significant.

For the impact new disputes and exacerbation of pre-existing disputes and conflict around land and property, application of these mitigation measures will reduce the magnitude from large to medium and the residual impact is not significant.

For the impact permanent loss of physical structures due to project land acquisition, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from very long-term to short-term. The residual impact is not significant.

For the impact loss of community infrastructure (schools, clinics, community halls) due to project land acquisition, application of these mitigation measures will reduce the magnitude from small to negligible and the duration from long-term to short-term. The residual impact is not significant.

For the impact loss of access to informal support networks and social services after physical displacement due to project land acquisition, application of these mitigation measures will reduce the magnitude from small to negligible and the residual impact is not significant.

Vibration

Impact: The generation of vibrations during construction works

The infrastructure and utilities management plan will include measures that control impacts resulting from construction-related vibration.

A pre-construction entry survey area will be conducted for infrastructure that may be exposed to construction-related vibration. A post-construction exit survey will be conducted to assess the condition of infrastructure and any actions, such as repairs, arising from the exit survey will be closed out on a timely basis to allow a prompt return to the relevant authority, PAC or landowner.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are also applicable to the 20 PACs near the four MCPYs.

Location: RoW: KP15 to KP22.5, KP75 to KP82.5, KP90 to KP97.5 and KP127.5 to KP135

The generic mitigation measures are also applicable to the 15 PACs between these kilometre points.

Location: RoW: PACs Between KP0.5 and KP15 (Hoima District) and Sembabule Market Zone (KP190)

The generic mitigation measures are also applicable to the three PACs in Hoima district (from KP0.5 to KP15) and Sembabule Market Zone (KP190).

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic mitigation measures are also applicable to the eight PACs near the two pumping stations.

8.15.3.4 Operation**Generic Mitigation Measures**

As there are no predicted generic impacts during pipeline and AGI operation, no mitigation measures are required.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts during pipeline and AGI operation, no mitigation measures are required.

8.15.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on land and property after mitigation measures have been implemented.

Table 8.15-2 summarises the potential generic land and property impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.15-3 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on land and property are considered not significant.

8.15.4.1 Ecosystem Services

Section A11.4.8 in Appendix A11 identifies that land and property does not provide ecosystem services. It does, however, rely on ecosystem services which are described in land-based livelihoods (see Section 8.13).

Table 8.15-2 Land and Property – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Resettlement	Permanent loss of private land due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
Resettlement	Land speculation by third parties	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	6	2	1	5	14
Resettlement	Land and property speculation by landowners	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	4	11
Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	6	4	1	5	16

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.15-2 Land and Property – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Resettlement	Permanent loss of physical structures due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
Resettlement	Permanent loss of local enterprises due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
Resettlement	Loss of community infrastructure (schools, clinics, community halls) due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	2	2	2	4	10
Resettlement	Loss of access to informal support networks and social services after physical displacement due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	2	3	1	4	10
Vibration	The generation of vibrations during construction works	C	Y	Infrastructure and Utilities Management Plan	4	3	1	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.15-3 Land and Property – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Resettlement	Permanent loss of private land due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the four MCPYs	Resettlement	Land speculation by third parties	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the four MCPYs	Resettlement	Land and property speculation by landowners	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	4	11
PACs near the four MCPYs	Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	6	4	1	5	16

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.15-3 Land and Property – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Resettlement	Permanent loss of physical structures due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the four MCPYs	Resettlement	Permanent loss of local enterprises due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs near the four MCPYs	Resettlement	Loss of access to informal support networks and social services after physical displacement due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	3	1	4	12
PACs between KP15 to KP22.5, KP75 to KP82.5, KP90 to KP97.5, KP127.5 to KP135	Resettlement	Permanent loss of private land due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.15-3 Land and Property – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs between KP15 to KP22.5, KP75 to KP82.5, KP90 to KP97.5, KP127.5 to KP135	Resettlement	Permanent loss of physical structures due to project land acquisition	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs between KP0.5 and KP15 and Sembabule Market Zone (KP190)	Resettlement	Land speculation by third parties	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	4	2	1	5	12
PACs between KP0.5 and KP15 and Sembabule Market Zone (KP190)	Resettlement	New disputes and exacerbation of pre-existing disputes and conflict around land and property	C	Y	Resettlement Action Plan Stakeholder Engagement Plan Community Health, Safety and Security Plan Monitoring and Reporting Plan	6	4	1	5	16

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.15.5 Transboundary Project Impacts

No transboundary project impacts have been identified.

8.15.6 Cumulative Impacts

8.15.6.1 Context

Section 6.4.3.10 describes the baseline condition of land and property, the trends and sensitivity to change. Table 8.15-2 and Table 8.15-3 summarise project residual impacts.

In Uganda, access to both private and communal land is becoming increasingly challenging due to population growth (natural increase and in-migration) and changing land use patterns. An added layer of complexity surrounding land and property rights is the absence of formal title deeds, the prevalence of land conflicts, as well as land speculation in areas with proposed developments. These factors are rendering land holders and land users vulnerable in terms of available land and, should their land be impacted, access to replacement land of suitable quality.

Residual project impacts that may contribute to cumulative impacts include:

- land speculation
- exacerbation of existing land disputes and conflicts
- permanent loss of private land due to project land acquisition
- loss of access to informal support networks and social services after physical displacement due to project land acquisition

The associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H. These are:

- associated facilities:
 - o Tilenga Project (AF01)
 - o Kingfisher Oil Project (AF02)
- third-party developments:
 - o transmission line from the Tilenga Project Central Processing Facility (CPF) to Kabaale (UG0A)
 - o Kabaale International Airport (UG04)
 - o transmission lines to Kabaale Airport (UG05)
 - o refinery (UG07)
 - o Hoima-Buloba pipeline (UG08)
 - o Lot 4 R4 Kabaale-Kiziranfumbi road upgrade (UG19)
 - o Buhimba to Kakumiro road upgrade (UG20)
 - o construction camp for Bulima–Kabwoya road (UG21)
 - o Bulima–Kabwoya road upgrade (UG22)
 - o transmission line extension (UG34)
 - o Kyotera- Rakai road upgrade (UG41)
 - o ICT infrastructure installation (UG44).

The preferred condition is for the status of impacted individual or household livelihoods and general standards of living in PACs to be equal to, or better than, before construction.

8.15.6.2 Cumulative Impacts

Associated Facilities

Potential cumulative impacts are predicted based on the premise that the EACOP and the feeder pipeline components of the Tilenga Project and Kingfisher Oil Project have concurrent or consecutive construction phases.

Land Speculation

The EACOP, Tilenga and Kingfisher projects may jointly lead to a rise in third party investors purchasing land with the intention to subsequently secure a financial return on selling land to project developers. As the exact boundaries of land required for the developments are not necessarily known to investors and local communities, the entire subcounty of Buseruka where the pipelines converge at PS1 may be affected.

Land speculation may lead to inflated land prices and a shift in land tenure patterns, which may reduce access to land for poorer community members.

The project will liaise with the Tilenga Project and Kingfisher Oil Project to support the management of potential cumulative impacts relating to speculation, the project will engage with relevant stakeholders (authorities and civil society) to identify patterns of population in-migration, associated consequences and identify appropriate mitigation measures and interventions.

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Exacerbation of Pre-Existing Disputes and Conflict

Consultation for the EACOP project identified a history of disputes over land. The land acquisition and construction activities for the EACOP project and the associated facilities, as well as the potential for PIIM of economic migrants attracted to the area because of the developments increases the potential for aggravation of pre-existing disputes and conflict over land.

The PACs potentially affected by pre-existing disputes and conflict are in Buseruka subcounty and include Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5).

Ongoing stakeholder engagement will support the project in engaging proponents of the associated facilities and relevant government agencies to consider options for management measures to address any exacerbation of conflicts. This may include liaising with the Tilenga Project and Kingfisher Oil Project on their land requirements and collaborating on stakeholder engagement.

With the additional mitigation measure implemented, it is predicted that the preferred condition will be achieved and hence the cumulative residual impact is not considered significant.

Permanent Land Loss

The EACOP project and the feeder pipeline components of the Tilenga Project and Kingfisher Oil Project will undertake permanent resettlement of some households. Permanent loss of land due to land acquisition from the EACOP project may cause double resettlement, where a household is required to relocate by one project and then again as a result of another project. Though exact land requirement details are not available at the time of writing the EACOP project will liaise with the other projects to understand respective resettlement requirements and the avoidance of double resettlement. PACs potentially impacted include Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5). In addition, the project will consider the matter of double livelihood resettlement into its resettlement plan.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Loss of Access to Informal Support Networks and Social Services After Physical Displacement due to Project Land Acquisition

Cumulative impacts on a PAC's land, may cause a shortage of land for resettlement in the same PAC, thereby affecting resettled households in terms of their access to support networks and social services. This may apply to the PACs affected by permanent loss of land cited above.

The project will engage proponents of the associated facilities and appropriate government agencies to consider options for management measures to address the cumulative impacts. This may include liaison with the on their land requirements and collaborating on stakeholder engagement.

With the additional mitigation measure implemented, it is predicted that the preferred condition will be achieved and hence the cumulative residual impact is not considered significant.

Third-Party Developments

The potential cumulative impacts of third party developments are similar to those of the associated facilities. In addition, the third*party developments may cause the following cumulative impacts:

Potential cumulative impacts associated with land and property are predicted where the EACOP project and third-party developments have parallel or consecutive construction schedules and require land acquisition. The third-party developments, and the subcounties/districts that may be impacted are shown in Table 8.15-4.

Table 8.15-4 Cumulative Impacts: Land and Property

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG0A	Transmission line from the Tilenga CPF to Kabaale	0	PS1, approximately 3.5 km from UG0A	Buseruka subcounty, Hoima district	No data available
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district	The airport will be constructed within the 29 km ² area of land already acquired by the government for the Kabaale Industrial Park. The PAPs from Kabaale industrial area that accepted replacement housing were moved to a homestead in Kizirafumbi subcounty. PAPs that took in-kind compensation moved to locations of their choice
UG05	Transmission lines to Kabaale Airport	12	PS1, approximately 3.9 km from UG05 Crosses EACOP at KP12	Buseruka subcounty, Hoima district	The lines will have a 10 m construction corridor with a 5 m permanent right of way.
UG07	Refinery	0	PS1, approximately 0.2 km from UG07	Buseruka subcounty, Hoima district	The refinery will be constructed within the 29 km ² area of land already acquired by the government for the Kabaale Industrial Park. The PAPs from Kabaale industrial area that accepted replacement housing were moved to a homestead in Kizirafumbi subcounty. PAPs that took in-kind compensation moved to locations of their choice

Table 8.15-4 Cumulative Impacts: Land and Property

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG08	Hoima–Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 runs parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Kisiita subcounty, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba, Buseruka, and Kiziramfumbi subcounties, Hoima district	No data available
UG19	Lot 4 R4 Kabaale-Kiziranfumbi road upgrade	0–19	PS1, approximately 3.2km from UG 19	Buseruka and Kiziranfumbi subcounty, Hoima district	The road width will be increased from 4.5 m to a maximum of 12 m. The road will have a maximum RoW of 50 m.
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Kisiita subcounty, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba and Kiziramfumbi subcounties, Hoima district	The proposed road will be constructed within a 30–50-m-wide corridor
UG21	Construction camp for Bulima-Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from pipeline	Kiziranfumbi subcounty, Hoima district	The camp will be constructed on a 1.8-ha area
UG22	Bulima – Kabwoya road upgrade	19	Crosses pipeline at KP19	Kiziranfumbi subcounty, Hoima district	No data available
UG34	Transmission line extension	133	UG34 crosses MCPY2	Kitenga subcounty, Mubende district	The line will have a 10 m RoW

Table 8.15-4 Cumulative Impacts: Land and Property

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted	Land Requirements
UG41	Kyotera-Rakai Road upgrade	258	Crosses pipeline at KP258	Kyotera, Rakai district	The proposed road will be constructed within a 30–50-m-wide corridor
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses EACOP at KP223	Kakuuto subcounty, Kyotera district Kibanda subcounty, Rakai district	No data available

Land Speculation

Land speculation may be caused by the EACOP project and the third-party developments that have yet to acquire land. This may affect the subcounties and districts presented in Table 8.15-4 above.

EACOP is likely to be the main contributor to the cumulative impact of land speculation because it is a major international project, which has had national and international media attention. Land for Kabaale International airport and the refinery has already been purchased by the government, so land speculation will not occur for these sites. The scale and nature of the transmission line and road upgrade projects will make land speculation less profitable and therefore more unlikely. The scale and nature of the Hoima-Buloba pipeline and the ICT infrastructure project means that there is a greater risk of land speculation for these projects.

The project will liaise with the third-party developments to support the management of potential cumulative impacts relating to speculation, the project will engage with relevant stakeholders (authorities and civil society) to identify patterns of population in-migration, associated consequences and identify appropriate mitigation measures and interventions.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Exacerbation of Pre-Existing Disputes and Conflict

The PACs that may be impacted by exacerbation of existing disputes and conflict include:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the construction of the EACOP project and the transmission line from the Tilenga CPF to Kabaale, the Kabaale international airport, the transmission lines to Kabaale airport, the refinery, the Hoima-Buloba pipeline and the R4 Kabaale-Kiziranfumbi road upgrade. The refinery and the Kabaale airport are likely to be the main contributors to the cumulative effect
- Kalembe (KP122) and Kyenda (125.5) caused by the EACOP project and the transmission line extension. EACOP is likely to be the main contributor to the cumulative effect
- Nabigasa (KP283), Kabugimbi (KP282), Bigada (KP281.5) and Kabonera (KP284.5) caused by the EACOP project and the ICT infrastructure. Due to lack of data on the ICT project, the contribution of EACOP to the overall cumulative effect could not be identified.

The project will engage proponents of the third-party developments and relevant government agencies to consider options for management measures to address any exacerbation of conflict. This may include liaising with the third parties on their land requirements and collaborating on stakeholder engagement.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Permanent Land Loss

The EACOP project and the third-party developments will undertake permanent resettlement of some households. Permanent loss of land due to land acquisition

from the EACOP project may cause double resettlement, where a household is required to relocate by one project and then again as a result of another project. Where data was available, land requirement details are presented in Table 8.15-4. PACs potentially impacted include:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the EACOP project and the transmission line from the Tilenga Project CPF to Kabaale, the Kabaale international airport, the transmission lines to Kabaale airport, the refinery, the Hoima-Buloba pipeline and the R4 Kabaale-Kizirafumbi road upgrade. In the case of the transmission line from the Tilenga Project CPF to Kabaale, the transmission lines to Kabaale airport, and the Hoima-Buloba pipeline, the EACOP project has a larger footprint and may involve the resettlement of more households than the other projects. The households that accepted replacement housing in the area allocated for the Kabaale Industrial Park which includes the airport and the refinery have already been relocated to a location in Kizirafumbi Subcounty that would not be affected by the EACOP project. For those households that accepted in-kind compensation, there is the potential that they resettled with the EACOP project footprint and may be required to relocate.
- Katikara (KP41) and Kisenyi (KP40) caused by the EACOP project and the Buhimba to Kakumiro road upgrade

The implementation of the RAP for the EACOP project will consider cumulative effects of projects that have preceded or developed concurrently with the EACOP project and will consider the matter of double resettlement and livelihood restoration in its resettlement plan.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Loss of access to informal support networks and social services after physical displacement due to project land acquisition

Cumulative impacts of third parties on a PAC's land, may cause a shortage of land for resettlement in the same PAC, thereby affecting resettled households in terms of their access to support networks and social services. This may apply to the PACs affected by permanent loss of land in Table 8.15-4 above.

The mitigation measures proposed for the cumulative impact of the associated facility will be applied.

The project will engage proponents of the third-party developments and relevant government agencies to consider options for management measures to address the impact of on access to support networks and social services following displacement. This may include liaising with the third-party developers on their land requirements and collaborating on stakeholder engagement. The project will also participate in the regional cumulative environmental management initiatives mentioned above in the AF section.

With the additional mitigation measures implemented, it is predicted that the preferred condition will be achieved and hence the cumulative residual impact is not considered significant.

8.15.6.3 Cumulative Transboundary Impacts

There are no transboundary cumulative impacts on land and property.

8.16 Workers' Health, Safety and Welfare

This section describes potential impacts on workers' health, safety and welfare during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

There is the potential for traffic to impact workers' health, safety and welfare through project-related road traffic accidents, which are considered in Section 9, Unplanned Events.

8.16.1 Key Sensitivities and Considerations

The workers' health, safety and welfare baseline conditions are described in Section 6.4.3.11, as well as:

- workers' health, safety and welfare key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the workers' health, safety and welfare impact assessment.

Sensitivity in the workers' health, safety and welfare AOI is ranked as very high for the local workforce owing to low levels of occupational health and safety awareness.

Key considerations are:

- unscrupulous recruitment agencies exist in Uganda and potential workers may be asked to pay fees to 'register' their interest in being part of a workforce
- a low level of awareness of health and safety and worker rights in the PACs
- low levels of understanding of a non-discriminatory work culture such as with a mixed gender workforce in the PACs
- human rights of workers with regards to health and safety.

Section A11.4.9.4 in Appendix A11 identifies that workers' health, safety and welfare does not provide ecosystem services.

The main human right that is relevant to this VEC is the right to safe and healthy working conditions. International standards for responsible business require that minimum labour standards are respected by companies and that they use their leverage to ensure that contractors and suppliers also respect labour rights. Another human right applicable to this VEC is the worker's right to security (see Section 4).

8.16.2 Potential Project Impacts

8.16.2.1 Construction

Generic Benefits

Employment

Many companies in Uganda have no previous exposure to basic health and safety standards. Workers active in informal economic sectors typically receive no occupational health and safety (OHS) training and hazards are not identified by their employers. Baseline data revealed a low level of awareness of health and safety and workers' rights in the PACs.

Benefit: An improvement in the health and safety of people employed from disease awareness and reduction programmes

The project will employ PAC members. As part of the project health and safety plan, the local workforce will be trained in safety principles and will be subject to disease awareness and reduction programmes implemented during project employment. Increased knowledge about health and safety on a personal level may lead to a more comprehensive understanding of diseases and improve health-seeking behaviour (HSB), all of which may lead to an improvement in general health.

The improvement in general HSB and disease knowledge may extend to the employees' immediate family, increasing general health status among additional PAC members.

The impacts are considered beneficial.

There may be a positive impact on the human right to life, the right to health and the right to safe and healthy working conditions.

Generic Impacts

Employment

Impact: Risk of wildlife interaction/animal bites and contracting zoonotic diseases

This may lead to direct and indirect impacts.

Zoonotic diseases, particularly viral haemorrhagic fevers (VHFs) like Ebola and Marburg, pose a significant risk in all of the districts traversed by the AOI.

Transmission of certain zoonotic disease (e.g., rabies) depends on close interaction between animal hosts while others (e.g., leptospirosis) can be transmitted through other mediums, such as water.

Activities related to construction, such as bush clearing, may cause an increase of animal encounters by the project workforce, including workers from PACs. This may lead to a potential increase in disease transmission, bites (including snake bites) and an increase in morbidity and mortality among members of the local workforce. Workers charged with clearing vegetation will be most vulnerable.

The impacts will be medium-term and will affect some individuals within the PACs. Owing to their localised extent, before mitigation the impacts are considered not significant.

Impact: Other occupational health and safety incidents causing diseases, injuries and mortality

This may lead to direct and indirect impacts.

As stated above, baseline findings show that occupational health services across the project area are limited in number and scope. Existing laws and regulations do not reach the entire population and therefore may not offer sufficient protection to workers. Workers who are involved in the project as part of the supply chain may lack access to occupational health and safety protection.

Unskilled workers, especially those from PACs, are unlikely to have had exposure to work conditions and safety standards associated with a project of this nature and magnitude. Although it is anticipated that local unskilled workers will not be utilised in high-risk activities, the risk of involvement in occupational incidents, causing injury and mortality, remains.

It is expected that the local unskilled workforce will be working in environments where moving objects will be commonly encountered, including supply vehicles and diggers transporting heavy equipment. Therefore, incidents associated with moving objects pose a significant risk. The potential impacts may cause injury, permanent incapacity and even mortality in certain instances for those involved. This will in turn have an impact on families, who may lose a breadwinner.

Risks to workers' health and safety may also arise where unidentified contaminated soil is encountered during construction (see Section 8.5). In addition, the border of Tanzania and Uganda has been identified as a potential UXO area (see Section 2 and Section 8.5.2.1), which could pose a risk to workers' health and safety during construction.

There may be an impact on the human right to life, the right to health and the right to safe and healthy working conditions.

The impacts will be very long-term and will affect some households within the PACs. Owing to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are applicable to the 20 PACs near the four MCPYs. The following location-specific impacts are also applicable to these PACs:

Employment

Impact: Increased risk of vector-related diseases among the local workforce

This may lead to direct impacts.

Malaria and other vector-related diseases, such as dengue fever, are prevalent throughout the districts traversed by the AOI. An increase in vector-related diseases may be experienced in the MCPYs and in the workforce due to:

- changes in the environment in and around camps that may create vector breeding areas and, as a result, increase the density of disease transmitting vectors
- movement of people in and out of camps who may increase the risk for the transmission of disease as they may harbour parasites
- proximity of the MCPYs to PACs or make-shift settlements (caused by PIIM) that support an increased transmission of disease in the workforce due a high burden of disease in the community.

Both expatriate and local workers (who reside in the PACs) may be exposed to this increased localised risk, with a potential increase in morbidity and mortality. Malaria is the biggest risk and workforce members with limited natural acquired immunity from malaria will be more vulnerable.

The impacts will be long-term and will affect some households within the PACs. Owing to their localised extent, before mitigation the impacts are considered not significant.

8.16.2.2 Operation

Generic Benefits

The following potential generic benefit, described during construction, is also applicable during pipeline and AGI operation:

Employment

Benefit: An improvement in the health and safety of people employed from disease awareness and reduction programmes

The impacts are considered beneficial.

Generic Impacts

The following potential generic impact, described during construction, is also applicable during pipeline and AGI operation:

Employment

Impact: Other occupational health and safety incidents causing diseases, injuries and mortality

This may lead to direct and indirect impacts.

The impacts will be very long-term and will affect some households within the PACs. Owing to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Personnel during operations will be employed in accordance with national and project requirements. In addition, a set of management measures will apply (discussed in Section 8.16.3).

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation.

8.16.3 Enhancement and Mitigation Measures

This section describes the enhancement and impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect workers' health, safety and welfare.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.16.3.1 Design

Generic Enhancement and Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to workers' health, safety and welfare such as population density, security, and social and community infrastructure. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.16.3.2 Construction

Generic Enhancement Measures

Employment

Benefit: An improvement in the health and safety of people employed from disease awareness and reduction programmes

The occupational health, safety and security plan will include measures that contribute to the wellbeing of the workforce.

A risk-based worksite and construction camp training programme will be developed for the workforce, vendor representatives and site visitors.

Generic Mitigation Measures

Employment

Impact: Risk of wildlife interaction/animal bites and contracting zoonotic diseases

The occupational health, safety and security plan will include measures that contribute to management of worker-animal interactions.

The risk to worker health posed by wildlife at each camp and yard will be assessed and procedures will be developed to maintain the condition of each camp and to ensure camp facilities are kept clean and hygienic. A pest control plan will be developed, and pets will be prohibited in MCPYs.

Welded pipe sections will be capped to prevent fauna entering, morning trench inspection will be conducted, and fauna ladders will be placed in open excavations.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from medium-term to short-term. The residual impact is not significant.

Impact: Other occupational health and safety incidents causing diseases, injuries and mortality

The occupational health, safety and security plan, labour management plan and community health, safety and security plan will include measures that will contribute to the control of this impact.

A job-specific risk assessment process will be developed to identify specific risks associated with project activities and the appropriate associated mitigation measures; pre-deployment screenings will be implemented, there will be requirements for use of personal protective equipment, a medical emergency response plan will be developed and implemented, and a first aid needs assessment will be undertaken.

Mitigation of risks from worker fatigue will be addressed in the occupational health, safety and security plan and the transport and road safety management plan. A risk-based worksite and construction camp training programme will be developed and administered to the workforce, vendor representatives and site visitors.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and the duration of impact from long-term to short-term. The residual impact is not significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are also applicable to the 20 PACs near the four MCPYs. The additional location-specific mitigation measures for workers are:

Employment

Impact: Increased risk of vector-related diseases among the local workforce

The occupational health, safety and security plan will include measures to manage worker vector-related diseases.

Measures include development and implementation of a camp malaria and other vector control management plan and provision of workers with personal protection from prevalent diseases, for example insecticide treated bed nets at camps.

Vector management on all project sites (camps and construction) will align with national vector control programmes and strategies.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from long-term to short-term. The residual impact is not significant.

8.16.3.3 Operation

Generic Enhancement Measures

The following generic enhancement measure, described for construction, is also applicable during pipeline and AGI operation:

Employment

Benefit: An improvement in the health and safety of people employed

The occupational health, safety and security plan will include measures that contribute to the wellbeing of the workforce.

A risk-based worksite and MCPY training programme will be developed for the workforce, vendor representatives and site visitors.

Generic Mitigation Measures

The following generic mitigation measures, described for construction, are also applicable during pipeline and AGI operation:

Employment

Impact: Other occupational health and safety incidents causing diseases, injuries and mortality

The occupational health, safety and security plan and the transport and road safety management plan will include measures that will contribute to the control of this impact.

Mitigation of risks from worker fatigue will be addressed in the occupational health, safety and security plan and the transport and road safety management plan. A risk-based worksite and an operational training programme will be developed and administered to the workforce, vendor representatives and site visitors.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and the duration of impact from very long-term to short-term. The residual impact is not significant.

With respect to Human Rights:

The labour management plan and the occupational health, safety and security plan will ensure that project performance regarding the Voluntary Principles on Security and Human Rights (VPSHR) will be reviewed and performance improvement addressed where necessary.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts for pipeline and AGI operation, no mitigation measures are required.

8.16.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on workers' health, safety and welfare after mitigation measures have been implemented.

Table 8.16-1 summarises the potential generic workers' health, safety and welfare impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation.

Table 8.16-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on workers' health, safety and welfare are considered not significant.

8.16.4.1 Ecosystem Services

Section A11.4.9.4 in Appendix A11 identifies that workers' health, safety and welfare does not provide ecosystem services.

Table 8.16-1 Workers' Health, Safety and Welfare – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Employment	An improvement in the health and safety of people employed from disease awareness and reduction programmes	C & O	-	Occupational Health, Safety and Security Plan	B				
Employment	Risk of wildlife interaction/animal bites and contracting zoonotic diseases	C	-	Occupational Health, Safety and Security Plan	4	2	1	5	12
Employment	Other occupational health and safety incidents causing diseases, injuries and mortality	C & O	-	Community Health, Safety And Security Plan Occupational Health, Safety and Security Plan Labour Management Plan Transport and Road Safety Management Plan	6	2	1	5	14

Table 8.16-2 Workers' Health, Safety and Welfare – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Employment	Increased risk of vector-related diseases among the local workforce	C	-	Occupational Health, Safety and Security Plan	4	2	1	5	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.16.5 Transboundary Project Impacts

No transboundary project impacts have been identified.

8.16.6 Cumulative Impacts

No cumulative project impacts have been identified in relation to workers' health, safety and welfare.

8.16.6.1 Cumulative Transboundary Impacts

There are no transboundary cumulative impacts on workers' health, safety and workforce.

8.17 Social Infrastructure and Services

This section describes potential impacts on social infrastructure and services during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

Impacts associated with road traffic accidents are described in Section 9, Unplanned Events.

8.17.1 Key Sensitivities and Considerations

The social infrastructure and services baseline conditions are described in Section 6.4.3.12 and the traffic baseline conditions are described in Section 6.4.3.15, as well as:

- social infrastructure and services key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the social infrastructure and services impact assessment.

Sensitivity in the social infrastructure and services AOI is ranked as moderate for:

- PACs in relation to electricity; most PACs do not have access to grid electricity and rely on other means for cooking and lighting (e.g., firewood, fuel lamps)
- households without mobile phones and internet; these households may become increasingly vulnerable as media is increasingly shared through those platforms

Sensitivity is ranked as low for:

- PACs in relation to media (radio, television, newspapers); all households in the PACs have access to one or more media information source.

Sensitivity in the traffic AOI ranges from medium to very high, depending on the road type, condition and current levels of congestion.

Key considerations are:

- PACs rely on radio as a main means of receiving information
- mobile phone and internet is becoming increasingly important for exchanging information

- rural electrification is low, limiting general development
- in many parts of the AOI, the road network condition will be improved by upgrades made by the government as part of its ongoing improvements or by the project for construction purposes
- accident rates in Uganda are high, with pedestrians, children and cyclists considered particularly vulnerable
- traffic levels are low, so congestion is rare, except at the border with Tanzania and in Kampala.

Access to water, health and waste management facilities are discussed in Section 8.18.

Section A11.4.10 in Appendix A11 identifies ecosystem services associated with social infrastructure and services in the AOI. The following ecosystem services have been considered:

Provisioning services:

- electricity from hydro, fossil fuels and solar energy
- cooking fuel from biomass and firewood (see Section A11.4.6.4 in Appendix A11, land-based livelihoods – natural resources use).

The key human rights relevant to social infrastructure and services relate to the right to health, right to an adequate standard of living, right to education and right to water. International standards for responsible business also require that negative impacts of projects on communities should be avoided or at least minimised (see Section 4).

8.17.2 Potential Project Impacts

8.17.2.1 Construction

Generic Benefits

Use of Road Network

Benefit: Road widening and improvement

Many parts of the road network are in poor condition and will need to be upgraded to accommodate increased volumes of traffic generated by the project. In these instances, the roads will be widened and resurfaced or reprofiled to accommodate two-way traffic and ensure that the surface is even, which could otherwise lead to vehicle and motorbike damage and risk of accidents.

One of the criteria for the selection of construction facilities' locations was to maximise the use of existing roads that could be upgraded. Approximately 4 km of roads will be upgraded. These access roads will have an unsealed surface and will be maintained regularly by the project during construction. Once their construction is completed, these enhancements will improve road conditions for road users.

The potential benefits of road widening and improvement include enabling goods to be transported to market more quickly and reduced travel times for people commuting to major towns and cities for work. It will also improve access for healthcare and assist in the provision of health-related outreach activities by district

health authorities. Emergency response times may also be reduced. Due to the short length of road upgrades for the project, however, these impacts will be of limited benefit.

In addition, the risk of accidents is likely to reduce as roads are improved, and the incidence of potholes is reduced. However, the improved surface may lead to higher speeds and partially offset the reduction in accident risk.

The impacts are considered beneficial. Disruption to traffic flows is covered below.

Generic Impacts

Damage to Third Party Infrastructure (Pipelines, Cables and Community Infrastructure)

The level of electrification in the PACs is low. The large majority of households rely on fuel lamps for light and firewood for cooking. Access to electricity for businesses and services in more urbanised PACs is slightly higher, however usage remains limited.

Mobile phones play an increasingly important role in PACs, enabling PAC members to communicate with one another and share information (including market information relating to produce pricing), access the internet and utilise mobile money services. The majority of PAC members rely on radios to access news and information concerning the local area.

Impact: Temporary disruption of power supply due to planned outage or accidental damage to cables or other pipelines during pipeline construction

This may lead to direct and indirect impacts.

Underground lines to be potentially crossed by the pipeline include fibre optic cables, electrical and communications cables.

Where the pipeline intersects electrical cables, local businesses, health facilities, households and other users may temporarily lose power. This may lead to a reduction in business operating hours, and temporarily close public services and schools.

Where the pipeline intersects fibre optic and communications cables, local businesses, services and households who use landline telephones and cable internet connections may lose access for a short period of time. This may hamper their ability to communicate with one another and send and receive information.

The impacts will be transient and will affect entire PACs. Due to their transient nature and small extent, before mitigation the impacts are considered not significant.

Use of Road Network

During the construction period, traffic impacts may arise from vehicle movements, specifically:

- movement of pipe sections and other imported construction materials from a particular location, which usually follow defined routes for much of the journey
- national, regional or local movements of nationally sourced materials, often from several different locations and not following defined routes

- movement of workers from MCPYs to worksites.

Parts of the existing road network are currently in poor condition and not capable of accommodating increased traffic volumes. Poor road conditions increase travel time and costs considerably, particularly during the rainy season (discussed in Section 8.12). Potholes create a hazard for motorists, motorbikes (used as taxis) and bicycles. Local roads typically are murrum and are mostly single lane. The poor quality of roads constitutes a substantial challenge for PACs.

New permanent and temporary access roads will need to be constructed to accommodate project traffic movements as some activities will take place on sites remote from the existing road network.

The development of construction facilities and access roads will require specialist materials and labour, which will be imported, and non-specialist materials and labour, which will be sourced locally, regionally or nationally. Access road upgrades and construction of new access roads will lead to traffic-related impacts from importing aggregates, plant and other materials and the movement of labour.

The MCPYs will be developed sequentially for each pipeline spread as the works move from the northern end and progress southwards. Therefore, it is likely that only one MCPY will be under construction at any time in each spread. Non-local workers are expected to live within temporary fly camps within the MCPY site during the construction of these facilities and therefore the impacts of their movements to and from the site are expected to be minimal. Locally sourced workers from the surrounding villages that live outside the camp will travel to work by shuttle bus service.

Table 8.17-1 summarises the heavy-goods-vehicle (HGV) movements required to transport construction materials to each location (no pre-construction activities required for PS1).

Table 8.17-1 Heavy Goods Vehicle Movements Required to Transport Construction Materials to Each Location

Facility	Purpose of Material Movements to the Facility	Average Daily No. of HGVs (Two Way)	Duration of Impact (months)
PS1	No activities	0	n/a
MCPY1	Camp construction	20	3
MCPY2	Camp construction	20	3
PS2	Upgraded access road	15	1
MCPY3	Camp construction plus upgraded access road	50	3
MCPY4	Camp construction plus upgraded access road	50	3

The construction of the pipeline will require a major movement of pipe to the RoW from the nearest MCPY, along with a smaller number of movements for other materials. Each MCPY will accommodate up to 1000 workers at any one time. Daily transport will typically consist of 200 local workers travelling to the MCPY and up to

300 pipeline workers travelling between the MCPY and the worksites. Pipeline construction will start at the northern end and progress southwards within a single spread for EACOP. It is expected that only one MCPY will typically be in use at any one time.

The operation of the MCPYs will require regular locally sourced deliveries to service the camps, including food and fuel for plant, and services like the removal of waste.

Pumping station construction will take place over a period of approximately 24 months. During this period, the movement of people and materials is provided in Table 8.17-2.

Table 8.17-2 Traffic Movements for Pumping Station Construction from Moving People, Material and Equipment

Facility	Purpose of Transport	Daily No. of Cars/ Motorcycles (Two Way)	Daily No. of Buses (30- Seater) (Two Way)	Daily No. of HGVs (Two Way)	Daily No. of Total Vehicles (Two Way)
PS1	Specialist materials, daily commuting	0	14	2	16
PS2	Specialist materials, daily commuting	0	14	2	16

Pipeline construction will be transient and therefore traffic volumes at some VECs may only be present for a few months as the works progress in a linear fashion. However, the impacts may be felt for longer where construction traffic is travelling along national roads to reach more than one MCPY, and on the access roads around the camps.

A summary of the transportation requirements for each location during pipeline construction is provided in Table 8.17-3 and illustrated in Figure 8.17-1.

Table 8.17-3 Traffic Movements for Pipeline Construction from Moving People, Material and Equipment

Route	Purpose of Transport	Daily No. of Cars/ Motorcycles (Two Way)	Daily No. of Buses (30- Seater) (Two Way)	Daily No. of HGVs (Two Way)	Daily No. of Total Vehicles (Two Way)
MCPY1 to spread	Pipe delivery, daily commuting and pipeline workers	72	42	61	175
MCPY2 to spread	Pipe delivery, daily commuting and pipeline workers	72	28	30	130
MCPY3 to spread	Pipe delivery, daily commuting and pipeline workers	72	42	32	146

Table 8.17-3 Traffic Movements for Pipeline Construction from Moving People, Material and Equipment

Route	Purpose of Transport	Daily No. of Cars/ Motorcycles (Two Way)	Daily No. of Buses (30- Seater) (Two Way)	Daily No. of HGVs (Two Way)	Daily No. of Total Vehicles (Two Way)
MCPY4 to spread	Pipe delivery, daily commuting and pipeline workers	72	28	30	130

Impact: Deterioration of road conditions

This may lead to direct and indirect impacts.

Roads typically deteriorate because of the number and weight of vehicles passing over them. Therefore, the additional traffic generated by the project, including HGVs, could lead to an increase in the rates at which road conditions deteriorate.

The potential impacts of deterioration in road conditions include an increase in the number and size of potholes and edge subsidence, particularly on unsealed roads. This could lead to increased accident rates as drivers swerve to avoid potholes and come into conflict with other road users or damage their vehicles when they cannot swerve.

Project traffic will make a relatively small contribution to the total volume of HGVs on the road network during the construction of the pipeline and AGIs. The volume, intensity and duration of traffic is expected to be greater during pipeline and AGI construction. Regardless of the level of change, the types of project traffic are likely to make pipeline and AGI construction traffic noticeable at local VECs because there are generally low traffic volumes at PAC level. In particular:

- locations between the trunk roads and the worksites are expected to experience impacts, but for a short duration owing to the transient nature of the works
- trunk road locations within the AOI; these will experience project related traffic for around 18 months
- no location is predicted to experience an increase in total traffic of more than 11%
- large parts of the road network within the AOI; these will experience an increase of more than 100 two-way HGV movements per day, although none will experience an increase greater than 40% in HGV and bus movements.

The impacts will be short-term and will affect entire PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Traffic congestion leading to delays

This may lead to direct and indirect impacts.

Sections of the road network are susceptible to traffic congestion where there are obstacles such as buildings, stalls and people walking in the road (including

children going to school), which interfere with two-way flow of traffic. These constraints can lead to congestion where traffic is reduced to a single lane. Where roads are narrow and winding, slow moving vehicles or convoys of vehicles can cause congestion problems. In these instances, driver frustration may lead to dangerous overtaking and an increased risk of accidents.

An increase in congestion and delays may increase journey time for traffic road users and pedestrians who use the road to head load goods to markets or to access farming plots on the peripheries of communities. Costs associated with delay caused by traffic congestion are discussed in Section 8.12. This may also have negative outcomes for PAC business owners travelling to purchase supplies (i.e., reduction in business opening times, increase in product prices) and people seeking health services. Public transport providers may also choose to increase fare prices.

The impacts will be short-term and will affect entire PACs. Owing to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: Disruption of traffic flows

This may lead to direct and indirect impacts.

The development of construction facilities will include upgrading the access roads connecting project locations to trunk roads. During the road upgrades, local communities may experience disruption of traffic flows where full or partial road closure will be required.

The pipeline will cross roads connecting local communities to major trunk roads. The construction methods at these road crossings will vary, depending on the importance of the road, the traffic volumes travelling along it and the availability of alternative routes. For roads with low traffic volumes open cut crossings may be used.

The potential impacts of traffic disruption to local users may prevent access to local markets or require use of an alternative route, which could introduce a delay to their journey causing inconvenience.

The level of traffic-flow disruption will depend on the construction method at each location. The activity will be transient during facility construction as the upgrade works progress along the access road. However, where there are no alternative routes, a full road closure would cause a transient impact for local users.

The AOI for social infrastructure and services will change with the construction method selected for each location. The activity will generally be transient as the construction works progress along the pipeline route. However, there may be a short-term impact for local users where there are no alternative routes, or where travel times are significantly increased.

The impacts will be transient and will affect entire PACs. Due to their transient nature and small extent, before mitigation the impacts are considered not significant.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The traffic associated with developing each of the construction facilities will transport materials on the national road network and access roads. This additional traffic will vary in different parts of the road network depending on the concentration of facilities and the extent of access road upgrades.

Section 6.4.3.15 describes the baseline traffic volumes and HGV content for representative locations on the national road network. The impacts of the additional project traffic shown in Table 8.17-1 and Table 8.17-2 have been quantitatively assessed in each of these locations. The results are considered representative of the impacts on the road network surrounding each location. They are shown in Table 8.17-4 and Table 8.17-5 and are illustrated in Figure 8.17-1.

Table 8.17-4 Location-Specific Traffic Increases Associated with the Movement of Construction Materials for Construction Facilities

Assessment Location (Described in Section 6.4.3.15)	Daily Baseline Traffic (All Vehicles)	Daily Baseline Traffic (HGVs)	Average Daily No. of Project HGVs (Two Way)	Increase in HGVs (%)
Hoima	6,886	230	0	0%
Mubende	7,721	513	20	4%
Kitenga	2,440	968	20	2%
Masaka	10,289	1,214	65	5%
Kyotera	10,851	794	50	6%

These impacts will represent a negligible increase (less than 10%) in traffic volumes on the road network at each location.

Table 8.17-5 Location-Specific Traffic Increases for Pipeline Construction from Moving People, Material and Equipment

Assessment Location (Described in Section 6.4.3.15)	Daily Baseline Traffic (All Vehicles)	Daily Baseline Traffic (HGVs)	Average Daily No. Of Project Vehicles (Two Way)	Average Daily No. Of Project HGVs and Buses (Two Way)	Increase in All Vehicles (%)	Increase in HGVs and Buses (%)
Hoima	6,886	230	60	60	1%	26%
Mubende	7,721	513	266	194	3%	38%
Kitenga	2,440	968	266	194	11%	20%
Masaka	10,289	1,214	254	182	2%	15%
Kyotera	10,851	794	224	152	2%	19%

At all locations except Kitenga, the impacts for all vehicles are a negligible increase in traffic volumes (defined as less than 10%). At Kitenga, there is an 11% increase in all vehicles, which is considered a small increase (defined as 10–30%).

HGVs and buses also have a limited range of increases, being considered either as small (10–30%) or medium (30–100%), with only Mubende experiencing a medium increase.

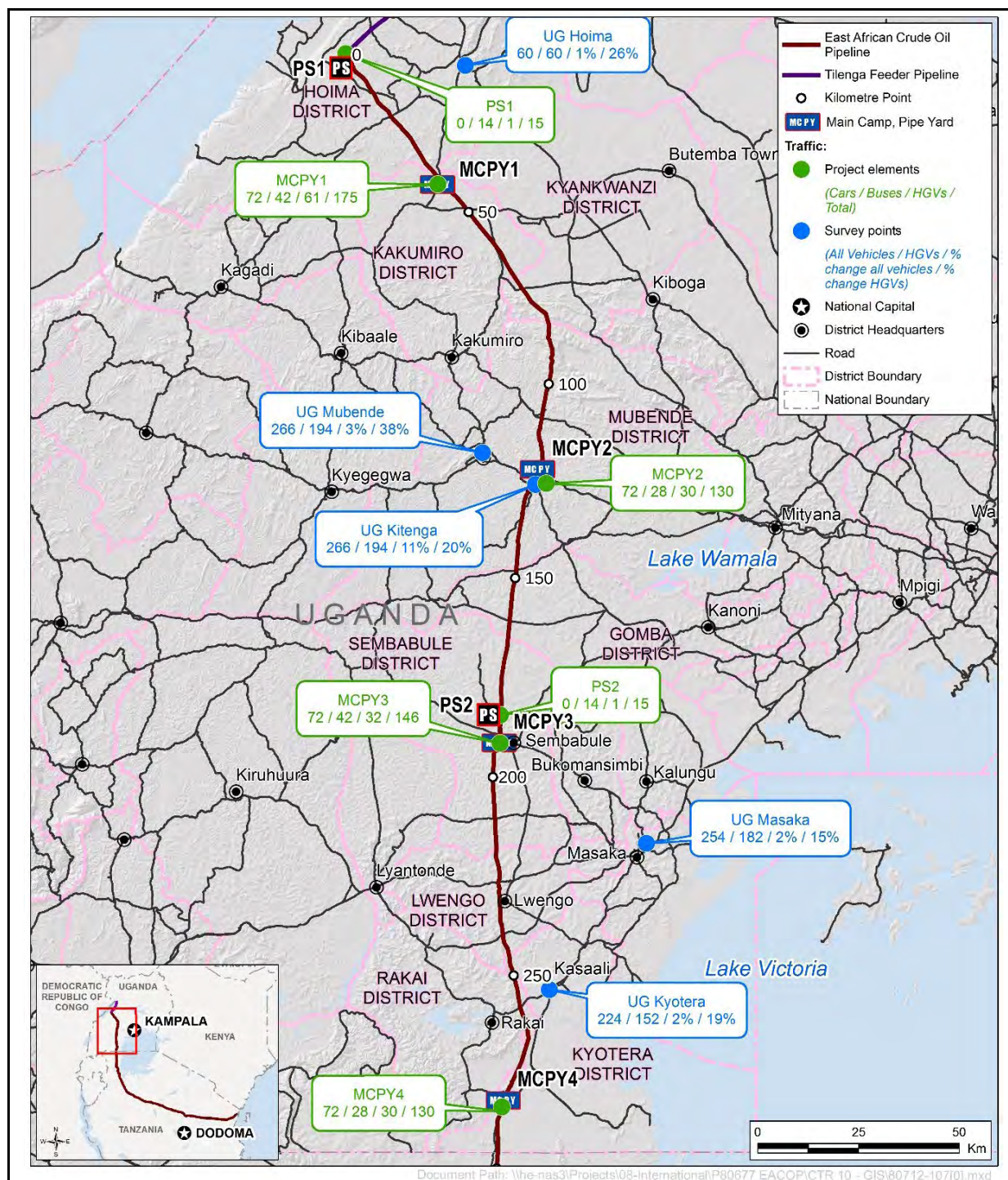


Figure 8.17-1 Baseline Traffic Flows (Blue) and Predicted Traffic Movements at Project Locations (Green) (Per Day)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs. However, the following generic impact may be more pronounced in Katikara Trading Centre (KP41), Kyenda (KP125.5) and Sembabule Market Zone (KP190):

Use of Road Network

Impact: Traffic congestion leading to delays

This may lead to direct and indirect impacts.

These PACs are densely populated and growing in size due to rural-urban migration. Many local businesses are already present, attracting residents from neighbouring PACs which offer fewer goods and services. Traffic levels are higher in Katikara Trading Centre, Kyenda and Sembabule Market Zone than in other PACs close to the MCPYs. Understanding the pull factors of in-migration, these PACs, as established urban centres, are more likely to experience PIIM of opportunistic job seekers than neighbouring PACs due to proximity to the MCPYs. This may exacerbate traffic volumes with increased public transport, congestion and delays even further.

The impacts will be short-term and will affect the entire PACs. Owing to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location: RoW: Mutukula Town, Kyotera District, KP295.5

Mutukula town, at the border between Uganda and Tanzania, has experienced rapid population growth and rising levels of economic activity in recent years. Mutukula is one of the main entry points into Uganda from Tanzania and customs revenues have increased at the border, reflecting an increase in cross-border flows of goods and services. Heightened trading activities in Mutukula has resulted in an increase in traffic volumes in the town and surrounding area. KIIs reported that traffic levels are increasing in Mutukula by roughly 20% per year.

The potential generic impacts are also applicable to the border town of Mutukula. However, the following generic impact may be more pronounced in this PAC:

Use of Road Network

Impact: Traffic congestion leading to delays

This may lead to direct and indirect impacts.

The impacts will be short-term and will affect the entire PAC. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations.

8.17.2.2 Operation

Generic Impacts

There are no generic impacts during pipeline and AGI operation. Vehicle movements for the duration of this period will mainly be to facilitate movement of people to and from the RoW and AGIs. The operation of the pipeline and AGIs will therefore introduce traffic onto the road network in the immediate vicinity, primarily for maintenance and inspection. However, the extent to which it affects the existing traffic volumes will depend on the origin of workers.

The traffic volumes from the operation of the pipeline and AGIs is unlikely to materially increase the baseline given the frequency of visits to any single location and the number of workers required on a daily basis at crewed locations.

The operation of the pipeline and AGIs across Uganda is predicted to have a not significant impact on infrastructure (e.g., power lines, roads), traffic volumes and movements.

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation.

8.17.3 Enhancement and Mitigation Measures

This section describes the enhancement and impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect social infrastructure and services.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.17.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to social infrastructure and services such as minimising impacts on settlements and social and community infrastructure. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routeing options available.

The project will generate its own power and is thus independent of locally supplied electricity (see Section 2). This will mitigate increased pressure on local electricity supplies due to construction activities. Project water and waste management requirements are also described in Section 2.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.17.3.2 Construction

Generic Mitigation Measures

Damage to Third Party Infrastructure (Pipelines, Cables and Community Infrastructure)

Impact: Temporary disruption of power supply due to planned outage or accidental damage to cables or other pipelines during pipeline construction

An infrastructure and utilities management plan will be developed, describing the specific mitigation measures to be implemented to ensure infrastructure and utility services are identified and protected during construction.

Potentially affected landowners, land users and communities will be consulted if there is likely to be any disruption to the existing infrastructure and utility services which will be communicated at least 72 hours before work starts and where disruption to infrastructure and utilities will occur for more than 12 hours, a risk analysis of impacts on affected settlements will be completed. Feedback from communities will inform planning of the works, especially when determining the options for temporary alternatives.

The project will notify third-party utility services of any damage and the damage will be repaired promptly in consultation with the service operator or utility owner.

Application of these mitigation measures will reduce the magnitude of impact from small to negligible with no significant residual impact.

Use of Road Network

Impact: Deterioration of road conditions

The infrastructure and utilities management plan will include these measures that will contribute to the management of this impact.

An initial survey will be completed of the condition of roads to be used by the project including bridges, drainage structures, signage, traffic management and other road infrastructure upon the completion of construction. Any actions, such as repairs, arising from the exit survey will be closed out on a timely basis.

Vehicle movements will be restricted to defined access routes and demarcated working areas. Where feasible, preference will be given to transport of pipe and other construction materials by rail.

Application of these mitigation measures will reduce the magnitude of impact from very large to medium with no significant residual impact.

Impact: Traffic congestion leading to delays

The transport and road safety management plan and stakeholder engagement plan will include measures that will contribute to the control of this impact to manage congestion.

The transport and road safety management plan will address site-specific traffic risk assessment and safe driving procedures. Vehicle movements will be restricted to defined access routes and demarcated working areas.

In addition to the mitigations for the deterioration of road conditions the following mitigation also applies to this impact:

Community liaison officers will encourage PAC leadership to provide advance warning of local events so that construction activities can be avoided at these times.

Application of these mitigation measures will reduce the magnitude of impact from large to small with no significant residual impact.

Impact: Disruption of traffic flows

The transport and road safety management plan and infrastructure and utilities management plan will restrict vehicle movements and times (unless in the event of an emergency). At major road crossings where it is necessary to maintain traffic flow, consideration will be given to trenchless crossing techniques or the crossing will be made in two stages and only half of the road width will be used at a time.

Application of these two mitigation measures will reduce the sensitivity of impact from very high to low with no significant residual impact.

Mitigation for deterioration of road conditions and traffic conditions leading to delay will control impacts resulting from disruption to traffic flows; no additional mitigation is necessary.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are applicable to the 20 PACs near the four MCPYs.

Location: RoW: Mutukula Town, Kyotera District, KP295.5

The generic mitigation measures are applicable to the border town of Mutukula.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic mitigation measures are applicable to the eight PACs near the two pumping stations.

8.17.3.3 Operation

Generic Mitigation Measures

As there are no predicted generic impacts for pipeline and AGI operation, no mitigation measures are required.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts for pipeline and AGI operation, no mitigation measures are required.

8.17.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on social infrastructure and services after mitigation measures have been implemented.

Table 8.17-6 summarises the potential generic social infrastructure and services impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.17-7 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on social infrastructure and services are considered not significant.

Ecosystem Services

Section A11.4.10 in Appendix A11 identifies ecosystem services associated with social infrastructure and services in the AOI. The following ecosystem services have been assessed in Section 8.17.2 and 8.17.3:

Provisioning services:

- electricity from hydro, fossil fuels and solar energy
- cooking fuel from biomass and firewood (see Section A11.4.6.4 in Appendix A11, land-based livelihoods – natural resources use).

With the implementation of the planned mitigation measures, the residual impact on the above services will be not significant.

Table 8.17-6 Social Infrastructure and Services – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Use of Road Network	Road widening and improvement	C	Y		B				
Damage to Third Party Infrastructure (Pipelines, Cables and Community Infrastructure)	Temporary disruption of power supply due to planned outage or accidental damage to cables or other pipelines during pipeline construction	C	-	Infrastructure and Utilities Management Plan	2	1	2	2	7
Use of Road Network	Deterioration of road conditions	C	Y	Infrastructure and Utilities Management Plan	6	2	2	5	15
Use of Road Network	Traffic congestion leading to delays	C	-	Stakeholder Engagement Plan Transport and Road Safety Management Plan	4	2	2	3	11
Use of Road Network	Disruption of traffic flows	C	-	Infrastructure and Utilities Management Plan Transport and Road Safety Management Plan	4	1	2	2	9

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.17-7 Social Infrastructure and Services – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
Katikara Trading Centre (KP41)	Use of Road Network	Traffic congestion leading to delays	C	-	Stakeholder Engagement Plan Transport and Road Safety Management Plan	6	2	2	3	13
Kyenda (KP125.5)	Use of Road Network	Traffic congestion leading to delays	C	-	Stakeholder Engagement Plan Transport and Road Safety Management Plan	6	2	2	3	13
Sembabule Market Zone (KP190)	Use of Road Network	Traffic congestion leading to delays	C	-	Stakeholder Engagement Plan Transport and Road Safety Management Plan	6	2	2	3	13
Mutukula town (KP295.5)	Use of Road Network	Traffic congestion leading to delays	C	-	Stakeholder Engagement Plan Transport and Road Safety Management Plan	6	2	2	3	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.17.5 Transboundary Project Impacts

8.17.5.1 Generic Transboundary Project Impacts

The following generic transboundary project impacts have been identified:

Use of Road Network

Impact: Deterioration of road conditions

Impact: Traffic congestion leading to delays

Impact: Disruption of traffic flows.

Traffic generated in Uganda will cross the border to Tanzania to transport goods and materials. The potential transboundary cumulative impacts related to traffic are discussed in Section 8.17.6.3.

The potential for deterioration of road conditions, traffic congestion leading to delays and disruption of traffic flows will be managed through the mitigation measures described in Section 8.17.3. After mitigation has been implemented, the potential residual impact is considered not significant.

8.17.5.2 Location-Specific Transboundary Project Impacts

No location-specific transboundary project impacts have been identified in relation to social infrastructure and services.

8.17.6 Cumulative Impacts

8.17.6.1 Context

The baseline condition of social infrastructure and services, the trends and sensitivity to change are described in Section 6.4.3.12. Project residual impacts are summarised in Table 8.17-6 and Table 8.17-7. The traffic baseline conditions, the trends and sensitivity to change are described in Section 6.4.3.15.

Poor road conditions increase travel time and costs considerably. New permanent and temporary access roads will be constructed to accommodate project traffic movements as some activities will take place on sites remote from the existing road network. Traffic levels tend to be low, so congestion is rare outside the main urban areas.

Residual project impacts that may contribute to cumulative impacts include:

- several roads will be widened and improved as part of the project
- construction traffic leading to congestion and disruption of flow from the movement of equipment and people leading to delays
- additional project traffic, including HGVs, could lead to an increase in the rates at which road conditions deteriorate.

Associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H. These are:

- associated facilities:
 - o Tilenga Project (AF01)
 - o Kingfisher Oil Project (AF02)
- third-party developments:
 - o Kabaale International Airport (UG04)
 - o refinery (UG07)
 - o Hoima-Buloba pipeline (UG08)
 - o Lot 4 road upgrades (UG19)
 - o Buhimba to Kakumiro road upgrade (UG20)
 - o construction camp for Bulima – Kabwoya road (UG21)
 - o Bulima – Kabwoya road upgrade (UG22)
 - o ICT infrastructure installation (UG44).

No threshold is required for the long-term beneficial impacts of road improvements.

The preferred condition is defined as a return to, or near the original condition of social infrastructure and services (including road condition) before construction and that disruption is minimised and managed during construction so that pre-construction social infrastructure use patterns and services can be maintained.

8.17.6.2 Cumulative Impacts

Associated Facilities

Potential cumulative impacts are predicted based on the premise that the EACOP, Tilenga, and the Kingfisher projects have similar construction phase timelines, causing an additional demand on infrastructure through increased traffic volumes.

The transportation of materials, equipment and personnel to and from construction camps and worksites will increase traffic on the assigned routes on public roads, causing congestion and disrupting traffic flows.

Using traffic predictions supplied by the other projects, Table 8.17-8 presents the assessment of cumulative traffic impacts from EACOP, Tilenga and Kingfisher projects. The three projects are estimated to have similar contributions to the cumulative impact.

Table 8.17-8 Location-Specific Traffic Increases for EACOP, Tilenga and Kingfisher Projects from Moving People, Material and Equipment

Location	Daily Baseline Traffic (All Vehicles)	Daily Baseline Traffic (HGVs)	Average Daily No. Of All Project Vehicles (Two-Way)	Average Daily No. Of All Project HGVs and Buses (Two-Way)	Increase in All Vehicles (%)	Increase in HGVs and Buses (%)
Hoima	6,886	230	165	165	2%	72%
Mubende	7,721	513	266	194	3%	38%
Kitenga	2,440	968	266	194	11%	20%
Masaka	10,289	1,214	359	287	3%	24%
Kyotera	10,851	794	329	257	3%	32%

At all locations except Kitenga, the increase in traffic volumes for all vehicles is considered of negligible magnitude (defined as a less than 10% increase in daily two-way traffic flow in the EACOP project impact assessment criteria). At Kitenga, the 11% increase in all vehicles from the three projects, is considered a small magnitude (defined as 10–30% increase in daily two-way traffic flow). The EACOP-only contribution to increases in traffic volume is considered as being of small magnitude.

At Hoima and Kyotera the increase in HGV and bus traffic from all three projects is considered of medium magnitude (30–100% increase in daily two-way traffic flow). This is an increase in magnitude from when only the EACOP project is considered (the project magnitude was ranked as small). At Mubende, the magnitude of increases in HGVs and buses for all three projects is considered medium which is the same ranking as for the EACOP project only. For Masaka and Kyotera, the magnitude of increases in HGV and bus traffic is small. The level of increase is considered the same as for the EACOP project alone.

The impact of increased volumes for all traffic and specifically for HGVs and buses for all three projects is considered not significant.

Information received from the Tilenga Project and the feeder pipeline component and the Kingfisher Oil Project indicate that mitigation measures similar to those in Section 8.17.3 will be applied.

With the mitigation measures implemented, it is predicted that the limit of acceptable change will be achieved and hence the residual cumulative impact is not significant.

The transboundary cumulative impacts from EACOP and the AFs is described in Section 8.17.6.3.

Third-Party Developments

Potential cumulative impacts are predicted where the EACOP project and the above mentioned third-party developments have similar construction phase timelines, resulting in an additional demand on infrastructure through increased traffic volumes. Table 8.17-3 shows the above-mentioned third-party developments, EACOP AGIs and MCPYs and the districts that may be impacted.

Table 8.17-9 Cumulative Impacts: Roads

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district
UG07	Refinery	0	PS1, approximately 0.2 km from UG07	Buseruka subcounty, Hoima district
UG08	Hoima–Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 is parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Buseruka and Kiziranfumbi subcounty, Hoima district Kisita and Banaywa subcounty, Kakumiro district

Table 8.17-9 Cumulative Impacts: Roads

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG19	Lot 4 road upgrades	0–19	PS1, approximately 3.2 km from UG 19	Buseruka subcounty, Hoima district
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Kisita subcounty, Kakumiro district
UG21	Construction camp for Bulima–Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from the pipeline	Kiziranfumbi subcounty, Hoima district
UG22	Bulima–Kabwoya road upgrade	19	Crosses pipeline at KP19	Kiziranfumbi subcounty, Hoima district
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses the pipeline	Lwengo subcounty, Lwengo district

Road Widening and Improvement

A long-term beneficial cumulative impact will occur from the upgrade of the EACOP project access roads and the third-party road upgrades, see Figure 8.17-2.

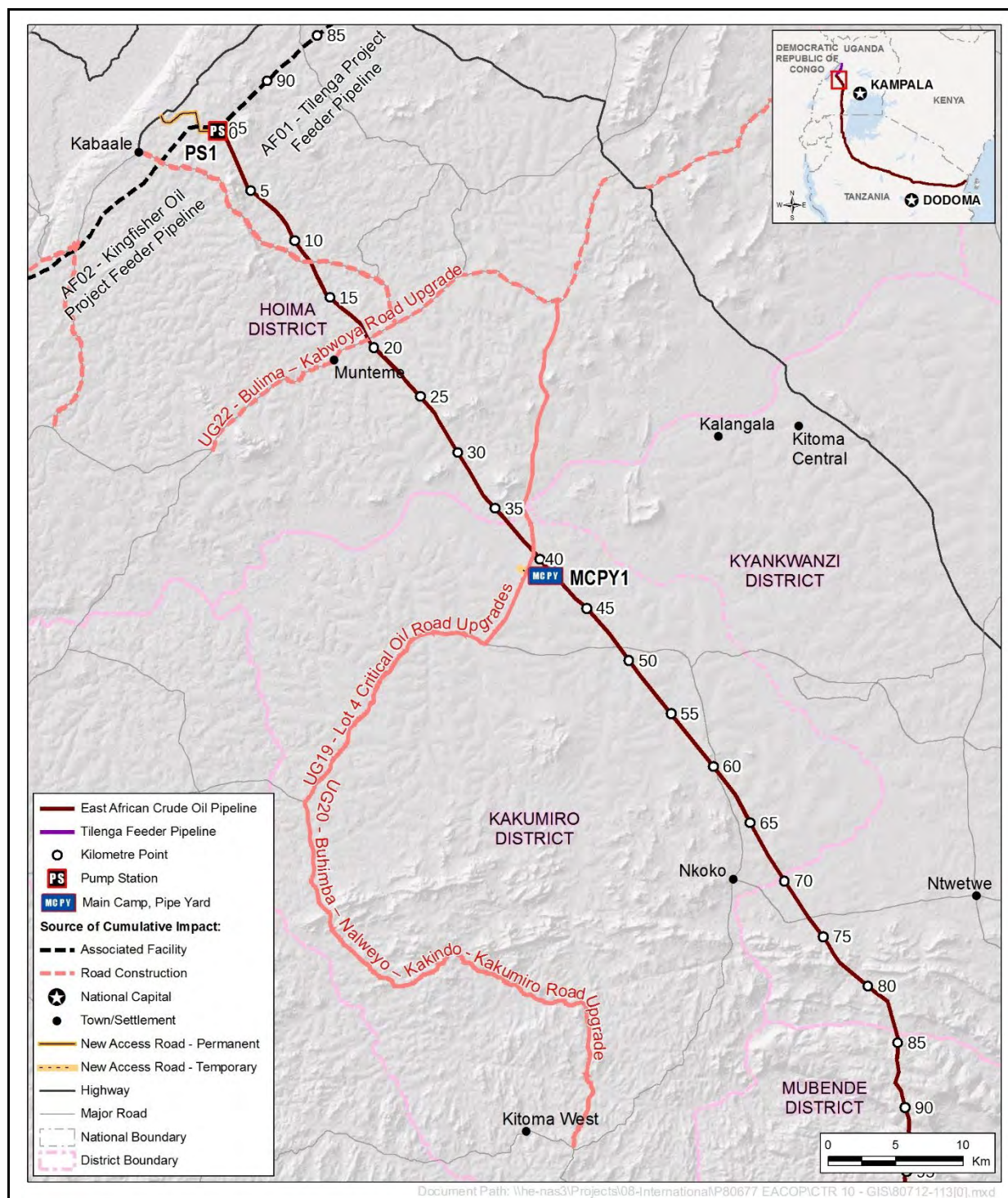


Figure 8.17-2 Cumulative Impacts: Road Improvements

The combined effect of the improved project access roads and the national road is that goods can be transported to markets more quickly and travel times will reduce. Access to health care and response times in emergency situations will be improved.

Traffic Congestion and Disruption of Traffic Flows

The transportation of materials, equipment and personnel to and from construction camps and worksites will increase traffic on public roads used by the same projects,

potentially causing congestion and disrupting traffic flows, and accelerating the deterioration of road conditions, bridges and communal infrastructure. The potentially affected routes are:

- Hoima to Kampala
- Kampala to Masaka
- Masaka to Kyotera.

It should be noted that assumptions have been made about routes and traffic volumes for third-party developments, as detailed data were not available, and therefore a more fulsome assessment has not been completed.

To manage the cumulative impact, the project will liaise with third-party developers, the police and authorities to identify and implement additional traffic management measures that limit disruption.

With the additional mitigation measure implemented, it is predicted that the limit of acceptable change will be achieved and hence the cumulative residual impact is not considered significant.

8.17.6.3 Transboundary Cumulative Impacts

Transboundary cumulative impacts will occur because of construction activities associated with the EACOP project and the Tilenga Project including the feeder pipeline. At the time of writing no information on the transportation of construction materials outside Uganda is available for the Kingfisher Oil Project. Traffic transporting imported construction materials for the EACOP project and the Tilenga Project is expected to have travelled from Dar es Salaam and Tanga ports in Tanzania, through Tanzania and to the Uganda MCPYs. The coated pipe would be transported from a coating facility planned for the Tabora region in Tanzania. This traffic will therefore affect the main highways in Tanzania and Uganda.

Similar baseline conditions exist in both countries with similar effects on VECs. As mentioned the Tilenga Project including the feeder pipeline component will implement mitigation measures similar to those in Section 8.17.3. Consequently, it is predicted that the limit of acceptable change will be achieved and hence the transboundary residual cumulative impact is not significant.

8.18 Community Health

This section describes potential impacts on community health during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.18.1 Key Sensitivities and Considerations

The community health baseline conditions are described in Section 6.4.3.13, as well as:

- community health key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the community health impact assessment.

Sensitivity in the community health AOI is ranked as potentially high for:

- children
- the elderly
- pregnant women
- people living in crowded areas
- PACs with decreased access to appropriate healthcare facilities
- people with poor access to clean water and adequate sanitation
- households using biomass fuel for indoor cooking and lighting
- female headed households
- women and young girls
- PACs near to artisanal mining sites, along transport routes and access roads
- PAC members with less access to wild foods
- PACs with members employed by the project and PACs where PIIM is likely.

Sensitivity is ranked as potentially very high in immuno-compromised individuals and commercial sex workers.

Key considerations are:

- population growth (natural and as a result of PIIM) may lead to local health care facilities being overstretched
- interaction between PACs and an expatriate labour force may increase the risk of transmission of communicable diseases
- given the high incidence of communicable diseases and the poor health facilities, PIIM into the PACs will likely increase the prevalence of communicable diseases
- construction activities may create standing water, in which malaria-spreading mosquitoes can breed
- vector management activities, if not aligned with national strategies, may increase vector resistance and compromise local authority interventions
- PIIM may promote vector breeding, disease transmission and an increased burden on health systems
- environmental sanitation, health care services and prophylaxis, vector control programmes and the management of PIIM are key for controlling malaria
- PIIM into PACs may influence the availability of clean drinking water, exacerbate unsanitary conditions and increase disease spread and BOD
- districts with a high prevalence of STDs, PIIM and a growing population are likely to have increased STI prevalence
- the majority of farmers in the AOI are subsistence farmers and an increase in external demand will need to be managed
- PIIM into the AOI may increase food prices and, as a result, affect food security of vulnerable groups
- VHF and the associated outbreak potential remains a risk to PACs, in particular those that are impacted by PIIM
- PAC households that experience a sudden increase in disposable income may be affected by a loss of cohesion through increased use of substances such as alcohol and drugs, and sex workers
- PIIM may lead to pressure on health care services.

Section A11.4.11 in Appendix A11 identifies ecosystem services associated with community health. The following ecosystem services have been assessed in Sections 8.18.2 and 8.18.3:

Water-related diseases are linked to safe water, which provides the following ecosystem services:

Provisioning services:

- general health
- form of livelihood (see Section 8.14 on river and lake-based livelihoods).

Social cultural health practices are linked to the use of wild plants, which provides the following ecosystem service:

Provisioning services:

- ingredients for treatment of common illnesses (traditional medicine).

The key human rights that are relevant to community health relate to the right to health, which is also a component of the right to an adequate standard of living. Women's rights and children's rights should also be considered as they are particularly vulnerable to certain health risks related to EACOP. International standards for responsible business also require that negative impacts of projects on the health of the communities should be avoided or at least minimised (see Section 4).

8.18.2 Potential Project Impacts

8.18.2.1 Construction

Generic Impacts

Resettlement

Project land requirements for construction facilities and associated access roads will be permanent. The project has developed a Resettlement Strategy (RS) that will guide all land acquisition consistent with national and IFC requirements (see Section 8.15). Due to the land requirements, specific VECs in communities may be impacted through physical resettlement or economic displacement.

Impact: Resettled households' exposure to areas of higher vector densities, increasing the burden of vector-related diseases

This may lead to direct impacts.

Physical displacement of households may result in households being moved to areas where environmental, semi-urban and urban conditions are more suitable for vector breeding, resulting in an increase in vector densities (e.g., wetlands and densely populated areas).

This may result in households being exposed to higher vector densities and a corresponding higher BOD. This impact not only relates to malaria but also to other vector-related diseases that are prevalent in the AOI, such as:

- arboviral diseases (dengue, yellow fever)
- human African trypanosomiasis (HAT)
- onchocerciasis.

From a human rights perspective, there is a potential impact on the right to health.

The impacts will be long-term and will affect some households within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Impact: Resettled households' decreased food security

This may lead to direct impacts.

Households affected by loss of land without adequate in-kind compensation may experience a decrease in food security if suitable alternatives to producing or procuring food and seeds for planting are not available. Longer-term food insecurity for sensitive VECs (female-headed households, children, pregnant women, elderly) may lead to nutritional disorders. Food insecurity has already been noted as a concern in the districts of Hoima, Kakumiro and Kyotera.

From a human rights perspective, there is a potential impact on the right to food and the right to health.

The impacts will be medium-term and will affect some households within the PACs. Due to their localised extent, before mitigation the impacts are considered not significant.

Community Health

Construction activities such as site clearing and road construction will cause changes in the natural environment, which may increase the number and suitability of breeding habitats for vectors.

Equipment, materials and other goods will be shipped to Tanga and Dar es Salaam and transported to project sites, thus allowing for the movement of vectors to these locations.

Impact: Project activities leading to an increase in vector-related diseases

This may lead to direct and indirect impacts.

An increase in vector density may increase the risk for localised disease transmission. High risk activities that may contribute to this impact include:

- site clearing activities
- borrow pit development
- road construction (with a specific focus on drainage)
- construction sites and MCPY drainage
- poor housekeeping at construction sites and MCPYs, resulting in conditions that promote the collection of standing water.

A localised increase in mosquito vectors that transmit arboviral conditions (*Aedes* spp.) may also give rise to an increased risk for the potential spread of rift valley fever if a localised outbreak was to occur. This disease is a zoonosis in East Africa, mosquitoes play an important role in transmission and higher densities may

increase the risk. Areas and objects allowing pooling of water provide the preferred breeding areas for these species of mosquito and MCPYs are therefore considered to be high risk areas.

There is a risk that movement of goods and materials via road from the ports of Tanga and Dar es Salaam can introduce vector-related diseases as shipments will arrive from global locations and may be stored in the port. Countries of origin may be endemic to different strains and types of arboviral diseases (particularly dengue) and infected larva and eggs may be transferred in goods or packaging, introducing these diseases to the AOI.

The impacts will be medium-term and will affect districts and regions. Due to their medium-term nature, before mitigation the impacts are considered not significant.

Noise

Construction activities are expected to change the noise environment in the immediate vicinity of construction sites. Sources of noise such as excavators, dozers, dump trucks, graders and vehicles may add a new noise character to the existing noise environment.

Impact: Excessive noise exposure due to project activities

This may lead to direct and indirect impacts.

The role of noise as an environmental pollutant and its impact on health are increasingly recognised. Beyond potential damage on the auditory system, noise causes annoyance, disturbs sleep and impairs cognitive performance.

Furthermore, evidence from epidemiological studies has demonstrated that environmental noise is associated with an increased incidence of arterial hypertension, myocardial infarction, disruptions of sleep structure and increases in stress hormone levels (Munzel et al. 2014).

Based on the available information (see Section 8.10), the following activities have been identified as potential contributors to noise exposure during the construction phase of the project:

- MCPY construction and power generation during pipeline and AGI construction
- access road construction and use
- RoW earthworks
- AGI construction.

An increase in general economic activity due to improved access caused by road improvement may cause an increase of non-project related traffic in PACs. This increase in traffic may contribute to potentially excessive environmental noise exposure.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Disposal of Solid and Liquid Waste

It is anticipated that the project will generate different types of solid and liquid waste which will need to be managed.

Impact: Increased pressure on regional waste management facilities due to project activities

This may lead to direct impacts.

All the project districts have limited local capacity to process municipal and household waste. Waste management facilities are virtually non-existent and formal waste handling and disposal procedures are scarce. Project activities have the potential to generate significant amounts of waste belonging to diverse waste streams (see Section 2).

Improper management and disposal of waste streams have the potential to impact on community health in the following ways:

- contamination of water sources and soil by general wastes such as oils and metals and infectious wastes from sanitary waste streams has the potential to spread disease to PACs that come into contact with these. This is of particular concern as it relates to spread of infectious diarrhoeal disease
- exposure of community members to improperly discarded medical waste poses a biological exposure risk from waste that may harbour infectious diseases, injuries from contaminated needles and other sharp objects pose a substantial risk as HIV and hepatitis B and C can be transmitted as a result
- improperly managed waste sites have the potential to attract vermin and animals, which can also increase the potential for human-animal interactions. This may result in injuries from bites (snake or animal) as well as the potential spread of zoonotic diseases.

The impacts could potentially be long-term but, due to their small extent, before mitigation the impacts are considered not significant.

Use of Road Network

It is anticipated that project logistics will be extensive during the construction phase; transport of materials from Dar es Salaam and Tanga will include the transport of materials from harbours and the movement of the construction workforce.

Impact: An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases

This may lead to direct impacts.

There is the potential for increased high-risk sexual behaviours along transport corridors to, from and within the project area. Drivers are a well-documented high-risk group, often having multiple sexual partners and supporting sexual networks along transport corridors. Thus, there is the potential for an increase in high-risk sexual practices that may promote the spread and incidence of sexually transmitted infections, including HIV.

Women who are already engaged in commercial sex, often target truck drivers for commercial or transactional sex as they are away from their usual family network and have disposable income. Truck drivers (mainly men) generally target women for company and entertainment. These encounters are often transactional in nature. Women and young girls, engaged in transactional and commercial sex, are considered to be sensitive VECs to this impact.

The impacts may be felt along the whole transport route. Truck rest stops (as drivers will be expected to take rest-stops every two hours and overnight stops after 10 hours of driving) are considered high risk areas.

From a human rights perspective, there are potential impacts on the right to health associated with commercial sex work. There are also potential impacts on the rights of women and children who may be vulnerable to exploitation in commercial sex work.

The impacts will be long-term and will affect districts and regions. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are also applicable to the 20 PACs near the four MCPYs. The following specific impacts are also applicable to these PACs:

Abstraction of Groundwater

The baseline data revealed that 36% of households in the sample PACs relied on community wells for domestic water supply, while 51% had access to boreholes. However, during the dry season, water sources may dry up and households have to buy water. Shortage of clean drinking water is a concern in most of the PACs, particularly during the dry season. The districts of Mubende, Kakumiro and Sembabule, where some of the construction camps will be located, reported low levels of access to clean water.

Impact: Reduced availability of groundwater

This may lead to direct impacts.

Abstraction of groundwater to supply MCPYs may have a direct impact on the groundwater table in the vicinity of the wells through drawdown effects. This may have an adverse impact on the yield of nearby community boreholes and wells, negatively affecting the availability of safe water in PACs. This may negatively impact on the quantity and quality of available safe water for PACs near the MCPYs. During the dry season it may even lead to a total loss of the water source. A decrease in the availability of safe water may, in turn, lead to an increase in sanitation-related diseases. Households without alternative water sources in their vicinity will be most vulnerable.

From a human rights perspective, there is a potential impact on the human rights to water, sanitation and health.

The impacts will be short-term and will affect entire PACs that rely on a ground water source that is used for the project. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Employment

The project will employ both skilled and unskilled labour (see Sections 8.11 and 8.12). The majority will be skilled labour, which will be sourced outside the AOI and will be accommodated in the MCPYs.

Despite the requirement that camp residents must remain in the MCPYs after working hours, a certain amount of interaction between the project workforce and local PACs is unavoidable, primarily through the hiring of unskilled workers from PACs who will reside at home. These local workers may act as a conduit through which communicable diseases may be transferred from camp residents to PAC populations.

Impact: The transmission of communicable diseases between the project's externally contracted workforce and PACs

This may lead to direct impacts.

The utilisation of an externally contracted project workforce, including expatriates and Ugandan nationals from outside the AOI, may cause an increase in burden of communicable disease in PACs in the following ways:

- the externally contracted workforce may originate from a country or area where the burden of communicable diseases is appreciably higher than in the PACs. This refers in particular to PTB and HIV. This may increase local transmission patterns in both the project workforce and ultimately the communities, as workers work and reside in close association with one another, especially in the MCPYs. An additional risk related to the incoming workforce and PTB transmission is the potential introduction of multidrug or extreme drug resistant strains of the disease
- inadequate design and construction of the MCPYs may lead to favourable conditions that promote the spread of communicable diseases, leading to an increase in burden of communicable diseases in the workforce, and ultimately spreading to PACs through local workers working closely with MCPY residents
- inadequate development and implementation of pre-deployment and fitness-to-work medical screening programmes for project personnel may lead to the introduction of communicable diseases that may have significant public health implications, such as pandemic influenza and other novel communicable conditions.

The baseline data has shown that the capacity and capabilities of local health systems in the AOI are limited, a factor that will likely affect the initial identification and effective subsequent management of a communicable disease outbreak in PACs. It is anticipated that persons with a compromised immune status, the elderly and children below five years of age are the more sensitive VECs.

The impacts will be long-term and will affect entire PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities

This may lead to direct impacts.

Malaria and other vector control plans that are implemented by the project to provide protection to its construction workforce may, if not implemented to an adequate technical standard and in alignment with national malaria control strategies, result in the development of insecticide resistance in vectors. This may result in resistant vector populations that are no longer susceptible to vector control measures and bite prevention strategies implemented in PACs. The failure of vector control and bite prevention strategies are likely to lead to an increase in the burden of disease and associated morbidity and mortality.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: Outbreaks of infectious conditions within MCPYs affecting the health of PACs

This may lead to direct impacts.

Following interaction between the local workforce based in the MCPYs and PACs, infectious conditions may be transferred to the PACs.

The impacts will be long-term and will affect some individuals in the PACs. Due to their very large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

PIIM

As a result of the perceived potential for employment prospects and other indirect economic possibilities, PIIM of potential job seekers, commercial sex workers and business opportunity seekers is likely to occur in the project area, in particular near the MCPYs. It is anticipated that the living conditions and housing standards of these job seekers may be of a poor standard as job opportunities may be of a temporary nature only and migrants may not settle permanently but elect to migrate along the pipeline route. Poor standards of housing, associated with overcrowding and poor environmental hygiene, is a contributing factor to the development and spread of diseases in communities.

Impact: PIIM of jobseekers into PACs carrying communicable diseases

This may lead to indirect impacts.

Multiple factors may lead to an increase in communicable disease in PACs:

- the job seekers may originate from areas where the burden of various communicable diseases may be higher than in the PACs they migrate to, resulting in the introduction of a higher disease burden
- migrant job seekers may have different hygiene standards and sanitation practices that may increase the risk of disease spread
- the increase in social ills, introduced by PIIM of job seekers, may lead to an increase in commercial sex work, which, in the existing polygamous environment, may cause an increase in sexually transmitted diseases.

The increased burden of disease introduced to the PACs, together with living conditions that are conducive to the spread of these conditions, may lead to an increase in incidence of diseases, including but not limited to:

- communicable diseases linked to the living environment (e.g., acute respiratory infections (ARIs), PTB, measles)
- soil-, waste- and water-related diseases (diarrhoeal disease, cholera, schistosomiasis)
- sexually transmitted diseases, including HIV and AIDS.

Community members with a compromised immune status, the elderly and children under five are considered sensitive VECs with regards to communicable diseases linked to the living environment and soil-, waste- and water-related diseases. Young women and women engaged in transactional and commercial sex may be more vulnerable to sexually transmitted diseases.

The impacts will be very long-term and will affect districts. Owing to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Impact: PIIM of job seekers causing environmental changes in PACs that promote vector breeding

This may lead to indirect impacts.

Job seekers are likely to lodge in informal settlements generally characterised by poor housekeeping and environmental hygiene standards that promote standing water, increasing breeding habitats for vectors. This could lead to an increase in vector-related diseases in the PACs.

Community members with compromised immunity, the elderly, children under five and women are considered sensitive VECs.

The impacts will be medium-term and will affect entire PACs. Owing to their small extent, before mitigation the impacts are considered not significant.

Impact: PIIM of job seekers causing increased pressure on existing health services at the PAC level

This may lead to indirect impacts.

The existing health services in the districts traversed by the AOI reported significant challenges in relation to both capacity and capabilities. In general, all project districts reported inadequate infrastructure, number of staff and equipment required to provide an acceptable service to their target populations.

PIIM related to job seekers would, however, place additional pressure on, and in some instances even exceed the capacity of, what are already limited district level health care capabilities.

There is minimal institutional capacity to support this potential growth either from a planning, budget or delivery perspective; without early consultation, awareness and support, the inability to meet a sudden increase in demand will impact on local health service delivery. This can include acceptable infrastructure, effective supply chain for medications and consumables and diagnostic equipment.

The impacts will be medium-term and will affect entire PACs. PACs in the districts of Kakumiro, Kyankwanzi, Lwengo, Gomba and Sembabule are considered highly sensitive VECs due to difficult access to appropriate health care and services.

Owing to their small extent, before mitigation the impacts are considered not significant.

Impact: PIIM of job seekers causing uncontrolled disposal of waste in PACs

This may lead to indirect impacts.

Baseline findings show that there is limited local capacity to process municipal and household waste. Household waste is predominantly burnt in the open air near to homesteads, buried in the ground or often eaten by livestock. PIIM of job seekers may place an additional burden on existing waste management services with the potential for the spread of disease.

Most sanitation facilities conditions in PACs do not adequately prevent contact with human sewage. Development of informal settlements may exacerbate this situation. This has the potential to impact on the health of the PACs in the following ways:

- there is an existing high burden of diarrhoeal disease, and deterioration in waste management has the potential to increase the risk for spread of sanitation related diseases in the PACs. This can include diarrhoeal disease (of viral, parasitic and bacterial origin), typhoid fever, forms of dysentery, cholera, soil-transmitted helminths and schistosomiasis
- unregulated dumping and accumulation of domestic wastes may attract insects, vermin and other animals, which may potentially cause injuries to PAC inhabitants (due to human-animal interactions) and a risk for zoonotic disease transmission
- discarded domestic waste may cause an increase in favourable breeding sites for vectors and an increase in vector-related diseases.

It is anticipated that children, the elderly, immuno-compromised individuals and communities with poor access to safe water and adequate sanitation will be most likely affected.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: Reduction in the availability of potable water in PACs due to PIIM

This may lead to indirect impacts.

PIIM may increase the pressure on local water resources and the accessibility and scarcity of water supplies in many settlements may make it difficult for PACs to cope with additional demands for water. This may cause a decline in the quality and quantity of available potable water resources. In combination with poor sanitation facilities and potential poor hygiene practices, this may result in an increase in water-related diseases (i.e., diarrhoea) and potentially increase the risk of outbreaks of typhoid, dysentery and cholera.

Access to potable water is a sensitive matter because it is a fundamental human right. There is also potential for conflicts to arise in PACs where local residents and newcomers compete for access to this vital resource.

The impacts will be long-term and will affect entire PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Provision of Goods and Services

Commercial activity in the PACs consists predominantly of informal small-scale enterprises that trade in agricultural produce, daily necessity goods and basic services.

Impact: Nutrition of PACs compromised by reduced food security

This may lead to direct and indirect impacts.

Procurement of food by the project from local markets may lead to a rise in the cost of basic foodstuffs. This may impact on food security and limit the diversity of diets in households that are dependent on food procurement as opposed to subsistence agricultural activities. This may manifest as an increase in malnutrition rates.

Baseline findings identified the following districts where lack of food security was already reported: Hoima, Kakumiro and Kyotera.

The impacts will be short-term and will affect entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

8.18.2.2 Operation

Generic Impacts

The following potential generic impact, described for construction, is also applicable during pipeline and AGI operation:

Use of Road Network

Impact: An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases

This may lead to direct and indirect impacts.

The operation of the pipeline and AGIs will introduce traffic onto the road network in the immediate vicinity, primarily for the purposes of maintenance and inspection.

The mobilisation of the operational project workforce, or a portion thereof, may result in workers engaging in casual sexual practices on routes, increasing the spread and incidence of sexually transmitted infections, including HIV.

Women and young girls, engaged in transactional and commercial sex, are considered to be sensitive VECs to this impact.

The impacts will be long-term and will affect districts and regions. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location-Specific Impacts

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The following potential generic impact, described for construction, is also applicable to the eight PACs near the two pumping stations during operation:

Disposal of Solid and Liquid Waste

Impact: Increased pressure on regional waste management facilities due to project activities

This may lead to direct and indirect impacts.

During operations, the project will continue to generate waste belonging to diverse waste streams.

The impacts will be long-term and will affect entire PACs. Due to their small extent, before mitigation the impacts are considered not significant.

8.18.3 Mitigation Measures

This section describes the enhancement and impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect community health.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.18.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to community health such as minimising impacts on settlements, water points/sources and social and community infrastructure. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routing options available.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.18.3.2 Construction

Generic Mitigation Measures

Resettlement

Impact: Resettled households' exposure to areas of higher vector densities, increasing the burden of vector-related diseases

and

Impact: Resettled households' decreased food security

The resettlement action plan and grievance procedure will include measures that will all contribute to the management of health impacts for resettled households.

A resettlement action plan will describe the procedures related to compensation for loss of assets and livelihood restoration strategies. Post-resettlement monitoring of livelihood restoration measures will be implemented.

The grievance procedure allows PAC inhabitants to express grievances about the project and resettlement action plan procedures. The grievance process will be communicated to PACs and it will be clearly communicated that complaints related to interactions with public or private security forces will be addressed.

For the impact resettled households' exposure to areas of higher vector densities increasing the burden of vector-related diseases, application of these mitigation measures will reduce the magnitude of impact from medium to small and the duration of impact from long-term to short-term. The residual impact is not significant.

For the impact resettled households' decreased food security, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from medium-term to short-term. The residual impact is not significant.

Community Health

Impact: Project activities leading to an increase in vector-related diseases

The community health, safety and security plan, occupational health, safety and security plan and the stakeholder engagement plan will include measures to manage vector-related diseases.

As part of the CHSSP, community-based programmes will be developed and implemented, in cooperation with health management teams which consider the development and implementation of a community malaria control programme.

Project design specifications such as adequate drainage and the avoidance of standing water in construction sites will help manage PAC member health.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and duration of impact from medium-term to short-term. The residual impact is not significant.

Noise

Impact: Excessive noise exposure due to project activities

The community health, safety and security plan, pollution prevention plan and the stakeholder engagement plan will include measures to manage noise.

Detailed acoustic design will be undertaken for sensitive receptors which should consider location of noisy equipment away and the incorporation of noise abatement measures (e.g., acoustic barriers).

A monitoring plan will be developed and implemented to ensure that environmental noise exposure levels are periodically monitored and documented corrective measures will be implemented.

Application of these mitigation measures will reduce the magnitude of impact from small to negligible and the residual impact is not significant.

Disposal of Solid and Liquid Waste

Impact: Increased pressure on regional waste management facilities due to project activities

The waste management plan will identify suitable offsite disposal sites for waste soil and rock and implement appropriate management measures. Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible. Application of these mitigation measures will reduce the magnitude of impact from large to small with no significant residual impact.

Use of Road Network

Impact: An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases

The community health, safety and security plan, occupational health, safety and security plan, infrastructure and utilities management plan and the stakeholder engagement plan will include measures to manage the transport corridor burden of disease.

A workers' code of conduct outlining expected worker behaviours will cover the interaction between the national, international and local workforce, including interactions with PAC members.

A community health, safety and security plan will be developed to manage infectious disease outbreaks in MCPYs and to prevent their spread to PACs. A HIV/STD awareness and prevention programme, which includes monitoring, will be put in place at the rest stops used by project drivers to address the risks of HIV and STDs and the preventative measures they can take.

An awareness campaign targeting schools in PACs will address risks of relationships with transient workers, transactional and commercial sex.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and duration of impact from long-term to medium-term. The residual impact is not significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are also applicable to the 20 PACs near the four MCPYs. The following additional mitigation measures are recommended for these PACs:

Abstraction of Groundwater

Impact: Reduced availability of groundwater

The following mitigations will be included in the natural resource management plan, pollution prevention plan, waste management plan and the stakeholder engagement plan to manage groundwater availability.

As part of the project's permit application, hydraulic testing and hydrogeological impact assessments will be undertaken to evaluate the potential impact on local groundwater abstraction points. If the assessment indicates potential impacts to local users, alternative borehole locations will be considered. During project water abstraction procedure will describe requirements for monitoring community water sources including surface water and groundwater.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the duration of impact from short-term to transient. The residual impact is not significant.

Employment

Impact: The transmission of communicable diseases between the project's externally contracted workforce and PACs

Impact: Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities

Impact: Outbreaks of infectious conditions within MCPYs affecting the health of PACs

The following mitigations will be included in the community health, safety and security plan, occupational health, safety and security plan, natural resources management plan, pollution prevention plan, waste management plan and the stakeholder engagement plan to contribute to the management of these impacts.

As part of the CHSSP, community-based programmes will be developed and implemented in cooperation with government health management teams which consider the implementation of a community malaria control programme, a community HIV/TB programme, a community water, sanitation and hygiene (WASH) programme and a communicable disease plan will be developed to manage infectious disease outbreaks in MCPYs and prevention of spread to PACs.

As part of the OHSSP, a malaria and other vector control management plan will be developed and implemented to ensure adequate control over malaria and other vector-related conditions in camps.

Pre-deployment screenings will be described in the labour management plan and communicated during the recruitment process and vaccinations will be identified and administered for the prevention of communicable diseases being transmitted between the national/international and local workforce. In addition, measures will be implemented to reduce the risk of water- and food-borne disease outbreaks in camps and the associated risk of transmission to local communities.

MCPYs will be designated as having "closed" status to prevent interactions between the workforce and PACs and prevent the spread of communicable disease. Policies will be developed to manage transgressions within the project disciplinary procedures and structures and a workers' code of conduct outlining expected worker behaviours will be developed and implemented.

For the impact of the transmission of communicable diseases between the project's externally contracted workforce and PACs, application of these mitigation measures

will reduce the magnitude of impact from very large to medium and the duration of impact from long-term to short-term. The residual impact is not significant.

For the impact of inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities, application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact is not significant.

For the impact outbreaks of infectious conditions within MCPYs affecting the health of PACs, application of these mitigation measures will reduce the magnitude of impact from very large to medium and the residual impact is not significant.

PIIM

Impact: PIIM of jobseekers into PACs carrying communicable diseases,

The following mitigation will be included in the PIIM management plan, community health, safety and security plan and the stakeholder engagement plan to manage effects of PIIM on communicable diseases.

A PIIM management plan will be developed and implemented for the project with the aim of reducing the number of people that arrive into PACs and mitigating the impacts of PIIM that does occur.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and the duration of impact from very long-term to long-term. The residual impact is not significant.

Impact: PIIM of job seekers causing environmental changes in PACs that promote vector breeding

Impact: PIIM of job seekers causing increased pressure on existing health services at the PAC level

Impact: PIIM of job seekers causing uncontrolled disposal of waste in PACs

Impact: Reduction in the availability of potable water in PACs due to PIIM

The following mitigations will be included in the PIIM management plan, community health, safety and security plan, occupational health, safety and security plan, resettlement action plan, natural resource management plan, pollution prevention plan, waste management plan and the stakeholder engagement plan to contribute to the management of these impacts.

A PIIM management plan will be developed and implemented for the project with the aim of reducing the number of people that arrive into PACs and mitigating the impacts of PIIM that does occur.

In addition, a cooperation agreement with the district health management teams (DHMTs) will be reached to evaluate potential health impacts, proposed mitigation measures and monitoring of specific key health indicators during construction.

For the impact of PIIM of job seekers causing environmental changes in PACs that promote vector breeding, application of these mitigation measures will reduce the magnitude of impact from large to medium and the residual impact is not significant.

For the impact of PIIM of job seekers causing increased pressure on existing health services at a PAC level, application of these mitigation measures will reduce the magnitude of impact from medium to small and the duration of impact from medium-term to short-term. The residual impact is not significant.

For the impact of PIIM of job seekers causing uncontrolled disposal of waste in PACs, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from long-term to short-term. The residual impact is not significant.

For the impact of reduction in the availability of potable water in PACs due to PIIM, application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from long-term to short-term. The residual impact is not significant.

Provision of Goods and Services

Impact: Nutrition of PACs compromised by reduced food security

The community health, safety and security plan, occupational health, safety and security plan, resettlement action plan, natural resource management plan, pollution prevention plan, waste management plan and the stakeholder engagement plan to contribute to the management of this impact.

An agreement with the DHMTs will be reached to discuss potential health impacts, proposed mitigation measures and longitudinal monitoring of specific key health indicators during construction.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact is not significant.

8.18.3.3 Operation

Generic Mitigation Measures

Use of Road Network

Impact: An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases

The community health, safety and security plan, occupational health, safety and security plan, the infrastructure and utilities management plan and the stakeholder engagement plan will include measures that will contribute to the control of this impact.

A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with PAC members.

A community health, safety and security plan will be developed to manage infectious disease outbreaks in MCPYs and prevention of spread to PACs and a HIV/STD awareness and prevention programme will be put in place at the rest stops used by project drivers to raise awareness about the risks of HIV and STDs and preventative measures that they can take.

An awareness campaign targeting schools within the project AOI will be developed, addressing risks particularly to girls of relationships with transient workers, and transactional sex.

Application of these mitigation measures will reduce the magnitude of impact from large to medium and the duration from long-term to medium-term. The residual impact is not significant.

Location-Specific Mitigation Measures

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The following generic mitigation measures, described for construction, are also applicable to the eight PACs near the two pumping stations during operation:

Disposal of Solid and Liquid Waste

Impact: Increased pressure on regional waste management facilities due to project activities

The waste management plan will identify suitable offsite disposal sites for waste soil and rock and implement appropriate management measures. Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact is not significant.

8.18.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on community health after mitigation measures have been implemented.

Table 8.18-1 summarises the potential generic community health impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.18-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on community health are considered not significant.

8.18.4.1 Ecosystem Services

Section A11.4.11 in Appendix A11 identifies ecosystem services associated with community health. The following ecosystem services have been assessed in Sections 8.18.2 and 8.18.3:

Water-related diseases are linked to safe water, which provides the following ecosystem services:

Provisioning services:

- general health
- form of livelihood (see Section 8.14 on river and lake-based livelihoods).

Social cultural health practices are linked to the use of wild plants, which provides the following ecosystem service:

Provisioning services:

- ingredients for treatment of common illnesses (traditional medicine).

With the implementation of the planned mitigation measures, the residual impact on the above services will be not significant.

Table 8.18-1 Community Health – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Resettlement	Resettled households' exposure to areas of higher vector densities, increasing the burden of vector-related diseases	C	Y	Resettlement Action Plan	4	2	1	5	12
Resettlement	Resettled households' decreased food security	C	Y	Resettlement Action Plan	4	2	1	4	11
Community Health	Project activities leading to an increase in vector-related diseases	C	-	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Stakeholder Engagement Plan	6	2	3	4	15
Noise	Excessive noise exposure due to project activities	C	-	Community Health, Safety and Security Plan Pollution Prevention Plan Stakeholder Engagement Plan	2	2	2	4	10
Disposal of Solid and Liquid Waste	Increased pressure on regional waste management facilities due to project activities	C	-	Waste Management Plan	4	2	2	5	13
Use of Road Network	An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases	C & O	Y	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Infrastructure and Utilities Management Plan Stakeholder Engagement Plan	6	4	2	5	17

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.18-2 Community Health – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYS	Abstraction of Groundwater	Reduced availability of groundwater	C	Y	Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	1	2	4	11
PACs near the four MCPYS	Employment	The transmission of communicable diseases between the project's externally contracted workforce and PACs	C	Y	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	6	2	2	5	15
PACs near the four MCPYS	Employment	Inadequate vector management activities, causing an increase in vector resistance and negative impacts on preventative interventions implemented by local authorities	C	-	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	2	1	5	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.18-2 Community Health – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Employment	Outbreaks of infectious conditions within MCPYs affecting the health of PACs	C	Y	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	6	4	1	4	15
PACs near the four MCPYs	PIIM	PIIM of jobseekers affecting PACs by: carrying communicable diseases	C	Y	Project-Induced In-Migration Management Plan Community Health, Safety and Security Plan Stakeholder Engagement Plan	6	4	3	5	18

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.18-2 Community Health – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	PIIM	PIIM of jobseekers affecting PACs by: causing environmental changes in PACs that promote vector breeding	C	Y	Project-Induced In-Migration Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Resettlement Action Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	6	3	2	4	15
PACs near the four MCPYs	PIIM	PIIM of jobseekers affecting PACs by: causing increased pressure on existing health services at the PAC level	C	Y	Project-Induced In-Migration Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Resettlement Action Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	2	2	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.18-2 Community Health – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	PIIM	PIIM of jobseekers affecting PACs by: causing uncontrolled disposal of waste in PACs	C	-	Project-Induced In-Migration Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Resettlement Action Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	2	2	5	13
PACs near the four MCPYs	PIIM	Reduction in the availability of potable water in PACs due to PIIM	C	Y	Project-Induced In-Migration Management Plan Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Resettlement Action Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	2	2	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.18-2 Community Health – Location-Specific Impacts

Location	Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Provision of Goods and Services	Nutrition of PACs compromised by reduced food security	C	Y	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Resettlement Action Plan Natural Resources Management Plan Pollution Prevention Plan Waste Management Plan Stakeholder Engagement Plan	4	2	2	5	13
PACs near PS1 and PS2	Disposal of Solid and Liquid Waste	Increased pressure on regional waste management facilities due to project activities	O	-	Waste Management Plan	4	4	2	5	15

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.18.5 Transboundary Project Impacts

8.18.5.1 Generic Transboundary Project Impacts

Use of Road Network

Impact: An increase in the burden of disease along the project's transport corridors caused by drivers spreading communicable diseases

It is anticipated that project long-range movements will be extensive during construction with transport of materials, equipment and personnel across the Tanzania–Uganda border. There is the potential for transfer of communicable disease between countries.

The potential for an increase in the BOD along the project's transport corridors will be managed through the mitigation measures described in Section 8.18.3. After mitigation has been implemented, the potential residual impact is considered not significant.

8.18.5.2 Location-Specific Transboundary Project Impacts

No location-specific transboundary project impacts have been identified in relation to community health.

8.18.6 Cumulative Impacts

8.18.6.1 Context

Section 6.4.3.13 describes the baseline condition of community health, the trends and sensitivity to change. Table 8.18-1 and Table 8.18-2 summarise project residual impacts.

There are several community health challenges in Uganda. These include inadequate cover by health facilities, a high burden of communicable, vector-related and infectious diseases, increasing burden of non-communicable diseases, inadequate waste, water and sanitation facilities and a shortage of medical supplies and equipment.

Section 8.18.2 describes the project impacts. The residual project impacts that may contribute to cumulative impacts include:

- an increase in the burden of disease along the project's transport corridors caused by drivers spreading infectious, communicable and zoonotic diseases
- decreased food security
- outbreaks of infectious diseases in the construction camp
- PIIM of job seekers who may
 - o transmit communicable diseases
 - o create local environments conducive to vector breeding
 - o increase pressure on existing health services and waste management facilities.

Associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H. These are:

- associated facilities:
 - o Tilenga Project (AF01)
 - o Kingfisher Oil Project (AF02)
- third-party developments:
 - o transmission line from the Tilenga Central Processing Facility (CPF) to Kabaale (UG0A)
 - o Kabaale International Airport (UG04)
 - o transmission lines to Kabaale Airport (UG05)
 - o refinery (UG07)
 - o Hoima-Buloba pipeline (UG08)
 - o Lot 4 R4 Kabaale-Kiziranfumbi road upgrade (UG19)
 - o Buhimba to Kakumiro road upgrade (UG20)
 - o construction camp for Bulima–Kabwoya road (UG21)
 - o Bulima–Kabwoya road upgrade (UG22)
 - o transmission line extension (UG34)
 - o ICT infrastructure installation (UG44).

The preferred condition is no outbreak or increase in disease and no overburdening of the healthcare system by the EACOP project in combination with the associated facilities and third-party developments.

8.18.6.2 Cumulative Impacts

Associated Facilities

Potential cumulative impacts are predicted based on if the EACOP, Tilenga and Kingfisher projects have parallel or consecutive construction phase timelines.

Infectious and Communicable Diseases

While the workforce for the EACOP, Tilenga and Kingfisher projects are to be housed in closed camps, outbreaks and spread of infectious and communicable diseases (including HIV and AIDS) could occur because of the EACOP, Tilenga and Kingfisher project labour forces engaging with PAC members and each other's labour forces. There is an increased cumulative risk of outbreaks and spread of diseases in the situations described below.

Transport Routes

The use of transport routes by both the EACOP project and the Tilenga Project and Kingfisher Oil Project may increase the potential spread of communicable diseases, particularly sexually transmitted diseases (STDs) at rest stops.

This cumulative impact may apply to Buseruka subcounty where roads are jointly used by the EACOP project and the Tilenga and Kingfisher projects, in particular to the following PACs near roads used by the projects: Kayere (KP0), Katooke (KP1.5) and Nyamosoga (KP0).

Information from the Tilenga Project and Kingfisher Oil Project indicates that mitigation measures similar to those described in Section 8.18.3 will be implemented. In addition, the project will liaise with the proponents of the associated facilities and relevant government bodies to consider options for management measures to address the cumulative impacts. This may include sharing information about worker and community health management strategies, to enable an efficient and coordinated HIV prevention plan.

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

PIIM

The effects of PIIM associated with the EACOP project such as increased rates of diseases overburdening local health facilities, water shortages, uncontrolled disposal of waste leading to environmental and health hazards and vector breeding increasing the transmission of malaria, may be exacerbated by the concurrent construction of the Tilenga Project and Kingfisher Oil Project feeder pipelines.

Cumulative impacts between EACOP and the associated facilities are most likely to occur in Buseruka subcounty and Hoima municipality at the following PACs: Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5).

The project will liaise with the Tilenga Project and Kingfisher Oil Project to support the management of potential cumulative impacts relating to PIIM and engage with relevant stakeholders (authorities and civil society) to identify patterns of population in-migration, associated consequences and appropriate mitigation measures and interventions.

The project will also participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants.

With the management measures implemented, the preferred condition will be achieved, and the residual cumulative impact is considered not significant.

Decreased Food Security

Cumulative impacts of land acquisition for EACOP and the Tilenga Project and Kingfisher Oil Project feeder pipeline components may leave insufficient land available for farming, grazing and collection of natural resources, potentially affecting households' food security. This may apply to the following PACs: Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5).

Information from the Tilenga Project and Kingfisher Oil Project indicates that mitigation measures similar those described in Section 8.18.3 will be implemented. In addition, the project will engage proponents of the associated facilities and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include collaboration on livelihood restoration programmes.

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Third-Party Developments

Potential cumulative impacts are predicted where the EACOP project and third-party developments have concurrent or consecutive construction phase timelines. The third-party developments' construction timeframes are not confirmed at the time of writing but, for this assessment, it has been assumed that the construction activities will be conducted in similar timeframes.

The third-party developments, EACOP AGIs and MCPYs and the subcounties that may be impacted are shown in Table 8.18-3.

Table 8.18-3 Cumulative Impacts: Community Health

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG0A	Transmission line from the Tilenga CPF to Kabaale	0	PS1, approximately 3.5 km from UG0A	Buseruka subcounty, Hoima district
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district
UG05	Transmission lines to Kabaale Airport	12	PS1, approximately 3.9 km from UG05 Crosses EACOP at KP12	Buseruka subcounty, Hoima district
UG07	Refinery	0	PS1, approximately 0.2 km from UG07	Buseruka subcounty, Hoima district
UG08	Hoima–Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 runs parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Buseruka, Kiziranfumbi and Buhimba and Buhanka subcounties, and Busisi, Kahoora and Mparo divisions, Hoima district Nsambya, Butemba, Wattuba and Mulagi subcounties, and Butemba TC, Kyankwanzi district Kapeke, Lwamata and Bukomero subcounties, and Kigoba, and Bukomero TC, Kigoba district Kikandwa and Ssekanyonyi subcounties, Mityana district Namayumba, Kakiri and Wakiso subcounties and Kakiri, and Namayumba TC, Wakiso district Muduuma and Kirigente subcounties, Mpigi district

Table 8.18-3 Cumulative Impacts: Community Health

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG19	Lot 4 R4 Kabaale-Kiziranfumbi road upgrade	0–19 188– 189	PS1, approximately 3.2 km from UG 19	Kyangwali Kabwoya and Kyangwali subcounties, Hoima district
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Buhimba subcounty, Hoima district Kisiita and Nalweyo subcounty, and Kakumiro TC, Kakumiro district
UG21	Construction camp for Bulima-Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from pipeline	Kiziranfumbi subcounty, Hoima district
UG 22	Bulima – Kabwoya road upgrade	19	Crosses pipeline at KP19	Kahoora and Busisi divisions, and Buhimba, Kiziranfumbi and Kabwoya subcounties, Hoima district
UG34	Transmission line extension	133	UG34 crosses MCPY2	Kitenga and bagezza subcounties, Mubende district
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses EACOP at KP223	Kakuuto, Kasasa, Kasaali, Kalisizo, and Kirumba subcounties, and Kalisizo and Kyotera TC, Kyotera district Kabonera, Kimaanya/Kyabakuza, Katwe/Butego, Nyendo/Ssenyange and Mukungwe subcounties, Masaka district Kkingo, Kisekka and Lwengo subcounties and Lwengo TC, Lwengo district Bukulula subcounty and Lukaya TC, Kalungu district Nkozi, Buwama, Kammengo and Kirigente subcounties, and Mpigi TC, Mpigi district Nsangi subcounty, Wakiso district Lubaga division, Kampala district

The potential cumulative impact of the third-party developments are similar to those of the associated facilities and are summarised below:

Infectious and Communicable Diseases

As described above under associated facilities there is a heightened cumulative risk of outbreaks and spread of diseases from the concurrent or consecutive construction of the EACOP project and the third-party developments in Table 8.18-3. This may occur in the situations described below.

Transport Routes

The use of transport routes by both the EACOP project and the third party developments may increase the potential spread of communicable diseases. This cumulative impact may apply to all the subcounties included in the table above.

The project will liaise with the proponents of third party developments and relevant government bodies to consider options for management measures to address the cumulative impacts. This may include sharing information about their worker and community health management strategies, to enable an efficient and coordinated HIV prevention plan.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Construction Camps

The EACOP project and third-party developments may increase the risk of outbreaks of contagious diseases if their construction schedules coincide and they have construction camps in each other's AOI. The fact that EACOP has a closed camp will reduce this risk. However, due to lack of available data on the existence and location of construction camps for the third-party developments at the time of writing no detailed analysis could be conducted of this potential cumulative impact. Because of the proximity to the EACOP and third-party construction camps (using available information at the time of writing) cumulative impacts are most likely to occur in:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) PACs caused by the EACOP project and the refinery, Kabaale international airport and the transmission lines to Kabaale airport
- Kabaale-Kyabicwe (KP35), Kisenyi (KP40), Kakende (KP29.5) and Katikara (KP41) caused by the EACOP project and the Hoima-Buloba pipeline and the Buhimba to Kakumiro road upgrade.

The project will engage proponents of the third-party developments to consider options for management measures to address the cumulative impacts. This may include sharing information about their worker and community health management strategies, to enable an efficient and coordinated response to any potential disease outbreak.

With the above mitigation measure, the preferred condition will be achieved and the residual cumulative impact is considered not significant

PIIM

Cumulative impacts similar to those identified for the associated facilities may occur because of EACOP and the third-party developments. However due to lack of available data on the existence and location of construction camps of third party developments at the time of writing detailed analysis could not be conducted. Using available information cumulative impacts are most likely to occur in the same PACs as those listed above.

The project will liaise with the third-party developments to support the management of potential cumulative impacts relating to speculation, the project will engage with

relevant stakeholders (authorities and civil society) to identify patterns of population in-migration, associated consequences and identify appropriate mitigation measures and interventions.

The project will also participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants.

With the additional mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Decreased Food Security

Cumulative impacts from EACOP and the third-party developments are similar to those of the associated facilities. PACs potentially impacted by the EACOP project and third parties include:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the EACOP project and the transmission line from the Tilenga CPF to Kabaale, the Kabaale international airport, the transmission lines to Kabaale airport, the refinery, the Hoima-Buloba pipeline and the R4 Kabaale-Kiziranfumbi road upgrade
- Katikara (KP41) and Kisenyi (KP40) caused by the EACOP project and the Buhimba to Kakumiro road upgrade.

The project will engage proponents of the third-party developments and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include collaboration on livelihood restoration programmes.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

8.18.6.3 Transboundary Cumulative Impacts

Transboundary cumulative impacts may occur as a result of construction activities for the EACOP project and the Tilenga project. Traffic bringing coated pipe and other imported construction materials for the EACOP project and the Tilenga project is likely to travel along the same routes through Tanzania and Uganda. There is no information from the Kingfisher project regarding transboundary transport routes.

The communities along the transport routes used by both EACOP and the Tilenga project could be vulnerable to the spread of communicable diseases. If the same rest stops are used these areas could experience increased risk of STDs.

In the unlikely event of an outbreak, the project will share information with the associated facilities about their worker and community health management strategies to ensure that they are commensurate and enable an efficient and coordinated response to any potential disease outbreak.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

8.19 Community Safety, Security and Welfare

This section describes potential impacts on community safety, security and welfare during the construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

There is potential for traffic to impact on community safety, security and welfare due to project-related road traffic accidents involving PAC members. Road traffic accidents are considered in Section 9, Unplanned Events.

8.19.1 Key Sensitivities and Considerations

The community safety, security and welfare baseline conditions are described in Section 6.4.3.14, as well as:

- community health, safety and security key VECs and their sensitivity ranking based on the relevant tables in Appendix D
- key considerations for the community safety, security and welfare impact assessment.

Sensitivity in the community safety, security and welfare AOI is ranked as very high for women; cultural attitudes toward women and their role within the household hinders many females in PACs from engaging in income-generating activities and decision-making processes. Widow headed households, the elderly and the disabled are ranked as very highly sensitive because they are challenged to meet basic household needs and afford health care. Children are ranked as very highly sensitive, particularly those from poor households, AIDS orphans and boys from pastoralist and plantation agriculture communities, who will be less likely to attend school and are more likely to be relied upon to perform household tasks. Youths are also ranked as very highly sensitive due to their limited access to productive assets, lack of education and vocational skills and scarce employment opportunities. People living with illnesses are ranked as very highly sensitive as they are reliant on other people for financial and food security. Land users without land titles are also deemed very highly sensitive because, without formal acknowledgement of land ownership, they will not be eligible for compensation (only for crops grown).

Key considerations are:

- there are effective established mechanisms for conflict resolution and support groups at village level; however, lack of land and migrations, emerging use of technology and intermarriage are reducing their effectiveness
- although PACs are generally peaceful, conflicts arise because of changing demographics and decentralisation, underlining the requirement for effective stakeholder engagement
- there are vulnerable groups which will need special considerations.

Section A11.4.12 in Appendix A11 identifies that community safety, security and welfare does not provide ecosystem services.

The right to life and the right to health are the main human rights at risk. Women's rights also apply as they are particularly vulnerable to health risks related to interactions with truck drivers along trucking routes. International standards for responsible business also require that negative impacts of projects on communities

should be avoided or at least minimised, and for organisations to be prepared to react to emergency situations to prevent and mitigate harm to people and the environment. The UN has proclaimed 2011–2020 the International Decade of Road Safety and has developed documents to address the matter. Traffic safety is described in Section 9, Unplanned Events.

Regarding community security, the right to life can be at risk as well as the related rights to liberty and security of the person and the right to be free from cruel, inhuman or degrading treatment. Women's rights also apply as they are particularly vulnerable to certain security risks related to EACOP. The Voluntary Principles on Security and Human Rights (VPSHR) are the main reference in terms of security and human rights. International standards for responsible business also require that negative impacts of projects on communities should be avoided or at least minimised, and that security personnel hired must be chosen and trained to ensure that they are not a threat to persons inside or outside the project.

Regarding community welfare, the right to health, the rights to liberty and security of the person, the right to an adequate standard of living and the right to a healthy environment are all potentially affected by PIIM into communities in the AOI (see Section 4).

8.19.2 Potential Project Impacts

8.19.2.1 Construction

Generic Impacts

Community Safety

Baseline data indicates that PACs are generally not safety conscious. Children often roam freely around the village without adult supervision and may approach the construction sites. Risks to people from project traffic are addressed in Section 9.

Impact: Community health and safety incidents associated with construction activities causing accidents other than traffic accidents

This may lead to direct and indirect impacts.

The project activities that may pose a risk of accidents and injuries during construction include:

- inadequate access control of project sites. This may result in the community gaining entry to construction and other sites and sustaining injuries from accidental interaction with mobile construction equipment or through injuries sustained from falling into excavations, or interaction with construction materials and other environmental changes
- spills and accidental discharges of hazardous chemical substances (HCS).

The project will utilise different types of HCS in the construction phase to support elements of the project, including:

- insecticides, pesticides and rodenticides to control insect and other vermin such as rats

- chlorine and associated water treatment chemicals used in the treatment of potable water as well as waste water
- materials for construction and maintenance, including paints and solvents as well as flux and welding rods
- domestic cleaning agents
- petroleum products to support heavy vehicles and light duty vehicles, including diesel fuel, mineral oils, grease, degreasers and so forth
- potentially contaminated surface water including storm water, fire water and wash-down water originating from dirty areas.

Accidental discharge of any of the abovementioned HCS during the construction phase may affect PACs in proximity to the spill, through various impact pathways, and deteriorate health in PACs.

The impacts will be short-term and will affect some households within the PACs. It is anticipated that children will be most vulnerable. Due to their short-term nature and localised extent, before mitigation the impacts are considered not significant.

Community Dynamics

PACs are usually peaceful but conflicts, mostly over land and natural resources, occasionally arise.

Households are tightly knit and interdependent with regards to livelihood activities. However, domestic disputes do occur and GBV is common.

Conflicts are predominantly resolved by the parties involved or community leaders; when these mechanisms fail, third parties (i.e., the police, local government officers) may get involved. The establishment of formal policing and security measures in the PACs is minimal.

Women are typically marginalised with regards to education, employment opportunities, access to and ownership of assets (both land and property) and decision-making. Widows and female headed households are considered particularly vulnerable and, as a result, women are deemed very highly sensitive to several of the impacts described under this VEC.

Impact: The capturing of project benefits by men leads to a decrease in quality of life and access to resources for women and children in PACs

This may lead to direct and indirect impacts.

Men in the PACs may benefit from employment or compensation payments for loss of assets by the project. Existing cultural and social norms in the project districts favour the available project-related employment opportunities to be allocated to men.

Among PAPs, the main preference for compensation among men tends to be cash payments rather than in-kind compensation. The increased disposable income of men from compensation may not necessarily be used for the benefit of the household. Increased access to cash by men in the PACs may negatively impact on the quality of life of women and children in the household. It may lead to:

- increase in the incidence of social ills such as substance abuse, crime and a rise in GBV with regards to spouse and children

- loss of food security, especially for those households that do not, or no longer, engage in subsistence agriculture and depend on procuring food due to the income being spent on non-food items.

The impacts may be long-term and will affect some households within the PACs. Poor households where women do not have access to income-earning opportunities are likely to be most affected. Due to their localised extent, before mitigation the impacts are considered not significant.

Impact: Conflict between PACs and project security personnel

This may lead to direct and indirect impacts.

During pipeline construction, security measures will be implemented along the pipeline RoW. Security posts and facilities will be established at pumping stations, along the RoW and at MCPYs.

Dissatisfaction in PACs over lack of project opportunities and benefits may lead to resentment among PAC members and may cause hostility toward project personnel. This could lead to conflict, demonstrations against the project or blockages. Any potential further escalation of conflict may require intervention by the national police force. The use of inexperienced security personnel or local security forces, who have not been adequately trained in the VPSHR, may lead to an escalation of conflict and the inappropriate use of force causing injuries to community members.

Members of PACs involved in ASM are considered sensitive VECs as it may be more difficult to keep them away from known mineral deposits (particularly gold). This may increase the interactions between miners and project security personnel.

The impacts will be long-term and will affect entire PACs. Due to their large magnitude and very high sensitivity, before mitigation the impacts are considered significant.

Location-Specific Benefits

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

Community Welfare

Benefit: Conversion of MCPY structures into community facilities, leading to improved service provision in PACs

After construction has been completed, the MCPYs, or some of the camp structures, may be transferred to the Government (see Section 2). The Government may convert the structures into community facilities (e.g., schools, medical facilities) and manage them on behalf of the host communities. In this case, there may be a positive impact on public service provision in PACs. This may lead to improvements at the household level with regards to living standards, health and education.

There may be a positive impact on the human right to health, education and an adequate standard of living.

Location-Specific Impacts

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The potential generic impacts are applicable to the 20 PACs near the four MCPYs. The following specific impacts are also applicable to these PACs:

Community Dynamics

Impact: Change in local community dynamics due to employment opportunities

This may lead to direct and indirect impacts.

The availability of economic opportunities for some PAC members could create income disparities and prompt a shift in local power dynamics and community structure. Employed youth may begin to challenge established local hierarchies and leadership structures, potentially resulting in a decline in community social cohesion. This may cause deterioration in well-being at the community level and a sense of insecurity and distrust among PAC members.

The employment of women may challenge household and community power structures. Marital clashes may occur where spousal support for women's employment in the project is absent.

The impacts will be medium-term and will affect the entire PACs. Due to their small extent, before mitigation the impacts are considered not significant.

Impact: PIIM causing an increase in social ills

This may lead to indirect impacts.

PIIM is likely to occur in areas and PACs where the potential for employment is perceived to be higher and other indirect benefits of the project may be anticipated. The PIIM of job seekers may result in a loss of social cohesion and traditional values and structures in these PACs which, in turn, may cause an increase in social ills (e.g., substance abuse, crime, commercial sex work, unplanned pregnancies and so forth).

Substance abuse is a significant contributor to social ills and gender-based domestic violence, as well as influencing crime and practices such as transactional sex and commercial sex work.

The impacts will be short-term and will affect the entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Impact: Tensions between non-local construction workforce and PACs

This may lead to direct and indirect impacts.

A proportion of project workers will be non-local and will belong to different ethnic groups and nationalities that have different cultural traditions and values from the PACs. These workers will be housed in the MCPYs near PACs and their lack of

local social ties may encourage anti-social behaviour, causing tension and potentially conflict with PAC members.

The impacts will be short-term and will affect the entire PACs. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Location: RoW: Mutukula Town, Kyotera District, KP295.5

The potential generic impacts are also applicable to the border town of Mutukula. The following impact, described for the MCPYs, is also applicable to this PAC:

Community Dynamics

Impact: PIIM causing an increase in social ills

This may lead to indirect impacts.

Mutukula has a thriving commercial sex work industry with a relatively large number of sex workers. An increase in substance abuse in Mutukula during pipeline construction may lead to a growth in the town's commercial sex work industry, increasing the risk of Mutukula's sex workers to matters such as GBV.

The impacts will be short-term and will affect the entire PAC. Due to their short-term nature and small extent, before mitigation the impacts are considered not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The potential generic impacts are also applicable to the eight PACs near the two pumping stations.

8.19.2.2 Operation

Generic Impacts

There are no generic impacts during pipeline and AGI operation. Security provision during operations will be in accordance with international and project requirements.

Location-Specific Impacts

There are no location-specific impacts during pipeline and AGI operation.

8.19.3 Mitigation Measures

This section describes the enhancement measures and impact avoidance and mitigation measures that will be applied to the aspects and activities that could affect community safety, security and welfare.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included in Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.19.3.1 Design

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered social aspects relating to community safety, security and welfare such as minimising impacts on settlements, social and community infrastructure (including places of worship) and security. The selected pipeline route was chosen partly because it had the lowest number of social constraints of the routeing options available.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.19.3.2 Construction

Generic Mitigation Measures

Mitigation measures relating to road safety, including for pedestrians, are discussed in Section 9.

Community Safety

Impact: Community health and safety incidents associated with construction activities causing accidents other than traffic accidents

The community health, safety and security plan, occupational health, safety and security plan and the stakeholder engagement plan will include measures to manage incidents. Regular meetings will be held with PAC representatives during construction to provide updates on construction progress and to receive comments or queries. In addition, specific measures will be implemented including, but not limited to:

- Construction barriers will have visible warning signs understandable by local communities. Signage will be in accordance with internationally accepted symbols and/or be well known to local communities.
- Welded pipe sections will be capped to prevent people entering a risk assessment will be conducted for excavations with consideration to community safety
- A first aid needs assessment will be undertaken for each camp to determine first aider and first aid kit requirements (e.g., qualifications, content of kits, locations).

Application of these mitigation measures will reduce the magnitude of impact from very large to small and the residual impact is not significant.

Community Dynamics

Impact: The capturing of project benefits by men leads to a decrease in quality of life and access to resources for women and children in PACs

The community health, safety and security plan, stakeholder engagement plan, labour management plan and the resettlement action plan will include measures that contribute to management of project benefits.

Financial management workshops will be held with workers to raise levels of financial literacy. During the recruitment process and throughout their contract, workers will be advised regularly that the duration of their employment is temporary and that they should maintain their existing livelihoods and prepare for the termination of their employment.

An information, education and communication programme will be developed for workers addressing social conduct and including topics such as gender-based violence and drug and alcohol misuse.

In relation to resettlement, during the land surveys, entitlement briefings and compensation agreement, both spouses will be consulted and present and both will sign the compensation agreements.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the duration of impact from long-term to short-term. The residual impact is not significant.

Impact: Conflict between PACs and project security personnel

The community health, safety and security plan and stakeholder engagement plan will include measures to manage conflicts with security personnel.

The Voluntary Principles on Security and Human Rights (VPSHR) will be implemented by the project. Security personnel (this will include where army and/or security forces engaged by the project) will receive training and their performance in relation to VPSHR compliance will be monitored.

Public awareness programmes for stakeholders will include information on the security presence around camps and security protocols which apply. The project grievance procedure will be available for grievances related to security considerations.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the duration from long-term to short-term. The residual impact is not significant.

Location-Specific Mitigation Measures

Location: Main Camp and Pipe Yard 1 (Kakumiro District, KP40), Main Camp and Pipe Yard 2 (Mubende District, KP125), Main Camp and Pipe Yard 3 (Sembabule District, KP195.5) and Main Camp and Pipe Yard 4 (Kyotera District, KP283)

The generic mitigation measures are also applicable to the 20 PACs near the four MCPYs. The additional specific mitigation measures are recommended for these PACs:

Community Dynamics

Impact: Change in local community dynamics due to employment opportunities and

Impact: PIIM causing an increase in social ills

The following mitigations will be included in the PIIM management plan, community health, safety and security plan and the stakeholder engagement plan to contribute

to the management of local community dynamics and PIIM causing an increase in social ills.

A PIIM management plan will be developed and implemented for the project with the aim of reducing the number of people that arrive into PACs and mitigating the impacts of PIIM that does occur.

The grievance procedure will be communicated to and promoted within all PACs and it will be clearly communicated to PACs that complaints related to PIIM will be addressed.

For the impact changes in local community dynamics due to employment opportunities, application of these mitigation measures will reduce the magnitude of impact from medium to small and the duration of impact from medium-term to short-term. The residual impact is not significant.

For the impact of PIIM causing an increase in social ills, application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact is not significant.

Impact: Tensions between non-local construction workforce and PACs

The community health, safety and security plan, stakeholder engagement plan and the resettlement action plan will include measures that contribute to management of community – workforce tensions.

A workers' code of conduct outlining expected worker behaviours will be developed and implemented. This code of conduct will cover the interaction between the national and international workforce and local workforce but also interactions with PAC members not employed by the project. Compliance with the workers' code of conduct will be a contractual requirement for all contractors, including subcontractor employees.

Application of these mitigation measures will reduce the magnitude of impact from large to small and the residual impact is not significant.

Location: RoW: Mutukula Town, Kyotera District, KP295.5

The generic mitigation measures are also applicable to the border town of Mutukula. The additional specific mitigation measures, described for the MCPYs, are recommended for this PAC:

Community Dynamics

Impact: PIIM causing an increase in social ills.

The following mitigations will be included in the PIIM management plan, community health, safety and security plan and the stakeholder engagement plan to contribute to the management of PIIM causing an increase in social ills.

A PIIM management plan will be developed and implemented for the project with the aim of reducing the number of people that arrive into PACs and mitigating the impacts of PIIM that does occur.

The grievance procedure will be communicated to and promoted within the PAC and it will be clearly communicated to the PAC that complaints related to PIIM will be addressed.

Application of these mitigation measures will reduce the magnitude of impact from medium to small and the residual impact is not significant.

Location: Pumping Station 1 (Hoima District, KP0) and Pumping Station 2 (Sembabule District, KP184.5)

The generic mitigation measures are also applicable to the eight PACs near the two pumping stations.

8.19.3.3 Operation

Generic Mitigation Measures

As there are no predicted generic impacts during pipeline and AGI operation, no mitigation measures are required.

With Respect to Human Rights

The labour management plan, occupational health, safety and security plan and the community health, safety and security plan will ensure that project performance regarding the Voluntary Principles on Security and Human Rights will be reviewed and performance improvement addressed where necessary.

Location-Specific Mitigation Measures

As there are no predicted location-specific impacts during pipeline and AGI operation, no mitigation measures are required.

8.19.4 Residual Impacts and Significance Summary

This section describes the residual impacts on community safety, security and welfare after mitigation measures have been implemented.

Table 8.19-1 summarises the potential generic community safety, security and welfare impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation.

Table 8.19-2 summarises the location-specific impacts.

After mitigation has been implemented, the potential residual impacts on community safety, security and welfare are considered not significant.

8.19.4.1 Ecosystem Services

Section A11.4.12 in Appendix A11 identifies that community safety, security and welfare does not provide ecosystem services.

Table 8.19-1 Community Safety, Security and Welfare – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Management Plan(s)	Residual Impact				
					M	D	E	S	SS
Community Safety	Community health and safety incidents associated with construction activities other than traffic accidents	C	Y	Community Health, Safety and Security Plan Occupational Health, Safety and Security Plan Stakeholder Engagement Plan	4	2	1	5	12
Community Dynamics	The capturing of project benefits by men leads to a decrease in quality of life and access to resources for women and children in PACs	C	Y	Community Health, Safety and Security Plan Stakeholder Engagement Plan Labour Management Plan Resettlement Action Plan	4	2	1	5	12
Community Dynamics	Conflict between PACs and project security personnel	C	-	Community health, safety and security plan Stakeholder engagement plan	4	2	2	5	13

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.19-2 Community Safety, Security and Welfare – Location-Specific Impacts

Location	Activity	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Community Welfare	Conversion of MCPY structures into community facilities, leading to improved service provision in PACs	C	Y		B				
PACs near the four MCPYs	Community Dynamics	Change in local community dynamics due to employment opportunities	C	Y	Project induced in-migration management plan Community health, safety and security plan Stakeholder engagement plan	4	2	2	4	12
PACs near the four MCPYs	Community Dynamics	PIIM causing an increase in social ills	C	Y	Project induced in-migration management plan Community health, safety and security plan Stakeholder engagement plan	4	2	2	4	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.19-2 Community Safety, Security and Welfare – Location-Specific Impacts

Location	Activity	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
						M	D	E	S	SS
PACs near the four MCPYs	Community Dynamics	Tensions between non-local construction workforce and PACs	C	Y	Community health, safety and security plan Stakeholder engagement plan Resettlement action plan	4	2	2	5	13
Mutukula town (KP295.5)	Community Dynamics	PIIM causing an increase in social ills	C	Y	Project induced in-migration management plan Community health, safety and security plan Stakeholder engagement plan	4	2	2	4	12

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.19.5 Transboundary Project Impacts

8.19.5.1 Generic Transboundary Project Impacts

No generic transboundary project impacts have been identified in relation to community safety, security and welfare.

8.19.5.2 Location-Specific Transboundary Project Impacts

Location: RoW: Mutukula Town, Kyotera District, KP295.5

The following location-specific transboundary project impact has been identified in Mutukula town (Uganda and Tanzania) during construction:

Community Dynamics

Impact: PIIM causing an increase in social ills

Mutukula's commercial sex work industry is comprised of nationals from both Uganda and neighbouring countries, particularly Tanzania. An increase in substance abuse and resulting growth in the town's commercial sex work industry may increase the number of foreign sex workers, and associated exposure to risks such as GBV.

In addition, criminal activities in Mutukula are known to be transboundary, with livestock theft across the border being a common problem. PIIM of newcomers into Mutukula may exacerbate transboundary criminal activities, particularly given the lack of security measures along the international border.

The potential for an increase in social ills across national borders will be managed through the mitigation measures described in Section 8.19.3. After mitigation has been implemented, the potential residual impact is considered not significant.

8.19.6 Cumulative Impacts

8.19.6.1 Context

Section 6.4.3.14 describes the baseline condition of community safety, security and welfare, the trends and sensitivity to change. Table 8.19-1 and Table 8.19-2 summarise project residual impacts.

While PACs are generally peaceful, conflicts occasionally arise, mainly over land and natural resources. Sensitivity is ranked very high for several groups in the PACs including women, the elderly and children, who are considered vulnerable in numerous ways.

Crime in Uganda, including in the sample PACs, is on the rise, however community policing has been established to help curb the increase. Gender based violence (GBV) also constitutes a significant and growing problem.

Section 8.19.2 describes the project impacts on community safety, security and welfare. The project impacts that may contribute to cumulative impacts include:

- potential increase in social ills (e.g., crime, drug use, alcoholism, commercial sex work, GBV and unplanned pregnancies) due to PIIM

- change in community dynamics due to employment opportunities.

Associated facilities and third-party developments that are in the AOI of the EACOP project are shown in the cumulative impacts matrices, described and mapped in Appendix H. These are:

- associated facilities:
 - o Tilenga Project (AF01)
 - o Kingfisher Oil Project (AF02)
- third-party developments:
 - o transmission line from the Tilenga Central Processing Facility (CPF) to Kabaale (UG0A)
 - o Kabaale International Airport (UG04)
 - o transmission lines to Kabaale Airport (UG05)
 - o refinery (UG07)
 - o Hoima-Buloba pipeline (UG08)
 - o Lot 4 R4 Kabaale-Kiziranfumbi road upgrade (UG19)
 - o Buhimba to Kakumiro road upgrade (UG20)
 - o construction camp for Bulima–Kabwoya road (UG21)
 - o Bulima–Kabwoya road upgrade (UG22)
 - o transmission line extension (UG34)
 - o ICT infrastructure installation (UG44).

The preferred condition is no increase in social ills and gender-based violence, no change in social cohesion and community wellbeing following the completion of construction.

8.19.6.2 Cumulative Impacts

The potential cumulative impacts will mainly arise between the EACOP project, associated facilities and third parties with significant labour forces and similar construction timelines.

Associated Facilities

The EACOP project impacts in Hoima district may be exacerbated by the construction of the Tilenga and Kingfisher projects where the pipelines converge at PS1.

PIIM and Social Ills

The EACOP, Tilenga, and Kingfisher projects are likely to encourage PIIM. PIIM will be the greatest in Hoima district which is home the most centrally located large urban centre, Hoima municipality, in the AOI. Workforces and influx of opportunistic job seekers may lead to an increase in social ills, such as crime, alcoholism and GBV.

Cumulative impacts are most likely to occur in PACs in Buseruka subcounty such as Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5).

The project will engage proponents of the associated facilities and relevant government agencies to consider options for management measures to address the

cumulative impacts. This may include collaboration to combat potential increase of social ills.

The project will participate in regional cumulative environmental management initiatives being developed in collaboration with operators of current projects, developers of proposed projects, and led by the government. It is envisaged that initiative management priorities would be defined for implementation by industry participants

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Community Dynamics

The population growth and increased employment opportunities associated with the EACOP, Tilenga and Kingfisher projects may prompt a shift in the social cohesion and community dynamics of PACs. Employed youths may begin to challenge established local hierarchies and leadership structures, potentially leading to a decline in social cohesion and deterioration in well-being at PAC level.

Change may therefore be experienced in the same PACs as listed above for PIIM and social ills.

The project will engage proponents of the associated facilities and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include alignment in terms of stakeholder engagement approaches to manage community dynamics.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Third-Party Developments

Potential cumulative impacts are predicted where the EACOP project and third-party developments have concurrent or consecutive construction timelines. The third-party developments' construction timeframes are not confirmed at the time of writing but, for this assessment, it has been assumed that the construction phases will have similar timeframes. The third-party developments and the subcounties that may be impacted are shown in Table 8.19-3.

Table 8.19-3 Cumulative Impacts: Community Safety, Security and Welfare

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG0A	Transmission line from the Tilenga Project CPF to Kabaale	0	PS1, approximately 3.5 km from UG0A	Buseruka subcounty, Hoima district
UG04	Kabaale International Airport	0	PS1, approximately 1.3 km from UG04	Buseruka subcounty, Hoima district

Table 8.19-3 Cumulative Impacts: Community Safety, Security and Welfare

ID	Project	Nearest KP	MCPY/AGI	Subcounty/District Potentially Impacted
UG05	Transmission lines to Kabaale Airport	12	PS1, approximately 3.9 km from UG05 Crosses EACOP at KP12	Buseruka subcounty, Hoima district
UG07	Refinery	0	PS1, approximately 0.2 km from UG07	Buseruka subcounty, Hoima district
UG08	Hoima–Buloba pipeline	0	PS1, approximately 0.2 km from UG08 UG08 is parallel to EACOP to approximately KP10 MCPY1, approximately 11 km from UG08	Kisiita subcounty, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba, Buseruka and Kiziramfumbi subcounties, Hoima district
UG19	Lot 4 R4 Kabaale-Kiziranfumbi road upgrade	0–19	PS1, approximately 3.2km from UG 19	For PS1: Buseruka subcounty, Hoima district
UG20	Buhimba to Kakumiro road upgrade	39.5	MCPY1, adjacent to UG20	Kisiita and Nalweyo subcounties, Kakumiro district Bananywa subcounty, Kyankwanzi district Buhimba and Kiziramfumbi subcounties, Hoima district
UG21	Construction camp for Bulima-Kabwoya road	19	MCPY1, approximately 10 km from UG21 UG21, approximately 3.5 km from pipeline	Kiziranfumbi subcounty, Hoima district
UG 22	Bulima – Kabwoya road upgrade	19	Crosses pipeline at KP19	Kiziranfumbi subcounty, Hoima district
UG34	Transmission line extension	133	UG34 crosses MCPY2	Kitenga subcounty, Mubende district
UG44	ICT infrastructure	223	MCPY4, approximately 2.5 km from UG44 and crosses EACOP at KP223	Kakuuto subcounty, Kyotera district Kibanda subcounty, Rakai district

Cumulative impacts associated with the EACOP and third-party developments are similar to those described for associated facilities are summarised below:

PIIM

Multiple projects nearby may encourage PIIM, that is larger than PIIM created by the EACOP project alone. Cumulative impacts are most likely to occur in the following PACs:

- Nyamosoga (KP0), Kayere (KP0) and Katooke (KP1.5) caused by the EACOP project and the refinery, the transmission line from Tilenga CPF to Kabaale, Kabaale international airport, the transmission lines to Kabaale airport and R4 Kabaale–Kiziranfumbi road upgrade. The airport and the refinery will have the most important contribution to this impact
- Kabaale-Kyabicwe, Kisenyi and Kakende caused by the EACOP project and the Hoima-Buloba pipeline. Due to lack of information it is not clear which project would have the most important contribution.
- Kabaale-Kyabicwe, Kisenyi, Katikara and Kakende caused by the EACOP project and the Buhimba to Kakumiro road upgrade. EACOP will have the most important contribution to this impact.
- Kalembe, Kyenda, Lugala, Mijunwa and Kagoma caused by the EACOP project and the transmission line extension. EACOP will have the most important contribution to this impact.
- Nabigasa, Kabugimbi, Bigada and Kabonera caused by the EACOP project and the ICT infrastructure installation. EACOP will have the most important contribution to this impact.

The project will engage proponents of the third-party developments and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include collaboration to combat potential increase of social ills. The project will also participate in regional cumulative environmental management initiatives mentioned above.

With the mitigation measures implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

Community Dynamics

As discussed above for the associated facilities, increased employment opportunities associated with multiple large-scale third party developments and the EACOP project can prompt a shift in community dynamics. Change may therefore be experienced in the same PACs as listed above for PIIM and social ills.

The project will engage proponents of the third party developments and relevant government agencies to consider options for management measures to address the cumulative impacts. This may include alignment in terms of stakeholder engagement approaches to manage community dynamics.

With the additional mitigation measure implemented, the preferred condition will be achieved and the residual cumulative impact is considered not significant.

8.19.6.3 Cumulative Transboundary Impacts

There are no transboundary cumulative impacts on community safety, security and welfare

8.20 Tangible and Intangible Cultural Heritage

This section describes the potential impacts on tangible and intangible cultural heritage during construction, commissioning and operation of the EACOP project and associated mitigation measures to be adopted.

8.20.1 Key Sensitivities and Considerations

Cultural heritage baseline is described in Section 6.4.3.16 and includes:

- key VECs and their sensitivity, ranked according to Table D38, Appendix D
- key considerations for cultural heritage.

The baseline and impact assessment include three categories of cultural heritage:

- Category 1 – tangible cultural heritage (TCH):
 - o archaeological sites
 - o areas of high archaeological potential
- Category 2 – tangible cultural heritage with strong intangible elements:
 - o cemeteries and graves
 - o religious places where worship associated with the main established religions is practised (such as churches or mosques)
- Category 3 – intangible cultural heritage (ICH) with a less well-defined tangible component:
 - o sites with an intangible component and/or traditional value; the importance of which is not always a factor of geography but of belief and ritual. Such sites may be used for music making, dancing, storytelling and other rituals. This category may also include rituals that are not linked to any particular site, but to a particular group of people.

The impact of the project on a Category 1 or Category 2 site may be more objectively measurable and thus allowing impact identification based on the methodology presented in Section 5. Sites and features identified as Category 1 were ranked as low or high sensitivity and Category 2 as moderate or high sensitivity in the baseline study. However, the significance of a Category 3 VEC is defined by the local community who visit, use or engage in an intangible practice that is not objectively measurable. It takes time to develop relationships of confidence and trust to establish the sensitivity associated with intangible cultural heritage, making it a challenge to acquire a sense of importance to the communities in the time available when a baseline survey is conducted. In general, due to their value to communities, these intangible features are considered to have high sensitivities.

Uganda's long and complex history is reflected in the identified TCH and ICH within the study area. The key considerations are as follows:

- The tangible and intangible cultural heritage identified is considered a representative sample. The sample represents the full range of features for categories 1, 2 and 3 likely to be encountered, though there is less certainty for Category 3.
- Religious structures are the most common Category 2 sites.

- No known nationally or internationally designated sites or critical cultural heritage have been identified.
- Three high sensitivity Category 2 features (cemeteries) are within the AOI of which two are within the RoW.
- The remaining Category 1 and 2 features within the AOI are moderate sensitivity.
- Category 3 is closely linked to individual and group identity and therefore sensitive to cultural change.
- Many more features for each category are likely to be identified in the AOI.
- Identification of further Category 3 features requires active participation of local key informants based on establishing a sufficient degree of trust.

Based on professional experience and opinion, and a precautionary principle that acknowledges that archaeological sites may be unique even if superficially similar to others, the definition adopted by the project is that tangible cultural heritage is a finite resource and loss is considered nonreplicable. This is at variance with the IFC definition but considered more conservative (see Section 6.4.3.16).

The Convention for the Protection of the World Cultural and Natural Heritage, 1972 and the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage refer to international human rights in respect of tangible and intangible cultural heritage and the importance of:

- the tangible and intangible cultural heritage as mainsprings of cultural identity and diversity
- maintaining access to and right to practice traditional cultural heritage and beliefs.

8.20.2 Potential Project Impacts

8.20.2.1 Introduction

Appendices E2 and E3 include all pre-mitigation and post-mitigation generic and location-specific impacts. This includes two types of construction and operational impacts, those from construction facilities and those from the pipeline and AGIs. For impacts on cultural heritage, the construction facility and pipeline and AGI impacts have been aggregated and are described as either construction or operation impacts. If a construction facility or pipeline and AGIs impact was greater than the other before the aggregation, the greater impact was applied. If a pre-mitigation or post-mitigation impact was determined to be significant, it is noted in the text when the other aggregated impact is not significant. All disaggregated impacts are included in Appendices E2 and E3.

8.20.2.2 Construction

Generic Impacts

Disturbance or Loss of Cultural Heritage

Benefit: Increased knowledge of tangible and intangible cultural heritage; employment of people to survey and investigate cultural heritage affected by the project

The pre-construction cultural heritage surveys and investigation and management activities will provide additional information for Category 1 and 2 sites and a better understanding of Category 3 by both internal and external parties. Publication of the TCH results may bring positive benefits, increasing the understanding and awareness of Ugandan history and development both inside and outside Uganda.

A further benefit will be the employment of people to undertake tangible and intangible cultural heritage surveys and research.

Impact: Damage, disturbance or disruption of access of unknown Category 1 or 2 cultural heritage

Impact: Damage, disturbance or disruption of access of unknown Category 3 cultural heritage

There is the potential for damage or disturbance, including disruption of access, to previously unknown TCH and ICH discovered during pre-construction surveys or construction. TCH may include evidence of previous settlement and graves. ICH may include meeting places, sacred natural sites, rivers or ceremonial ways, traditional dance, rituals, traditional healing and syncretism²¹.

The significance of the impact on TCH pre-mitigation will depend on the find and the extent of the damage or disturbance but could range from not significant to significant. A qualitative assessment of the significance of ICH has been undertaken, for the reasons described in Sections 8.20.1 and 5.5.2.5. In general, owing to the sensitivity of practices at the community level, pre-mitigation impacts should be considered significant.

Location-Specific Impacts

Location: Known Category 1 and Category 2 Tangible Cultural Heritage Locations

Impact: Damage, disturbance or disruption of access of known Category 1 and Category 2 tangible cultural heritage

The following activities have the potential to cause damage or disturbance of the various Category 1 or 2 cultural heritage features identified in Table 8.20-2:

- removal of vegetation from the project footprint
- ground disturbance including:
 - o the removal of topsoil and subsoil

²¹ Syncretism is the amalgamation of established religions (Islam and Christianity) and traditional African belief systems.

- o levelling of the RoW at construction facilities and AGIs
- o excavation of the pipe trench
- o excavation for foundations, utilities or drainage at construction facilities and AGIs
- operation of construction equipment
- traffic movement.

The potential impacts are direct damage or disturbance including:

- physical damage of sites, including from noise, vibration and dust due to plant, equipment and heavy vehicles
- noise and visual intrusion on people's appreciation of cultural heritage
- disruption of access to cultural heritage sites.

Impacts will be restricted to the footprint or the AOI, which extends to 100 m around the project footprint. It is unlikely that there will be discernible effects from noise, vibration or dust or restriction of access beyond this distance, but this will be checked as part of the proposed programme of cultural heritage construction planning survey and assessment, based on the impact assessment for noise and air emissions and additional engineering studies for noise and air emissions.

Impacts to Category 1 and 2 cultural heritage are generally negligible to small magnitude and limited in extent. The sensitivity varies from low to high, with high scores usually associated with Category 2 cultural heritage, owing to the social and religious sensitivity of some features. Impacts are not significant pre-mitigation (see Appendix E, Table E-3). Impacts on Category 1 and 2 features may also lead to impacts on community safety and security, through generation of conflict or dissent and community health. These are discussed in Section 8.19.

Location: Known Category 3 Intangible Cultural Heritage Locations

Impact: Damage, disturbance or disruption of access of known Category 3 intangible cultural heritage

Construction has the potential to alter or change traditional cultural practices and belief systems that are tied to identity, but are not represented by any specific tangible place, entity or community structure. This can refer to a connection with the landscape (e.g., sacred trees, as in Category 2) or traditional cultural practices including ritual practices such as dance and traditional healing techniques if associated with a site.

The following activities have the potential to cause damage or disturbance of the various Category 3 sites, features, traditional practices, rituals and beliefs identified in Table 8.20-2:

- removal of vegetation from the project footprint
- ground disturbance from installation of the pipeline, construction facilities and AGIs
- project-induced in-migration (PIIM) of construction workers from outside communities
- resettlement of dwellings

- failure to address all the belief systems within a community leading to alienation of some groups.

The potential impacts are direct and indirect damage or disturbance of traditional beliefs and practices covering:

- physical damage of cultural heritage sites or
- loss or change of identity or significance of the intangible cultural heritage
- effects of noise and visual intrusion on communities' abilities to appreciate and use their ICH
- disruption of access to cultural heritage assets leading to loss of ability to practise traditional beliefs, rituals, dance and healing
- disruption or diminution of cultural ecosystem services including, customary ways of understanding the wider world and for maintaining social relations and group identity.

Local communities did not always comment on the value that they place on intangible cultural heritage (although where there were comments, the value was always 'very high'), and this, in addition to any concerns they may have about relocating intangible or spiritual values, will vary. Therefore, a qualitative assessment of impacts on ICH is provided. The impacts to ICH will be transient to short-term but owing to the sensitivity of practices at the community level, pre-mitigation impacts should be considered significant.

Impacts of PIIM of job seekers on community cohesion, and traditional values and structures, are assessed in Section 8.19.

8.20.2.3 Operation

Generic Impacts

Disturbance or Loss of Cultural Heritage

Impact: Damage or disturbance of Category 1 and Category 2 tangible cultural heritage

During operations there may be a need to implement soil-erosion prevention measures. These activities carry a low risk of inadvertently exposing new sites or portions of previously known sites that were not previously affected and mitigated as activities may extend to areas outside the RoW.

Impacts will be restricted to areas close to the footprint, for example, eroded slope or bank of watercourse immediately adjacent to the RoW and are likely to range from not significant to significant pre-mitigation.

Impact: Damage or disturbance of Category 3 intangible cultural heritage

Effects on ICH may also occur. For example, there is low risk of impacts related to the use of the RoW for ICH activities, but none have been identified at the time of writing; or effects on intangible elements of erosion control works. Effects are likely to be not significant, pre-mitigation.

Location-Specific Impacts

No specific impacts have been identified.

8.20.3 Mitigation Measures

This section describes the avoidance and mitigation measures that will be applied to the aspects and activities that could affect cultural heritage.

Typically, it is not a single mitigation that reduces an impact but the application of several mitigations that all contribute to the management of an impact. The key mitigation measures presented in this section, and the associated management plan and other measures that are included Appendix E4, have been collectively used to assess residual impacts, and to determine their significance.

8.20.3.1 Design Phase

Generic Mitigation Measures

As described in Section 3, Alternatives, route identification for the pipeline has considered cultural heritage aspects. The selected route including the portion of the Ugandan pipeline avoided known cultural heritage sites identified during route selection.

Location-Specific Mitigation Measures

There are no location-specific mitigation measures relating to the design of the construction facilities, pipeline and AGIs.

8.20.3.2 Construction

Generic Enhancement Measures

Disturbance or Loss of Cultural Heritage

Benefit: Increased knowledge of tangible and intangible cultural heritage; employment of people to survey and investigate cultural heritage affected by the project.

The cultural heritage management plan will include measures that support the increase in knowledge of tangible and intangible cultural heritage. Such measures could include working in conjunction with the Department of Museums and Monuments of the Ministry of Tourism, Wildlife and Antiquities to ensure that findings are shared within the cultural heritage expert community and programmes are implemented to share findings with a wider audience.

Generic Mitigation Measures

Disturbance or Loss of Cultural Heritage

Impact: Damage, disturbance or disruption of access of unknown Category 1 or Category 2 tangible cultural heritage

Impact: Damage, disturbance or disruption of access of unknown Category 3 intangible cultural heritage

The cultural heritage management plan will include measures to manage impacts on unknown resources.

The cultural heritage management plan will be implemented in agreement with government authorities in advance of construction.

Regular meetings will be scheduled with government authorities and appropriate community leaders.

The key mitigation measures are the implementation of a pre-construction survey, including consultations with community leaders, to identify the location and extent of previously unknown cultural heritage resources. The results of the survey will be used to inform location-specific actions. This will be supported by the implementation of the chance finds procedure to address finds during construction. Appropriate management actions will be implemented for chance finds consistent with the cultural heritage management plan. Such actions may include preservation by photo-record, excavation by suitably qualified and approved archaeologists in accordance with government authorisations, relocation of graves and maintenance of access to cultural heritage assets.

Awareness training will be given to project personnel and collection of cultural heritage artefacts for their own use will be prohibited. Decompaction/ripping or other ground disturbance activities will be planned to avoid cultural heritage features preserved in situ.

Although the pre-mitigation impact on unknown Category 1 and 2 cultural heritage could be either significant or not significant depending on the site or asset, the residual impact should be not significant, with the reduction of significance depending on the method chosen. For example, the duration of impacts on graves or cemeteries could be reduced from permanent to transient due to relocation. At other sites, the magnitude of impact could be reduced if access is maintained. Sensitivity may increase or decrease depending on the information gained as the site or asset is assessed. If sensitivity increases this will lead to the investigation of further mitigation to reduce the magnitude of impacts. As mitigation measures will not be known until sites are identified, a range of significance scores has been included in Appendix E2 and Table 8.20-1.

Although pre-mitigation impacts on unknown Category 3 intangible cultural heritage should be considered significant the application of the proposed mitigation measures should reduce the residual impact to not significant by reaching agreement with local communities on ways to avoid or manage effects such that access or enjoyment of the ICH is not affected.

Location-Specific Mitigation Measures

Location: Known Category 1 and Category 2 Tangible Cultural Heritage Features

Impact: Damage, disturbance or disruption of access of known Category 1 and Category 2 tangible cultural heritage features

The cultural heritage management plan will manage damage or disturbance to cultural heritage resources.

A pre-construction survey will be undertaken to collect data on the location and extent of known cultural heritage to assist in the development of location-specific mitigation measures, including maintenance of access to cultural heritage assets.

Although the pre-mitigation impact is considered to be not significant, the application of the above measures should further reduce impacts, depending on the method chosen. The duration of impacts on graves or cemeteries will be reduced from permanent to transient due to relocation. At other sites, the magnitude of impact will be reduced if micro re-routing is undertaken or access maintained. Sensitivity may increase or decrease depending on the information gained during the pre-construction survey. If sensitivity increases this will lead to the investigation of further mitigation to reduce the magnitude of impacts. As mitigation measures will not be finalised until the preconstruction survey has been undertaken, the pre-mitigation and residual magnitude and sensitivity scores are the same in Appendix E3 and Table 8.20-2.

Location: Known Category 3 Intangible Cultural Heritage

Impact: Damage, disturbance or disruption of access of known Category 3 intangible cultural heritage or disruption of access

The cultural heritage management plan will include measures that contribute to the management of this impact.

A pre-construction survey, including consultations with community leaders, will be undertaken to collect data on the location and extent of intangible cultural heritage; data from the survey will inform the cultural heritage management plan that will describe measures to reduce impacts.

Intangible cultural heritage should be identified with sufficient time to allow mitigations to be agreed with the affected communities.

Although pre-mitigation impacts should be considered significant the application of the proposed mitigation measures should reduce the residual impact to not significant by reaching agreement with local communities on ways to avoid or manage effects such that access or enjoyment of the ICH is not affected.

8.20.3.3 Operation

Generic Mitigation Measures

Disturbance or Loss of Cultural Heritage

Impact: Damage or disturbance of Category 1 and Category 2 tangible cultural heritage

The cultural heritage management plan will include measures that contribute to the management of this impact.

The cultural heritage management plan will include description of all cultural heritage features identified before and during construction to inform cultural heritage management measures that may be required during project operation.

Although the pre-mitigation impact could be either significant or not significant depending on the site or asset, the residual impact should be not significant with the

reduction of significance depending on the method chosen. For example, the duration of impacts on graves or cemeteries could be reduced from permanent to transient due to relocation. At other sites, the magnitude of impact could be reduced if access is maintained. The sensitivity of any new sites or assets identified may increase or decrease depending on the information gained as the site or asset is assessed. If sensitivity increases this will lead to the investigation of further mitigation to reduce the magnitude of impacts. As mitigation measures will not be known until sites are identified, a range of significance scores has been included in the Appendix E2 and Table 8.20-1.

Impact: Damage or disturbance of Category 3 intangible cultural heritage

The cultural heritage management plan will include measures that contribute to the management of this impact.

The cultural heritage management plan will include details of all cultural heritage features identified before and during construction to inform cultural heritage management measures that may be required during project operation.

Although pre-mitigation impacts are likely to be not significant, the application of the above measures should further reduce any residual impacts by reaching agreement with local communities on ways to avoid or manage effects such that access or enjoyment of the ICH is not affected.

Location-Specific Mitigation Measures

No specific measures are currently required for project operations as no location-specific impacts have been identified for this phase.

8.20.4 Residual Impacts and Significance Summary

This section summarises the residual impacts on cultural heritage after mitigation measures have been implemented.

Table 8.20-1 summarises the potential cultural heritage impacts, proposed mitigation measures and the determination of significance of the residual impacts after mitigation. Table 8.20-2 summarises specific impacts.

8.20.4.1 Generic and Location-Specific Impacts

With the implementation of the planned mitigation measures, no significant residual generic or location-specific impacts to all tangible or intangible cultural heritage are predicted.

8.20.4.2 Ecosystem Services

Various features, both tangible and intangible, in the AOI provide cultural ecosystem services (CES), see Section 6.4.3.15. These CES are highly inter-related and cannot be easily separated. Their value lies in providing communities and individuals with a sense of self and their role in the world. This gives intangible features meaning that is no less important than finding food or undertaking other everyday occupations such as farming or craftwork.

The impacts from construction and operation, including the human right to practice traditional cultural heritage and beliefs, have been fully addressed and integrated in the mitigation measures (Section 8.20.3). By engaging the local communities in the process of identifying and mitigating impacts to specific practices or beliefs, impacts to the CES will be managed with local community awareness. It is anticipated that residual effects on CES will be not significant, including human rights.

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Table 8.20-1 Tangible and Intangible Cultural Heritage – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
					M	D	E	S	SS
Disturbance or loss of cultural heritage	Increased knowledge of tangible and intangible cultural heritage. Employment of people to survey and investigate cultural heritage affected by the project.	C	Y	Cultural Heritage Management Plan	B				B
Disturbance or loss of cultural heritage	Damage, disturbance or disruption of access of unknown Category 1 and 2 tangible cultural heritage features, such as evidence of previous settlement and graves.	C	TBC	Cultural Heritage Management Plan	1–3	1–5	1–2	2–8	5–18
Disturbance or loss of cultural heritage	Damage, disturbance or disruption of access of unknown Category 3 intangible cultural heritage, such as meeting places, sacred natural sites, rivers or ceremonial ways, traditional dance, rituals, traditional healing and syncretism	C	TBC	Cultural Heritage Management Plan	–	–	–	–	–
Disturbance or loss of cultural heritage	Damage or disturbance of Category 1 and 2 tangible cultural heritage	O	Y	Cultural Heritage Management Plan	1–3	1–5	1–2	2–8	5–18

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. TBC = to be confirmed. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.20-1 Tangible and Intangible Cultural Heritage – Generic Impacts

Aspect	Potential Impact	Phase	High Stakeholder Concern	Mitigation Measures	Residual Impact				
					M	D	E	S	SS
Disturbance or loss of cultural heritage	Damage or disturbance of Category 3 intangible cultural heritage	O	Y	Cultural Heritage Management Plan	–	–	–	–	–

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. TBC = to be confirmed. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.20-2 Tangible and Intangible Cultural Heritage – Location-Specific Impacts

Location (KP)	Aspect	VEC	Potential Impact	Phase	Location (Within Footprint (F) or AOI (AOI)) ²²	High Stakeholder Concern	Mitigation Measures	Residual Impact				
								M	D	E	S	SS
11	Disturbance or loss of cultural heritage	CHU129: Pentecostal Church Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	AOI	Y	Cultural Heritage Management Plan	1	1	1	6	9
26.4	Disturbance or loss of cultural heritage	CHU159: Fellowship Church Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	AOI	Y	Cultural Heritage Management Plan	1	1	1	6	9
43.15	Disturbance or loss of cultural heritage	CUH441: Pentecostal Church Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	AOI	Y	Cultural Heritage Management Plan	1	1	1	6	9
50.16	Disturbance or loss of cultural heritage	CUH445: Pentecostal Church Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	AOI	Y	Cultural Heritage Management Plan	1	1	1	6	9
184.8	Disturbance or loss of cultural heritage	CHU413: Kraal Category 1 tangible cultural heritage	Damage or disturbance of feature	C	F	TBC	Cultural Heritage Management Plan	1	5	1	6	13

²² Sites that are within the project footprint or the AOI are included in this table.

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score; Y = stakeholder concern; – = no stakeholder concern was recorded. TBC = to be confirmed. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

Table 8.20-2 Tangible and Intangible Cultural Heritage – Location-Specific Impacts

Location (KP)	Aspect	VEC	Potential Impact	Phase	Location (Within Footprint (F) or AOI (AOI)) ²²	High Stakeholder Concern	Mitigation Measures	Residual Impact				
								M	D	E	S	SS
226.5	Disturbance or loss of cultural heritage	CHU398: Kyawagonya Cemetery Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	F	Y	Cultural Heritage Management Plan	2–3	1	1	8	12–13
244.6	Disturbance or loss of cultural heritage	CHU399: Kanga / Rusheshe cemetery Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	F	Y	Cultural Heritage Management Plan	2	1	1	8	12
277.5	Disturbance or loss of cultural heritage	CHU401: Kasoga Cemetery Category 2 tangible cultural heritage with strong intangible element	Damage or disturbance of feature	C	AOI	Y	Cultural Heritage Management Plan	1	1	1	8	11

NOTES: C= construction; O= operation; C&O= construction and operation; B= beneficial impact; M= magnitude of impact; D= duration of impact; E= extent of impact; S= sensitivity; SS= significance score: Y = stakeholder concern; – = no stakeholder concern was recorded. TBC = to be confirmed. See Section 5 for the methodology used to calculate the significance score and Appendix D for the tables used to rank magnitude and sensitivity.

8.20.5 Transboundary Project Impacts

There are no transboundary impacts on TCH or ICH.

8.20.6 Cumulative Impacts

No cumulative impacts have been identified at the time of writing.

8.20.6.1 Transboundary Cumulative Impacts

There are no transboundary cumulative impacts.

8.21 Summary of Ecosystem Services Impacts

8.21.1 Ecosystem Service Impacts

Impacts on ecosystem services and mitigation measures have been considered in the assessments of the VECs that provide ecosystem services. References to ecosystem services documented in the VEC assessments are summarised in Table 8.21-1.

Table 8.21-1 Ecosystem Service References

Ecosystem Service*	Reference
Provisioning Services	
Crops	8.5 Soil, 8.6 Surface Water, 8.7 Groundwater, 8.13 Land-Based Livelihoods
Livestock	8.6 Surface Water, 8.7 Groundwater, 8.13 Land-Based Livelihoods
Capture fisheries	8.2 Habitats, 8.6 Surface Water, 8.14 River-, Lake- and Marine-Based Livelihoods
Aquaculture	8.14 River-, Lake- and Marine-Based Livelihoods,
Wild foods	8.2 Habitats, 8.3 Species, 8.4 Protected Areas, 8.13 Land-Based Livelihoods, 8.18 Community Health
Live trade in animals	8.2 Habitats, 8.3 Species
Timber and wood products	8.2 Habitats, 8.3 Species, 8.4 Protected Areas, 8.13 Land-Based Livelihoods
Fibres and non-wood products	8.2 Habitats, 8.3 Species, 8.4 Protected Areas, 8.13 Land-Based Livelihoods
Aggregates	8.5 Soil, 8.13 Land-Based Livelihoods
Biomass fuel	8.2 Habitats, 8.3 Species, 8.4 Protected Areas, 8.13 Land-Based Livelihoods, 8.17 Social Infrastructure and Services
Freshwater	8.6 Surface Water, 8.7 Groundwater, 8.13 Land-Based Livelihoods, 8.18 Community Health
Medicinal products	8.2 Habitats, 8.3 Species, 8.4 Protected Areas, 8.13 Land-Based Livelihoods, 8.18 Community Health

Table 8.21-1 Ecosystem Service References

Ecosystem Service*	Reference
Regulating Services	
Local air quality regulation	8.2 Habitats, 8.4 Protected Areas
Global climate regulation	8.2 Habitats, 8.4 Protected Areas
Local climate regulation	8.2 Habitats, 8.4 Protected Areas
Water regulation	8.2 Habitats, 8.4 Protected Areas, 8.6 Surface Water, 8.7 Groundwater
Erosion regulation	8.2 Habitats, 8.4 Protected Areas, 8.5 Soil, 8.6 Surface Water
Waste assimilation	8.2 Habitats, 8.4 Protected Areas, 8.6 Surface Water
Soil quality regulation	8.2 Habitats, 8.4 Protected Areas, 8.5 Soil, 8.6 Surface Water
Cultural Services	
Recreation and ecotourism	8.2 Habitats, 8.3 Species, 8.4 Protected Areas
Aesthetics, landscapes	8.2 Habitats, 8.4 Protected Areas, 8.8 Landscapes
Sense of place/self	8.2 Habitats, 8.4 Protected Areas, 8.20 Cultural Heritage
Spiritual, sacred and religious values	8.2 Habitats, 8.4 Protected Areas, 8.20 Cultural Heritage
Ethical and biodiversity non-use values	8.2 Habitats, 8.3 Species, 8.4 Protected Areas
Supporting Services	
Habitats and species support	8.2 Habitats, 8.4 Protected Areas, 8.5 Soil, 8.6 Surface Water, 8.7 Groundwater

NOTE: *The order of ecosystem services is based on a standard list of ecosystem services in WRI (2012) Corporate Ecosystem Services Review Version 2.0.

All potentially significant ecosystem services related impacts are addressed by the VEC impact assessments and mitigation measures set out in the sections listed in Table 8.21-1, the ESMP (Appendix J) and Appendix E4.

Where additional surveys are planned, it is recommended that associated ecosystem service aspects are considered in their design and implementation.

8.21.2 Ecosystem Service Dependencies

IFC PS 6 includes specific requirements for assessing ecosystem services dependencies²³ and documenting associated proposed resource use efficiency measures, as summarised for the project in Table 8.21-2.

²³ An ecosystem dependency occurs where the EACOP project depends on the ecosystem service.

Table 8.21-2 Ecosystem Service Dependencies

Ecosystem Service	Dependency Description	Resource Use Efficiency Measure²⁴
Water	Water use for hydrostatic testing, dust control and camp use as follows: Construction camps – potable water 200 m³/day at maximum occupancy (up to 1000 people). Construction activities – 100–200 m³/day. Hydrostatic testing – 16,000 m³ per test section required	- Water conservation initiatives and opportunities to reuse water, e.g., for dust suppression or concrete, will be identified, assessed for impacts on the environment and human health and those deemed suitable will be implemented. - Re-use water between sections for hydrostatic testing to reduce volumes needed (see Section 2.4.4.2) - The grey water stream will be separated from black water (e.g., sewage), treated and either reused (e.g., for toilet flushing, dust suppression) or discharged, in accordance with the environment project standards and national environmental guidance and regulations. All wastewater discharges will comply with permit conditions and the project environmental standards. - Water meters will be installed to measure the quantities of water supplied and wastewater discharged at the camps and detailed records will be kept of quantities of water reused and the purposes for which water is reused as part of the water management plan and the data used for monitoring water usage and project reporting requirements.
Energy	Energy use for operation of equipment and vehicles	Electrical equipment of a size that is appropriate for the functions to be performed will be selected with a view to maximising energy efficiency. Electrical equipment will be turned off when not in use.
Aggregates	Used for various construction activities, requiring an estimated: 44,000 m ³ gravel, 52,000 m ³ sand, 4,400 m ³ cement and murram (quantities to be identified during construction)	All excavated materials will be screened and reused where possible to reduce the need for newly quarried aggregates.
Timber	Used for various construction activities	If timber is cleared (e.g., as part of right-of-way clearance), it will be reused for construction activities as far as possible. Release of any and all chemically treated waste timber will be made by on a case-by-case basis.
Food	Food required for feeding personnel	Provision of food to workers will be planned to cater for workforce requirements and therefore minimise food waste as far as possible.

²⁴ Reference is to either a proposed mitigation measure in Appendix E4 or design mitigation included in the project description, Section 2.

8.22 Climate

This section includes:

- an assessment of the potential impacts on the global climate of the EACOP project, comprising:
 - o a description of the use of global warming potential (GWP) as the basis for comparing emissions of different greenhouse gases (GHG)
 - o an evaluation of the carbon intensity (emissions per unit of energy exported) of direct²⁵ project operations phase GHG emissions
 - o a description of the project's main direct and indirect²⁶ GHG emissions during construction and commissioning
 - o a description of the project's main direct GHG emissions during the operations phase
 - o a comparison of direct project operational phase GHG emissions to total national emissions and Ugandan reduction commitments, as described in Section 6.4.3.14 baseline
 - o a description of indirect emissions during the operations phase
 - o a description of the key mitigation measures used to reduce GHG emissions
- an assessment of the effects of climate change trends on the project and how these have been considered in project design and implementation.

8.22.1 Key Sensitivities and Considerations

Baseline Section 6.4.3.14 describes the climate baseline and key considerations.

The key considerations arising from the baseline are as follows:

- The global climate has undergone unprecedented change²⁷ and continuing change is predicted by climate scientists. Uganda's climate has changed and further change is predicted.
- Uganda is vulnerable to increased climate variability and climate change. For example, the severity and frequency of extreme events such as droughts and floods are projected to increase.
- Global anthropogenic GHG emissions, with other anthropogenic drivers, are extremely likely to have been the dominant cause of the observed warming of the global climate since the mid-20th century.
- The Ugandan government has put in place measures to reduce the risks of the changing climate. These include mitigation measures (reductions in GHG emissions relative to a business-as-usual (BAU) scenario²⁸) and adaptation measures (reduction of the vulnerability of social and biological systems).

²⁵ Direct emissions are from sources owned or controlled by the project.

²⁶ Indirect emissions are a consequence of the project but are from sources not owned or controlled by the project.

²⁷ "Since the 1950s, many of the observed changes are unprecedented over decades to millennia" (IPCC 2014).

²⁸ The BAU scenario is "projections in the Background Paper for the 2012 Climate Change Policy", according to MWE (2015).

8.22.2 Project Greenhouse Gas Emissions

8.22.2.1 Greenhouse Gases and Global Warming Potentials

The dominant source of GHG emissions from EACOP in Uganda is combustion of crude oil during operation of the bulk heaters at the pumping stations potentially later in the life of the project. The principal GHG emitted will be carbon dioxide (CO₂). There will be small emissions of methane (CH₄) and nitrous oxide (N₂O), see Table 8.22-1. Emissions of other GHGs considered in the Kyoto Protocol from EACOP-related activities will be negligible.

It is standard practice to convert GHGs to a common unit, so that their relative effects can be expressed on a common basis. Each GHG has a GWP, which accounts for the total contribution to global warming resulting from the emission of one mass unit of that gas relative to one mass unit of the reference gas, CO₂, which is assigned a value of 1. Based on a GHG's GWP, its carbon dioxide equivalent (CO₂e) can be calculated²⁹. The GWPs used for CO₂, CH₄ and N₂O and their contribution to a total GHG emission factor for crude oil combustion are shown in Table 8.22-1. GHGs have different GWPs depending on the 'time horizon' considered, as they have different lifetimes in the atmosphere. This assessment uses GWPs over a 100-year horizon, as primarily used by the US EPA (2018a, Internet site).

Table 8.22-1 GHG Emission Factors for Crude Oil Combustion

GHG	Emission Factor (kg GHG/kg fuel) ¹	GWP ²	Emission Factor (kg CO ₂ e/kg fuel)
CO ₂	3.13	1	3.13
CH ₄	1.25×10^{-4}	34	4.24×10^{-3}
N ₂ O	2.43×10^{-5}	298	7.26×10^{-3}
Total CO ₂ e	–	–	3.14

NOTES: ¹EPA (2018b, internet site), converted to mass basis using fuel density of 868 kg/m³ (EACOP crude blend E1)

²Myhre et al. (2013)

Table 8.22-1 shows that CO₂ comprises 99.6% of the GHG emissions from crude oil combustion. The data are similar for the combustion of gas oil, which will be the main fuel used in the construction phase of the project and as backup fuel in the operations phase.

8.22.2.2 Carbon Intensity

Carbon intensity (CI) is a measure of the rate of GHG emissions relative to the intensity of a specific activity, or an industrial production process. The EACOP project transports a (primarily) energy product to market, so the most appropriate CI

²⁹ For example, methane has a global warming potential of 34, which means that 1 kg of methane has the same impact on climate change as 34 kg of carbon dioxide and thus 1 kg of methane is 34 kg of carbon dioxide equivalent.

metric is GHG emissions per unit of energy exported, in units of grams of CO₂ equivalent per megajoule (gCO₂e/MJ).

Based on the predicted construction emissions and the emissions created to pump and heat the oil in the operational phase, EACOP's progressive total CI in Uganda is shown in Figure 8.22-1.

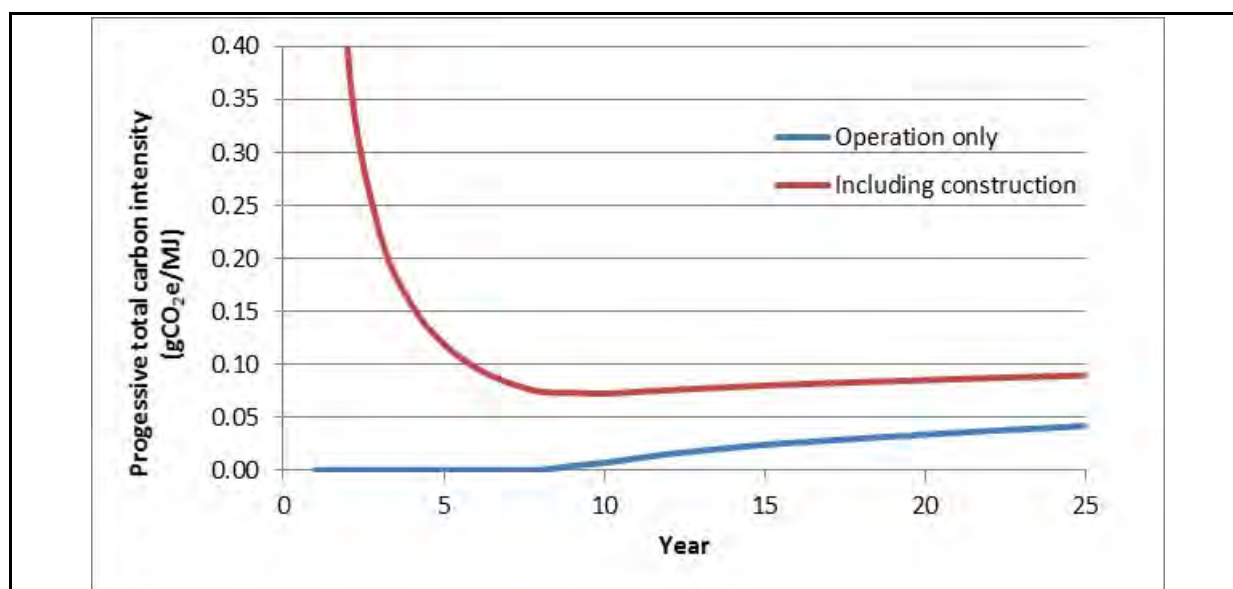


Figure 8.22-1 Progressive Total Carbon Intensity During Project Life

Emissions from the construction phase occur prior to any energy export, therefore a CI cannot be calculated until first energy export in year 1. At this point the total CI (including construction emissions) is 1.24 gCO₂e /MJ, but the y-axis in Figure 8.22-1 has been curtailed so that the operational curve's scale is not rendered obscure.

The operational CI is zero in the early years before the bulk heaters at PS1 and PS2 start up, when pumping power is provided from the Tilenga CPF, whose emissions are accounted for in that project's ESIA. After the bulk heaters start operation, the annual emissions peak at the 18 ktCO₂e shown in Table 8.22-2. These peak annual emissions are from the heating of moderate flow rates of 70 kbpd. The largest annual CI occurs at the lowest flow rates in the later years. The progressive total operational CI increases as the influence of the zero years diminishes. Over the project life, the predicted average operational CI of all the exported oil is 0.043 gCO₂e/MJ.

As the emissions from the construction phase are divided by the cumulative energy exported in the operational phase, the total intensity rapidly decreases. By year 25, the total intensity is 0.091 gCO₂e/MJ. The total emissions from the construction and operational phases are close to equal. They respectively contribute 53% and 47% to the total intensity of the exported energy.

8.22.2.3 Direct Emissions – Construction and Commissioning Phases

For the purposes of this assessment, all in-country construction phase emissions are considered, including:

- equipment used during construction of the main camps and pipe yards (MCPY), pipeline, aboveground installations (AGIs)
- road vehicles and transport by rail to move pipe, equipment, materials, fuel and the workforce
- generators at MCPYs
- compressors for hydrotest drying
- net emissions created under the umbrella definition of land use, land use change and forestry activities³⁰.

The quantities of these emissions are uncertain at this stage, pending further definition of the precise quantities and methods involved in constructing the pipeline and activities associated with the construction. Estimates have been made based on the information currently available. This inventory is detailed, with the assumptions, methods and data sources used in its derivation, in Appendix G3. The key outcomes are:

- total³¹ GHG emissions from the construction phase are estimated at 242 ktCO₂e
- non-road construction equipment used on the pipelay spread and in building the pumping stations is the dominant category of these emissions, contributing 68% (pipelay) and 28% (PSs) respectively
- several other categories, principally from the road transport of materials and the workforce³², were estimated and collectively comprise the remaining 4% of the emissions total.

8.22.2.4 Indirect Emissions – Construction and Commissioning Phases

The main sources of indirect emissions in the construction and commissioning phases will be the extraction, production and outsourced transport of purchased materials and fuels. For examples, emissions created in manufacturing the steel for the pipe, and in extracting and processing the oil that is eventually used as diesel in construction vehicles and equipment.

The GHG emissions from these sources have not been quantified, as they are minor relative to the direct emissions over the life of the project.

8.22.2.5 Direct Emissions – Operation Phase

The largest source of direct GHG emissions during the operational phase will be potential use of the crude oil-fired heaters at the pumping stations. The bulk heaters will not be used until later in the project life.

³⁰ The primary effect under this category is the biological carbon stock changes caused by the project activity on the project site. This category includes carbon sinks (absorbers of carbon) as well as sources.

³¹ Emissions from land use, land use change and forestry were not included in the estimates.

³² The inventory was limited to emissions within Uganda. Emissions from road transport journeys including international portions are estimated based on the distances within Uganda only.

The power and heat demands vary over the project life. Greater pumping power is required during high flow rates of oil. Less pumping power, but greater heat demand, is required during periods with lower flow rates to maintain the pipeline at the minimum operating temperature.

Table 8.22-2 presents the predicted minimum and maximum annual direct emissions for the AGI sites. Appendix G3 presents detail on these data and their derivation.

Table 8.22-2 Operational Direct Greenhouse Gas Emissions Inventory

Site	Emission Source	Operational GHG Emissions (kilotonne CO ₂ e)	
		Minimum Annual	Maximum Annual
PS1	Bulk heating	0	14
PS2	Bulk heating	0	7
Total – Uganda		0	18 ¹

NOTE: ¹The maximum and minimum years for the two pumping stations do not coincide, so the total is not the sums of the rows above

Other minor direct emission sources during the operational phase will include:

- diesel-fired combustion plant at the AGIs, e.g., firewater pumps and standby generators
- road vehicles for the movement of people and equipment for operations and maintenance, and supplies to the manned AGIs.

The GHG emissions from these sources have not been quantified, as they are negligible relative to the operational emissions over the life of the project.

National Emissions Context

As described in Section 6.4.3.14, the business-as-usual (BAU) emissions scenario predicts that Uganda's total emissions including land use, land-use change and forestry (LULUCF) will be 77.3 MtCO₂e³³ in 2030. The government intends to reduce emissions by around 22% of the BAU baseline by this date, according to its Intended Nationally Determined Contribution (INDC) report (MWE 2015), resulting in net emissions³⁴ of 60.3 MtCO₂e.

The project's direct operational emissions of 11–18 ktCO₂e/a in Uganda³⁵ represent:

- 0.014–0.023% of Uganda's 2030 BAU emissions
- 0.018–0.029% of 2030 emissions under the INDC emission reduction scenario.

The construction emissions of 242 kt, occurring over a 2–3 year period, represent a higher proportion of these annual BAU and target emissions, but will not occur in

³³ Mt = megatonne, or one million tonnes, equal to 1000 kilotonnes.

³⁴ The term 'net emissions' reflects the fact that the land use change and forestry (LUCF) sector is predicted to become a carbon sink.

³⁵ This range excludes the years of zero emissions from the bulk heaters in the early years of the project.

2030 and therefore will not be counted in the emissions total that is assessed against the 2030 INDC target.

The contribution of EACOP to national emissions will not affect Uganda's ability to meet its emission reduction target published as part of the UNFCCC's Paris Agreement.

8.22.2.6 Indirect Emissions – Operation Phase

The main sources of indirect GHG emissions during the operational phase will be:

- end use of the products derived from the crude oil
- other parts of the chain that ultimately gets the products to end users:
- upstream extraction and processing
- EACOP feeder pipelines
- shipping crude oil from the MST to refineries abroad
- refining
- distribution of refined products
- indirect sources³⁶.

The types of indirect emissions listed in Section 8.22.2.4 may also occur in the operational phase.

8.22.3 Effect of Climate Change

The impacts associated with climate change for a region are hard to predict and its specific effects on the EACOP project cannot be determined. However, climate trends (see Section 6.4.3.14) predict an increase in the severity and frequency of extreme events such as droughts, storms and floods, an increase in temperature and a decrease in rainfall over much of the country. These events and trends may affect EACOP in varying degrees.

Climate change timescales are considered too short to have an effect on the construction phase. Effects are therefore limited to the operational phase and may include:

- erosion at watercourses which could affect pipeline integrity
- soil erosion on the RoW
- increased risk of landslides
- flooding of AGIs.

³⁶ Here, indirect means indirect to the entire fuel chain, i.e., removed by a further level relative to the emission sources that are indirect to EACOP. The category includes induced land development and co-product production.

8.22.4 Mitigation Measures

8.22.4.1 GHG Emissions

Design

Most of the decisions and measures that substantially affect greenhouse gas emissions are the conceptual alternatives described in Section 3.

The configuration³⁷ of the main pumps at the pumping stations has been optimised, with efficiency as a key consideration. This optimisation has led to larger pumps being specified, with an efficiency benefit that will save an estimated 2 ktCO₂e/a in Uganda over the years of plateau flow rate, this emission being avoided at the Tilenga CPF owing to less power demand. Further study in detailed engineering will examine the performance over the varying flow rate during the project's life. Detailed engineering will also select the pump models, an evaluation process during which efficiency will be a key factor.

At the standalone block valve stations, solar power is the base case power source. For the estimated load of 31 kWh/day at each of 14 stations in Uganda, this use of renewable energy will save around 114 tCO₂e/a compared with generating that power from oil-fired generators.

Operation

Monitoring and management arrangements during operation (see Section 2.4.5.6) will address climate change effects.

8.22.5 Cumulative Impacts

The climate VEC has a global AOI and in effect, every source of GHG emissions is a source of cumulative impact and ultimately a contributor to the same impact (climate change) on the same VEC. Project contributions to national GHG emissions are described in Section 8.22.2 and project mitigation measures in Section 8.22.4.

8.22.6 Conclusions

The following are the key conclusions related to the EACOP project's impact on climate:

- Direct operational emissions in Uganda once the bulk heaters begin operation will range between 11–18 ktCO₂e/a, which represents around 0.014–0.029% of Uganda's total GHG emissions in 2030: the contribution of EACOP to national emissions is therefore low and will not affect Uganda's ability to meet its emission reduction target published as part of the UNFCCC's Paris Agreement.
- Predicted emissions within Uganda from the construction phase have been estimated at 242 ktCO₂e, comprising 53% of the total (i.e., with the quantified operational emissions) over the project life.
- Construction-phase indirect emissions have not been quantified, as they are minor relative to the direct emissions over the life of the project.

³⁷ Number of pumps and total capacity relative to maximum demand

The following key conclusion is related to climate change adaptation:

- Project design, construction and operation have taken into account events and trends that may be related to climate change.

8.23 Pipeline and AGI Decommissioning

When pipeline oil shipping volumes diminish to the point that it becomes inefficient to transport oil via the pipeline, then the pipeline will be decommissioned based on Ugandan regulations and standards and international standards and protocols. The decommissioning process will be based on the following principles:

- engagement with stakeholders at local, regional and district levels to determine potential use of all redundant equipment and structures
- project structures to be removed from land that is no longer required for operations
- environmental due diligence to ensure that no substance-affected soil is managed
- land to be reinstated to a capability similar to that which existed before pipeline construction.

A decommissioning plan, which includes a social management component that addresses the impact of decommission (loss of jobs, economic activity), will be prepared and the scope will be developed in consultation with stakeholders at that time.

The decommissioning plan will consider the available options for removal of AGIs and disposition of the pipeline, fibre optic and power cables, in-situ. It will assess, where necessary, options for remediating contaminated land and propose details for re-vegetation of the area and post-decommission environmental and social monitoring. The impacts of options will be considered and mitigation measures proposed. Activities, aspects and associated impacts will be similar to construction including:

- soil handling leading to soil erosion and sediment release to surface water
- activities and traffic leading to noise and air emissions
- workforce leading to potential social effects.

Effects may be limited and short term.

8.24 Associated Facilities

As outlined in Section 2.5.1 and Appendix H, the following have been identified as AFs:

- Tilenga Project
- Kingfisher Oil Project

- concrete batch plants, borrow-pits and waste management facilities where they meet the IFC definition of associated facilities³⁸.

In cases where there are overlapping AOIs from the EACOP project and an associated facility on a VEC, the cumulative impacts are identified and assessed in Sections 8.2 to 8.11. The potential residual impacts of AFs outwith the overlapping EACOP project AOI are discussed in this section. While the Tilenga feeder pipeline is part of the Tilenga project, the residual impacts are presented separately as a separate ESIA has been produced for the feeder pipeline. Potential associated facility impacts are categorised using the EACOP project VEC categories³⁹.

The locations of concrete batch plants, borrow-pits and any waste disposal sites required have yet to be defined. These will be subject to the management of change process described in Section 10.9, which includes environmental and social appraisal of the change.

8.24.1 Tilenga Project

This section summarises the impacts from the Tilenga field and the Tilenga feeder pipeline.

The beneficial impacts from both the field and the feeder pipeline are described in Table 8.24-1. The significant residual impacts from the Tilenga field are presented in Table 8.24-2.

There are no significant residual impacts for the Tilenga feeder pipeline (TEAM 2018).

³⁸ Associated facilities are defined in IFC Performance Standard 1, paragraph 8, as “facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.”

³⁹ The Tilenga feeder pipeline ESIA uses the same VECs as the Uganda EACOP project. The Tilenga Project and the Kingfisher Oil Project have similar VECs but where they differ they have been allocated to the equivalent EACOP VEC.

Table 8.24-1 Beneficial Impacts of the Tilenga Project

Beneficial Impacts	Phase
Socio-economic VECs	
Improved road accessibility within the Tilenga Project area (direct)	Site preparation and enabling works
Direct and indirect employment opportunities (direct/indirect/induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning ⁴⁰
Increased demand for goods and services (direct/indirect/induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Development of more educated and skilled workforce (direct/indirect)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Community empowerment and increased community participation in decision making (induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Increased revenue for government (direct)	Commissioning and operations
Improvement in nutritional status (indirect/induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Improved health seeking behaviour (induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Improved regional health planning and programme delivery (Induced)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning

⁴⁰ Closure is equivalent to decommissioning.

Table 8.24-1 Beneficial Impacts of the Tilenga Project

Beneficial Impacts	Phase
Ecosystem services	
Crop production may increase due to re-opening land for agriculture	Decommissioning
Livestock and fodder/ pastoralism – benefit of re-opening of pasture grounds	Decommissioning
Timber and woody biomass – limited increase in supply and shift in patterns of fuel use	Decommissioning
Wild foods and bushmeat – small increase in wild food availability due to recolonisation	Decommissioning
Fibres and ornamental resources – small increase in supply	Decommissioning
Improved knowledge of the region increasing scientific and knowledge values	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning

Table 8.24-2 Significant Residual Impacts of the Tilenga Project

Potential Residual Impact	Phase
Biodiversity: habitats of conservation importance	
Direct impacts on Forest-Savanna Mosaic (scattered to the south of the Tilenga Project area – the remnant forest patches within the overall savanna landscapes, generally outside protected forests), due to land use changes and loss of habitat and indirect impacts due to in migration (PIIM) causing land use changes and pressure on natural resources and habitats	Construction and pre-commissioning, commissioning and operations, decommissioning.
Indirect impact on natural habitat – Murchison Falls-Albert Delta Wetland System Ramsar site, stretching from the top of Murchison Fall to the Albert Delta, predominantly within the Murchison Falls National Park (MFNP)– due to PIIM pressures on natural resources and habitats in the region	Commissioning and operations, decommissioning
Biodiversity: flora and fauna species of conservation importance	
Direct impacts including loss, degradation or fragmentation of species' habitat, population changes, disturbance or barrier effects, and indirect impacts due to PIIM pressures on the natural environment, on fauna, including critical habitat qualifying species and other notable species, such as Rothchild's giraffe, Lelwel hartebeest, elephant, lion, spotted hyena, Bohor reedbuck, Uganda kob and Denham's bustard	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Biodiversity: legally protected, internationally or nationally recognised areas	
Direct impacts on grassland habitats including direct loss of the threatened ecosystem Hyparrhenia Grass Savanna and loss of integrity of the protected forests, and indirect impacts such as PIIM pressures and indirect loss of habitat, degradation or fragmentation on MFNP and Karuma Wildlife Reserve	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Indirect impacts, such as loss of habitat due to PIIM pressures, on Bugungu Wildlife Reserve, Budongo Central Forest Reserve, Forest Reserves in Masindi Area, Bugoma Forest	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations, decommissioning
Soils	
No significant impacts identified	–

Table 8.24-2 Significant Residual Impacts of the Tilenga Project

Potential Residual Impact	Phase
Surface water	
Impact of changed morphology of riverbanks and flow of the Victoria Nile River causing increased flood risk due to the construction of the Victoria Nile Ferry Crossing	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Groundwater	
No significant impacts identified	–
Landscape	
Impacts of construction and maintenance activities on local landscape character areas: Buliisa lowland pastoral farmland, Buliisa lowland rolling farmland, Lake Albert coastal fringe, Victoria Nile corridor and MFNP north, savanna plateau, and viewpoints: Kimoli, Buliisa (west), Kisimo, Kirama, Kabalega Wilderness Lodge, Murchison River Lodge, Nile Safari Lodge, Pakuba Safari Lodge, Paraa ferry crossing, Buligi track Delta track junction, Albert track, Kasinyi (west and east), Buligi track (Pakuba airfield)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Air quality	
See climate	
Acoustic environment	
Impact of site activity noise: night-time well drilling and well pad noise south of Victoria Nile, HDD drilling noise at the Victoria Nile crossing points, CPF night-time noise	Construction and pre-commissioning, commissioning and operations
Socio-economic VECs (economy; local economy (nonland-based livelihoods); land-based livelihoods; river and lake-based livelihoods; land and property; workers' health, safety and welfare; social infrastructure and services; community health; community safety, security and welfare)	
Economic displacement of communities due to land acquisition (direct)	Site preparation and enabling works
Changes to traditional land tenure system (induced)	Site preparation and enabling works
Increased pressure on education facilities (indirect/induced)	Site preparation and enabling works
Social disarticulation and increased family and community conflict (indirect/induced)	Construction and pre-commissioning

Table 8.24-2 Significant Residual Impacts of the Tilenga Project

Potential Residual Impact	Phase
Changes to traditional way of life leading to loss of community/sense of place (indirect/induced)	Construction and pre-commissioning
Increased prostitution (indirect/induced)	Construction and pre-commissioning
Local price inflation (induced)	Site preparation and enabling works
Loss of tourism revenue (indirect)	Construction and pre-commissioning
Increase in teenage and unwanted pregnancy (indirect)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Increased prevalence of HIV/AIDS and other STIs (indirect)	Site preparation and enabling works, construction and pre-commissioning, commissioning and operations
Tangible and intangible cultural heritage	
No significant impacts identified	–
Climate	
GHG emissions	Commissioning and operations
Ecosystem services	
Direct impacts including surface water runoff, disruption of fish and macroinvertebrates, and indirect impacts; overfishing and increased demand due to PIIM, and reduction in species diversity and catch size, on capture fisheries	Construction and pre-commissioning, commissioning and operations
Direct impact on wild foods and bushmeat through increased hunting, demand and instances of commercial hunting of flagship species, improved access and increases in human-wildlife conflicts	Commissioning and operations
Direct and indirect impacts on tourism and recreation values and wild species diversity, through disturbance to wild animals and visitors to Murchison Falls, damage to MFNP's reputation for remoteness and wildness, and increased hunting activities due to improved access	Construction and pre-commissioning, commissioning and operations

8.24.2 Kingfisher Oil Project

This section summarises the significant residual impacts from the Kingfisher Oil Project.

The beneficial impacts are described in Table 8.24-3 and the significant residual impacts are presented in Table 8.24-4. Information received from the project infers that an impact ranked as being of low significance does not require mitigation; Table 8.24-4 therefore includes the impacts ranked with moderate and high significance.

Table 8.24-3 Beneficial Impacts of the Kingfisher Oil Project

Beneficial Impacts	Phase
Socio-economic VECs	
Employment opportunities for local communities	Construction and operation
Skills development and training for employees	Construction and operation
Provision of accommodation and catering facilities for contract workers	Construction and operation
National and regional economic growth	Construction and operation
Local economic development	Construction and operation
Human capital development	Construction and operation
Increase in government revenue	Operation
Project acting as a persuasive and influential partner in promoting the development of a stable and diversified economy around the CPF	Operation
Project creating the impetus for increased government investment in district government funding	Operation
New well-ventilated, multi-roomed homes which will reduce the impact of respiratory diseases, in the case of relocation	Construction
Replacement of lost houses with modern weatherproof houses	Construction
Compensation from land acquisition combined with mechanisms to ensure effective livelihood restoration providing income to affected landowners along the feeder pipeline	Construction
Contribution of the project to the control of vector-based and non-communicable diseases in communities around the CPF	Operation
Improved access provided by regional road upgrades	Construction and operation

Table 8.24-4 Significant Residual Impacts of the Kingfisher Oil Project

Potential Impact	Phase
Biodiversity: habitats of conservation importance	
Indirect impacts of in-migration (PIIM) pressures including changes in water quality and increased soil erosion, increased harvesting and grazing on the habitats and ecosystem integrity of Buhuka Flats around the CPF	Construction and operation
Indirect impacts of PIIM pressures including changes in water quality and increased soil erosion, increased harvesting and grazing on the habitats and ecosystem integrity of the escarpment vegetation corridors near the CPF	Operation
Impact of the jetty upgrade at the CPF on sediment transport along the shoreline of Lake Albert affecting ecosystem composition	Construction
Impact of habitat loss of seasonal wetland and disturbance due to the extension of well pad 1 at the CPF on ecosystem composition	Construction
Indirect impacts of PIIM pressures including changes in water quality and increased sedimentation and erosion on wetlands and drainage lines along the feeder pipeline	Construction
Biodiversity: flora and fauna species of conservation importance	
Indirect impacts of PIIM pressure including habitat degradation, poaching, increased sedimentation on species of conservation concern including the mud snail (CR) along the shores of Lake Albert, grey-crowned crane (EN) on Buhuka Flats and Nahan's francolin (CR) and Eastern chimpanzees (EN) in the Bugoma Central Forest Reserve (BCFR), due to the CPF	Construction and operation
Direct impact of habitat loss and degradation through sedimentation and contamination on the mud snail (CR) along the shores of Lake Albert due to the CPF	Construction and operation
Impacts of additional construction traffic and transmission of human diseases on the survival and reproduction of Eastern chimpanzees within the BCFR	Construction and operation
Impacts on ecosystem configuration due to potential barrier effects of the road for fauna species through the escarpment vegetation corridors	Operation
Indirect impacts of PIIM pressure due to the feeder pipeline, including pressures on natural resources, on species of conservation concern, the grey-crowned crane (EN) on Buhuka Flats	Construction
Biodiversity: legally protected, internationally or nationally recognised areas	
Indirect impacts of PIIM pressures including encroachment on the habitats and ecosystem integrity of Bugoma Central Forest Reserve, due to the CPF and feeder pipeline	Construction and operation
Indirect impacts of upgrades of roads to the CPF within the Bugoma Central Forest Reserve, including collision, nuisance and harassment of wild animals	Construction
Soils	
No significant impacts were identified	

Table 8.24-4 Significant Residual Impacts of the Kingfisher Oil Project

Potential Impact	Phase
Surface water	
Impact on water levels in Lake Albert due to the CPF abstracting water	Operation
Groundwater	
No significant impacts were identified	
Landscape	
Impact on the visual aesthetics for local communities around the CPF (daytime and night-time)	Construction and operation
No significant impacts were identified along the feeder pipeline	
Air quality	
No significant impacts were identified	
Acoustic environment	
Impact of night-time CPF construction on structures and households close to CPF	Construction
Impact of night-time drilling noise on structures and households around the CPF	Construction and operation
Impact of night-time civil construction noise on structures and households	Construction
Socio-economic (economy; local economy (nonland-based livelihoods); land-based livelihoods; river and lake-based livelihoods; land and property; workers' health, safety and welfare; social infrastructure and services; community health; community safety, security and welfare)	
Indirect impacts due to PIIM, on infrastructure and community services such as increasing demand on limited schools, health and welfare services, emergency service and water supply at the CPF	Construction
Impact of loss of income due to layoff of casual labour around the CPF and along the feeder pipeline	Construction
Impact of sexually transmitted diseases (STDs), including HIV/AIDS on employee health and safety around the CPF and along the feeder pipeline	Construction and operation
Impact on land property and rates around the CPF and along the feeder pipeline	Construction
Impact of disrupted local livelihoods due to loss of grazing land on the Buhuka Flats due to CPF construction and of land on which subsistence agriculture is practiced along the feeder pipeline	Construction
Impacts due to PIIM, including competition for jobs and resources increasing tensions, increased pressure on existing services such as health centres and schools, dilution of local government influence, increase in vector-related diseases, STDs, water borne diseases, food and nutrition related diseases and zoonotic diseases, and increased crime and fire risks at the communities around the CPF	Construction and operation

Table 8.24-4 Significant Residual Impacts of the Kingfisher Oil Project

Potential Impact	Phase
Impacts due to PIIM, including competition for jobs and resources increasing tensions, increased pressure on existing services such as health centres and schools, and dilution of local government influence	Construction
Impact of STDs, including HIV/AIDS, on local communities around the CPF and along the feeder pipeline	Construction and operation
Impacts of land loss, resulting in loss of grazing land and resettlement around the CPF	Construction
Impact on land and property rates from increased land speculation on the Buhuka Flats due to the CPF and feeder pipeline	Construction
Impact of increased property prices and rental on existing tenants around the CPF	Construction and operation
Impact of social fragmentation and loss of sense of place in communities around the CPF	Construction
Impact of unmet expectations if work seekers are unsuccessful in communities along the feeder pipeline	Construction
Disruption of social networks due to resettlement of communities within the CPF footprint and along the feeder pipeline	Construction and operation
Impact of the release of hazardous materials or wastes through small spillages outside controlled areas on community safety around the CPF	Operation
Impact of restrictions on land use; prohibited further settlement or other built infrastructure within the buffer zone around the CPF	Operation
Tangible and intangible cultural heritage	
Direct impacts (loss or damage of site) on lithic archaeological sites from the Stone Age, a location where a bangle fragment was found, and sites of undated pottery scatter around the CPF location	Construction
Indirect impacts on intangible cultural landscapes, ritual sites, a sacred river and a sacred tree around the CPF location	Construction and operation
Climate	
No significant impacts identified around the CPF or along the feeder pipeline	