Republic of Kenya
Coast Water Works Development Agency

IMPROVEMENT OF DRINKING WATER AND SANITATION SYSTEMS IN MOMBASA: MWACHE CKE 1103

Detailed Designs, Tender Documents, Safeguard Reports and Construction Supervision of Mwache Water Transmission Pipelines and Terminal Reservoirs

Contract No : CWSB/AFD/MWCE/C/3/2017

Critical Habitat Assessment (CHA) REPORT

JULY 2025

ARTELIA

MIBP CONSULTING ENGINEERS

JULY 2025 / 877 3335

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ABREVIATIONS AND ACRONYMS

BMP	Biodiversity Management Plan
BMU	Beach Management Unit
DBH	Diameter at breast height,
DMU	Discreet Management Unit
ESF	Environmental and Social Framework
EN	Endangered Species
EOO	Extend of Occurrence
CFA	Community Forest Association
CHA	Critical Habitat Assessment
CH	Critical Habitat
CR	Critically Endangered
CCF	Chief Conservator of Forest
GN	Guidance Note
IBAT	Integrated Biodiversity Assessment Tool
IUCN	International Union for Conservation of Nature
IFC	International Finance Cooperation
IVI	Importance Value Index
LC	Least Concern
KBA	Key Biodiversity Area
KFS	Kenya Forest Service
KWS	Kenya Wildlife Services
NMK	National Museums of Kenya
NE	Not Evaluated
NT	Near Threatened
OS	Operational Safeguards
SLA	Service Level Agreement
SGR	Standard Gauge Railway
TMP	Traffic Management Plan
UNESCO	United Nations Educational, Scientific and Cultural Organization
VECs	Valued Environmental and Social Components
VU	Vulnerable Species
WML	West Mainland
WTP	Water Treatment Plant
WBG	World Bank Group
WRA	Water Resources Authority
WMP	Waste Management Plan

EXECUTIVE SUMMARY

The trunk main section 1.5km will traverse through Mwache forest which is a gazetted forest reserve located in Kwale County, and covers approximately 417 hectares. The pipeline alignment was adopted after analysis of 3Nr. different Pipeline route options as discussed in sub section (1.5) of this report.
From the analysis, the adopted route Option 2 where the Pipeline within a 4m wide corridor of the Mwache forest adjacent to the SGR Reserve involves:

- **Section 1**: Initial 400m section of the pipeline within the forest to be laid fully within the forest due to hydraulic considerations. The width of forest affected under this option will be 8m. The area of forest land affected on this 400m long section is 0.33Ha.
- **Section 2**: 1.1km section of the pipeline along the alignment of the SGR. The pipeline on this section will be laid within a 4m wide corridor adjacent to the existing SGR reserve, hence affecting only a 4m wide section of the forest for the 1.1km section of pipeline along the railway. The area of forest land affected on this 1.1km long section is 0.44Ha.

The Critical Habitat Assessment was carried between the Month of April to May 2025 as provided by the International Finance Corporation (IFC) Performance Standards PS6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC 2012, 2019). The (PS6) was the key standard that was reviewed for this assessment. The standard guided assessment of Project impacts on biodiversity values along the 1.5km section that interphases with the Mwache Forest as discussed in para above. The standard provide that a Critical Habitat Assessment (CHA) should be undertaken for such ecosystems to; (i) to confirm the presence of Critical Habitat-qualifying biodiversity values associated with the Project, based on a collation and review of existing data Environmental and Social Impact Assessment (ESIA), baseline surveys), scientific literature and expert input and (ii) to outline the implications of the outcome of the CHA for the Project; and (iii) to identify the recommended next steps for the Project, including identification of presenting mitigation measures of Project impacts to Biodiversity Within the alignment that interphases with the forest.

IFC Guidance Note (GN) 6 paragraphs GN70–83 provides that biodiversity values should be screened using critical habitat criteria and thresholds including (i). Criterion 1: Critically Endangered (CR) and Endangered Species (EN) applicable thresholds being areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥ 0.5% of the global population and ≥ 5 reproductive units GN16 of a CR or EN species). (ii) Criterion 2: Endemic and Restricted-range Species for terrestrial vertebrates and plants, restricted-range species are defined as those species that have an Extend of Occurrence (EOO) less than 50,000 square kilometres (km2) and (iii) Criterion 3: Migratory and Congregatory Species, being areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.

From the flora and fauna species analysis undertaken in this assessment, none of the species collected along the sampling polygon along the pipeline corridor met the thresholds detailed by the IFC PS 6 Guidance Note GN70–83. Further, assessment of species listed under IBAT was undertaken applying the thresholds provided under GN6.1 (criteria 1–5) that assessed presence or absence of the species, habitat suitability, observation status and threshold status (Appendix 3), similarly, no species met the thresholds of triggering either of the criterion detailed in para above.

Therefore, the assessment confirms that the proposed Project activities will not lead to measurable adverse impacts on biodiversity values within the water pipeline alignment. **Further, the Project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered**

species including the ones listed under IBAT for the 50km radius. This report presents a robust, appropriately designed, and long-term biodiversity monitoring and evaluation program that is based on the data collected in the field and literature. This plan will be updated and enhanced in collaborating with Kenya Forest Service (KFS) to make its more specific after finalisation of KFS 100% Census of floral biodiversity that will be enumerated within the pipeline alignment at the permitting stage.

As per the Kenya Forest Act 2016, The KFS plays a crucial role in issuing user permits, primarily to manage and conserve forests and forest resources. KFS is responsible for issuing various types of permits, including timber harvesting licenses, special use licenses, and cultivation permits, as well as other authorizations like concession agreements, joint management agreements, and contracts. For this Project KFS will undertake a census of all affected trees that will be impacted along the 1.5km stretch within the forest and bill CWWDA. KFS will ultimately use the funds to offset or reclaim another degraded section of the forest.

1. INTRODUCTION

1.1. MWACHE FOREST

Mwache Forest Reserve in Kwale County, is approximately 417 ha, Mwache Forest, specifically its mangrove ecosystem, plays a crucial role in biodiversity conservation and offers significant ecological and socioeconomic benefits. The forest is divided into 3 unique sections including the (i) kaya Mutswakara, (ii) Mwache Forest Reserves and (iii) Mwache Creek with Mangrove Vegetation.

Mwache Creek is vital for both ecological and socioeconomic reasons, primarily due to its extensive mangrove ecosystem. These mangroves act as natural barriers, protecting coastlines from erosion and storm surges, while also providing crucial habitats for diverse marine species. The creek's waters support fisheries, and the mangrove forests offer resources like timber and fuel. Additionally, the creek is a source of freshwater and sediment, impacting the surrounding environment and agricultural practices. Kaya Mutswakara is located to the right side of River Mwache as it flows into the creek is among the Sacred Mijikenda Forests that are listed under UNESCO World Heritage Sites. The Kaya is among the Mijikenda Kaya Forests consist of 10 separate forest sites spread over some 200 km along the coast containing the remains of numerous fortified villages, known as kayas, of the Mijikenda people. Mwache Forest to the left Bank of Mwache River: This forest section comprised of a mix of regenerating and natural vegetation. This section the forest has been fragmented and the Gami Quarry is located within Mwache Forest and the Standard Gauge Railway Line that traverses the forest. This section of the forest. The trunk main section 1.5km will traverse through Mwache forest at the western side close to Standard Gauge Railway Line alignment

The trunk main section 1.5km will traverse through Mwache forest at the western side close to Standard Gauge Railway Line alignment. This section characterized by a steep valley that begins from pipeline intersection with Mwache Rivers to the section where the pipeline interphases with Standard Gauge Railway (SGR) Line Wayleave. The section comprises of a mix of natural and modified forest vegetation regenerating from impacts of 2014 to 2016 SGR construction activities. The pipeline traversing through this section necessitates preparation of a Critical Habitat Assessment (CHA).

1.2. MWACHE DAM

Mwache Multipurpose Dam Project, a Vision 2030 flagship project, which has been given high priority by the Ministry of Water and Sanitation and Kwale and Mombasa Counties. The Mwache Project includes two components: i) the main dam and associated infrastructure and ii) the upper check dam and associated infrastructure. The main dam is located at Fulugani village, Kasemeni Ward, Kinango Sub-County of Kwale County, about 22 km northwest of Mombasa City. The proposed dam falls within the drainage system of Mwache and Mnyenzeni rivers and their tributaries. The proposed dam is a concrete gravity dam with a height of 101m and with a reservoir capacity of about 118 million m3. The dam with its reservoir will supply domestic water of about 186,000m3/day to Mombasa city.

1.3. TRUNK WATER MAIN

The Mwache Trunk Main forms part of the Mwache Water Transmissions Pipelines Project, the downstream works for the Mwache Dam Project. The scope of works under the Mwache Trunk Main will entail construction of Twin DN1000 Trunk Main Pipeline from the proposed Mwache Water Treatment Plant to the proposed West Mainland Reservoir Site located within Kasemeni Location of Kinango Sub County in Kwale County. Due to the

budgetary constraints, one of the 2Nr. pipelines forming the twin trunk main is financed by the French Development Agency (AFD) while financing agreement for the second pipeline is to be financed under other arrangements. The total length of this section of the Trunk Main is 2.9km. The outlet elevation of the WTP clear water tank, which is the start elevation of the trunk main, is 115 masl. From the WTP, the Mwache Trunk Main traverses south-east, through the dam operation area (undeveloped land) and small scale cultivated lands to the Mwache Forest. Within the Mwache Forest, the trunk main is proposed to be laid between the newly constructed Standard Gauge Railway (SGR) and the Mwache River. The section of the trunk main within the forest is approx. 1.5km in length. This section of the trunk main has a high cross-fall slope between the SGR and the Mwache River. After the forest, the trunk main continues generally along the standard gauge railway for approx. 250m up to Ch. 2+930, where the Transmission Main to the South Mainland (Kaya Bombo Transmission Main) branches off.

1.4. SOUTH MAINLAND TRANSMISSION MAIN

The Mwache South Mainland Transmission Main (Kaya Bombo Pipeline) is a 27.7km of a single DN 1000/900 Pipeline that traverses in the S.W direction through undeveloped open farmlands to the existing wayleave of Marere Water Transmission pipeline and runs along the Marere Pipeline to the Creek where it is proposed to cross beside the existing creek Crossing.

From the creek crossing, the South Mainland Transmission Pipeline then follows the alignment of the existing Marere Pipeline for approx. 6.4km up to Ch. 9+586 at Lutsangani. At this location, the proposed pipeline turns S.W. to the alignment of the existing DN 200 Kaya Bombo Pipeline for 12.2km up to the existing Kaya Bombo reservoir site at Ch. 21+744. The Pipeline on this section will cross the Pemba River at Ch. 11+090. It will then traverse through Mteza, Mbuguni, Majera and Kaya Bombo villages to the existing Kaya Bombo reservoir site.

At the existing Kaya Bombo Reservoir Site, an offtake from the transmission pipeline will deliver the 4,000m3/day allocation to Kwale County to the existing reservoirs then the main pipeline will taper from DN 1000 to DN 900 and continues S.E along the alignment of the existing DN 350 Tiwi Pipelines for approx. 1.1km to the Kiteje - Kaya Bombo Road at Ch. 22+824. At this point, the pipeline will turn N.E, along the Kiteje-Bombo Road for approx. 4.6km to Ch. 27+370 where it will traverse through private parcels for approx. 250m to the proposed Dongo Kundu reservoir site at Ch. 27+625. The transmission line traverses Kasemeni and Gandini Locations in Kinango Sub County and N'gombeni Location of Matuga Sub County in Kwale County.

1.5. MWACHE TRUNK MAIN SECTION WITHIN THE FOREST PIPELINE ROUTE OPTIONS

The following 3 Pipeline route options are available for construction of the Mwache Trunk Main section within the Forest.

i) Route Option 1: Pipeline within Mwache forest as per the original design.

In this option, a 15m width of forest would be affected, leading to clearing of 2.5Ha. of the forest land over 1.7km of pipeline section within the forest.

The Mwache forest lies within the jurisdiction of the Kenya Forest Service (KFS). The KFS were involved at the design stage and during RAP and ESIA preparation for the project, including issuing their No-Objection to the National Environment Management Authority for issuance of an ESIA License. The pipeline route under this option does not impact on the railway.

Comments by AFD during the E&S mission to the project in January 2025 necessitated review of measures to reduce the impact of the pipeline section within the forest to the forest ecosystem. Measures considered involved:

- Review of option for partial re-alignment of sections of the Transmission Pipelines within the forest to reduce the sections to a minimum possible length and width, hence significantly reducing the scale and magnitude of the impacts.
- Review of the mitigation and compensation measures, including proposal for carrying out a key biodiversity assessment, in line with the AFD comments.

The above measures resulted in commissioning of a Critical Habitat Assessment (CHA) discussed in this report. In order to reduce the pipeline impact on the forest, two alternative re-alignment routes for the section within the forest as follows:

- Pipeline route Option 2; Pipeline to be laid within 4m width of the forest adjacent to the SGR reserve
- Pipeline route option 3; Pipeline within the existing Railway Service Road beside the Standard Gauge Railway

ii) Route Option 2: Pipeline within 4m wide corridor of the Mwache forest adjacent to the SGR Reserve.

The pipeline route within the Mwache Forest under this option will be 1.5km comprising of two (2) sections as follows.

- Section 1; Initial 400m section of the pipeline within the forest to be laid fully within the forest due to hydraulic considerations. The width of forest affected under this option will be 8m. The area of forest land affected on this 400m long section is 0.33Ha.
- Section 2; 1.1km section of the pipeline along the alignment of the SGR. The pipeline on this section will be laid within a 4m wide corridor adjacent to the existing SGR reserve, hence affecting only a 4m wide section of the forest for the 1.1km section of pipeline along the railway. The area of forest land affected on this 1.1km long section is 0.44Ha.

The total area of forest affected under this option will be 0.77Ha, within the overall length of 1.5km., leading to a 69% reduction of the area of forest affected as compared to the original design.

The reduction in area of forest affected will be achieved by using the existing railway service road temporarily as a construction access and for working space during construction of the pipeline. This will enable the pipe laying works to be limited to only 4m of the forest, where the permanent works will be installed.

Approval by both KFS and Kenya Railways will be required to carry out the works under this option, with KFS granting the special user license to lay the pipeline within the 8m corridor on the section 1 (400m length) and 4m corridor on section 2 (1.1km length) of the pipeline, and Kenya Railways to grant permission to temporarily use the railway reserve for construction access and working space during construction. Under this arrangement, approval by Kenya Railways can be easily obtained as no permanent works will be installed within the railway reserve. Considering the significant reduction of the forest land affected under this option, the KFS approval will be for a significantly smaller corridor as compared to that in the original design (option 1 above).

iii) Route Option 3: Pipeline along railway service road within the SGR Reserve.

The pipeline route within the Mwache Forest under this option will be 1.5km comprising of two (2) sections as follows.

- Section 1; Initial 400m section of the pipeline within the forest to be laid fully within the forest due to hydraulic considerations. The width of forest affected under this option will be 8m. The area of forest land affected on this 400m long section is 0.33Ha.
- Section 2; 1.1km section of the pipeline along the alignment of the SGR. The pipeline on this section will be laid within an existing railway service road entirely within the existing SGR reserve. There will be no impact to the forest on this section within the railway reserve.

The area of forest affected under this option will be 0.33Ha, leading to an 87% reduction of the area of forest affected as compared to the original design.

Under this option, Approval by both KFS and Kenya Railways will be required to carry out the works, with KFS granting the special user license to lay the 400m on the initial section of the pipeline entirely within the forest (within an 8m corridor) and Kenya Railways to grant permission for laying 1.1km of the pipeline within the railway reserve. From past experience, approval by Kenya Railways to carry out permanent works within the railway reserve will be lengthy and bureaucratic, hence not the preferred option.

iv) Summary and Conclusion

A summary comparison of the 3Nr options presented above is given in the **Table 1.1** below.

Table 1-1: Comparison of Pipeline Route Options for the Mwache Trunk Main

S/No.	Aspect	Route Option 1	Route Option 2	Route Option 3
1	Impact to the forest (Area of forest land affected)	2.5Ha	0.77Ha	0.33Ha
2	Impact on Biodiversity	Significant	Less significant	Less significant
3	Forest Fragmentation	Yes	No	No
4	Approval requirements	KFS	KFS & Kenya Railways	KFS & Kenya Railways
5	Ease of approval	Easy	Relatively Easy	Relative complex

Based on the above, it is recommended that Option 2 of the Pipeline route options be adopted as it will result in significantly low impact to the forest while ensuring timely implementation of the Project.

Figure 1-1 on Page 8 illustrates layout Plan of the proposed Pipelines overlaid on Mwache Forest Distinct Sections (Kaya Section, Creek Section and Mwache Forest Reserve Section)

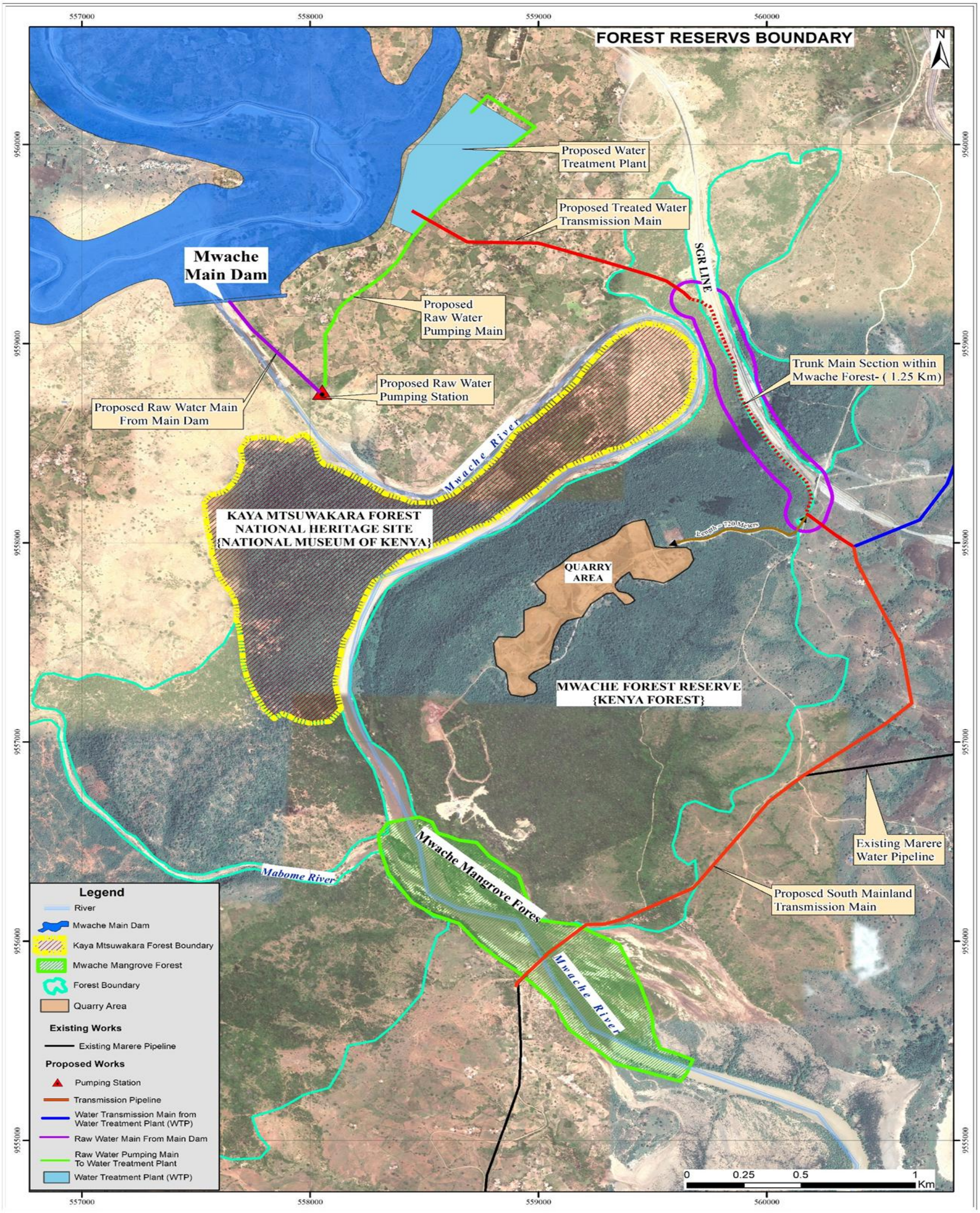


Figure 1.1: Layout of Proposed Water Transmission Mains Overlaid on Mwache Forest Distinct Section

1.6. PURPOSE OF THE ASSESSMENT

The trunk main section 1.5km will traverse through Mwache forest which is Mwache is a gazetted forest reserve located in Kwale County, and covers approximately 417 hectares *(Mwaguni and Munga, 2015*). Therefore, International Finance Corporation (IFC) Performance Standards (PS), including PS6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC 2012, 2019), a Critical Habitat Assessment (CHA) has been undertaken to;

- To confirm the presence of Critical Habitat-qualifying biodiversity values associated with the Project, based on a collation and review of existing data (ESIA, baseline surveys), scientific literature and expert input;
- To outline the implications of the outcome of the CHA for the Project; and to identify the recommended next steps for the Project, including identification of presenting mitigation measures of Project impacts to Biodiversity Within the alignment that interphases with the forest

1.7. RELEVANT STANDARDS

1.7.1 World Bank ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

The World Bank's ESS6 requires a differentiated risk management approach to habitats based on their sensitivity and values and address all habitats, categorized as 'Modified Habitat', 'Natural Habitat', and 'Critical Habitat', along with 'legally protected and internationally and regionally recognized areas of biodiversity value' which may encompass habitat in any or all of these categories.

Categorising habitats as Natural or Modified based on their condition needs to recognise that in practice, Natural and Modified Habitats exist on a continuum ranging from largely untouched, 'pristine' Natural Habitats to intensively managed Modified Habitats. Critical Habitats can be represented by Modified or Natural habitats depending on whether biodiversity features are present that meet the relevant criteria and the thresholds for Critical Habitat. This categorisation of habitats provides an indication of the level of risk a project poses to biodiversity and then provides a basis for determining the level of mitigation required to compensate for impacts on habitats of different conservation value e.g. loss or fragmentation. Both ESS6 and the IFC's PS6 requires an ultimate outcome of no net loss of biodiversity for Natural Habitat and net gain for Critical Habitat.

Projects with significant risks and adverse impacts on biodiversity require a Biodiversity Management Plan. Where there is a lack of scientific certainty or where impacts on biodiversity are uncertain, a precautionary approach is required, including implementation of the mitigation hierarchy, application of cost-effective mitigation measures and adaptive management.

ESS6 (in summary) states that projects can only be undertaken in Critical Habitat if a number of criteria are satisfied e.g. there are no other viable alternatives for the project in habitats of lesser biodiversity value; all national laws and international obligations of the host country' approval for the project in or adjacent to the Critical Habitat has been complied with; there is no likelihood of measurable adverse impacts on the biodiversity values for which the Critical Habitat was designated; there is no anticipated net reduction in a population of any Critically Endangered, Endangered or restricted range species over a reasonable time period; the project will be designed to achieve a net gain of those biodiversity values for which the Critical Habitat was designated, and that a robust appropriately designed long term biodiversity monitoring and evaluation program is integrated in to the Borrower's management program.

1.7.2 International Finance Corporation's Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

The International Finance Corporation (IFC) requires a client seeking funding for their proposed project to assess environmental and social risks using eight Performance Standards. Performance Standard 6 (PS6; IFC 2012a) and the associated Guidance Note 6 (GN6; IFC 2012b) focus on the protection and conservation of biodiversity. In most cases, the required conservation outcome under PS6 is no-net-loss of biodiversity value achieved using the "like-for-like" or better principle of biodiversity offsets. However, when a project occurs in critical habitat (CH) supporting exceptional biodiversity value, a net gain in biodiversity value is required.

Critical Habitat (CH) identification is required by PS6 to manage risks and avoid, mitigate, and offset impacts to areas with high biodiversity value including: 1) habitat of significant importance to Critically Endangered (CR) and/or Endangered (EN) species; 2) habitat of significant importance to endemic and/or restricted-range species; 3) habitat supporting significant global concentrations of migratory species and/or congregatory species; 4) highly threatened and/or unique ecosystems; and/or 5) areas associated with key evolutionary processes. Further, the standard provides that Critically Endangered (CR) and Endangered (EN) species potentially present in the area must be identified through a literature review (e.g., using IBAT). Field surveys should provide evidence to confirm their actual presence or absence. If these species are not detected during fieldwork, expert opinions and interviews with knowledgeable local stakeholders must be used to support their absence.

1.7.3 Key Biodiversity Area (KBA) Guidelines

The KBA Standard (IUCN, 2016) defines a set of criteria and associated quantitative thresholds for identifying KBAs in an objective, repeatable and transparent way. The general approach for identifying KBAs was informed by The IUCN Red List of Threatened Species™ (IUCN, 2012a, hereafter the IUCN Red List) and by the Red List of Ecosystems (RLE, Keith et al., 2013), which use criteria and quantitative thresholds to identify threatened species and ecosystem types respectively.

The KBA criteria are explicitly designed to cover all levels of biodiversity, including genetic diversity, species and ecosystems. The KBA criteria include both species-based criteria similar to those used in the above-mentioned schemes (e.g., AZE sites, IBAs), and ecosystem-based criteria designed to identify sites that are important for biodiversity at the ecosystem level. Collectively, the criteria aim to capture the various ways in which a site can be important for the global persistence of biodiversity. The eleven criteria are grouped into five high-level criteria (A-E). A site must contribute significantly to the global persistence of at least one of the following to qualify as a KBA:

- Threatened biodiversity (Criteria A1-2)
- Geographically restricted biodiversity (Criteria B1-4)
- Ecological integrity (Criterion C)
- Biological processes (Criteria D1-3)

or, it must have:

- Very high irreplaceability, as determined through quantitative analysis (Criterion E).

A site needs to meet the thresholds for only one criterion or sub criterion to qualify as a KBA, but all sites should be assessed against as many KBA criteria and for as many taxonomic groups and ecosystem types as possible, given available data. Mwache Forest IUCN Management Categories of Protected Areas as elaborated below;

- **Ia Strict Nature Reserve:** NO, the 1.5km Section targeted for the pipeline does not fall under this category. The forest does not exhibit strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphical features.

- **Ib Wilderness Area:** No, Mwache Forest is not designated as a Category Ib Wilderness Area. It is a gazetted forest reserve in Kwale County, while it is protected from human settlement and development, it does not have the specific wilderness area classification
- **II National Park:** No, Mwache Forest is not a National Park. It is a forest reserve, specifically a mangrove forest reserve, located in Kwale County, Kenya. It is one of the largest mangrove forests in Kenya. While it is a protected area, it is not designated as a National Park, which typically have a higher level of protection and management.
- **III Natural Monument or Feature: No,** the pipeline section is within a forest block that does not fall under Natural Monument or Feature. However, it is important to note that KAYA Mutswakara which is among the Mijikenda Kaya Forests denoted as UNESCO World Heritage site is located on the right side of Mwache River away from the targeted pipeline Section (See attached figure)
- **IV Habitat/Species Management Area:** No, Mwache Forest is not a Habitat/Species Management Area, but it is a part of the Mwache-Tanza-Mbuguni-Bonje forest ecosystem in Kwale County, which is known for its rich biodiversity and plays a crucial role in the local economy. The Kenya Forest Service, in collaboration with the Community Forest Association (CFA) and other partners, is developing a Participatory Forest Management Plan to promote sustainable practices within the ecosystem.
- **V Protected Landscape/ Seascape:** NO, although Mwache forest is gazette in Kenya as a government forest, there is no evidence of interaction of people and nature over time that could have resulted to distinct character with significant, ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting
- **VI Protected area with sustainable use of natural resources:** NO, although Mwache forest is gazette in Kenya, there is no evidence of sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area. As reported earlier, the only visible human activity is quarrying which is not a sustainable use of forest resources from a conservation perspective.

1.8. REFERENCE TO ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) PREPARED FOR MWACHE SOUTH MAINLAND TRANSMISSION LINES

The (ESIA) assessment was undertaken in line with the requirements of the Environmental Management and Coordination Act (EMCA) 1999 cap 387 section (58). The main objective of the assessment was to identify and assess Social and Environmental Impacts resulting from the Proposed Mwache Trunk Main and South Mainland Water Transmission Pipeline. The main focus was on impacts of the water pipeline construction to biophysical social and economic environment

Further, the ESIA using the concept of Valued Environmental and Social Components (VECs) assessed cumulative impacts of other related project within the areas including; Mwache Multi-Purpose Dam Project, Mombasa Southern Bypass Highway Project and the special economic zone development project at Dongo Kundu. The ESIA provides and evaluation of cumulative effects of the above projects to; Physical features; Environmental processes; Ecosystem conditions (e.g. biodiversity); Social conditions (e.g. health, economics); or Cultural aspects. This CHA will therefore enhance mitigation measures presented in the ESIA report especially on biological and social receptors recorded within Mwache Dam Ecosystem

2. FIELD METHODOLOGY

2.1 Critical Habitat (CH)

IFC Guidance Note 6 paragraphs GN70–83 provides that biodiversity values should be screened using critical habitat criteria and thresholds as summarized below.

Criterion 1: Critically Endangered and Endangered Species

GN70 Species threatened with global extinction and listed as CR and EN on the IUCN Red List of Threatened Species shall be considered as part of Criterion 1. GN14 Critically Endangered species face an extremely high risk of extinction in the wild. Endangered species face a very high risk of extinction in the wild.

- Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥ 0.5% of the global population AND ≥ 5 reproductive units GN16 of a CR or EN species).
- Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (VU) species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in GN72(a).
- As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.

Criterion 2: Endemic and Restricted-range Species

GN74. For purposes of this Guidance Note, the term endemic is defined as restricted-range. Restricted range refers to a limited extent of occurrence (EOO).

- For terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 square kilometres (km^2).
- For marine systems, restricted-range species are provisionally being considered those with an EOO of less than 100,000 km^2.
- For coastal, riverine, and other aquatic species in habitats that do not exceed 200 km width at any point (for example, rivers), restricted range is defined as having a global range of less than or equal to 500 km linear geographic span (i.e., the distance between occupied locations furthest apart)

Criterion 3: Migratory and Congregatory Species

GN76. Migratory species are defined as any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem).

- Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle.
- Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.

Criterion 4: Highly Threatened or Unique Ecosystems

GN79. The IUCN is developing a Red List of Ecosystems, following an approach similar to the Red List for Threatened Species. The client should use the Red List of Ecosystems where formal IUCN assessments have been performed. Where formal IUCN assessments have not been performed, the client may use assessments using systematic methods at the national/regional level, carried out by governmental bodies, recognized

academic institutions and/or other relevant qualified organizations (including internationally recognized NGOs).

- Areas representing ≥5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN.
- Other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.

Criterion 5: Key Evolutionary Processes

GN81. The structural attributes of a region, such as its topography, geology, soil, temperature, and vegetation, and combinations of these variables, can influence the evolutionary processes that give rise to regional configurations of species and ecological properties. In some cases, spatial features that are unique or idiosyncratic of the landscape have been associated with genetically unique populations or subpopulations of plant and animal species. Physical or spatial features have been described as surrogates or spatial catalysts for evolutionary and ecological processes, and such features are often associated with species diversification. Maintaining these key evolutionary processes inherent in a landscape as well as the resulting species (or subpopulations of species) has become a major focus of biodiversity conservation in recent decades, particularly the conservation of genetic diversity. By conserving species diversity within a landscape, the processes that drive speciation, as well as the genetic diversity within species, ensures the evolutionary flexibility in a system, which is especially important in a rapidly changing climate.

2.2 Determination of Discrete Management Unit (DMU)

The assessment focussed on the 1.5km stretch with a 15m wider corridor which translates into 3.3acres continuous polygon as illustrated in figure 2-1 on Page 11[1]. This was only a fraction of the forest where we focussed on the pipeline footprint. However, with the understanding that the area assessed for Critical Habitat is not just the direct footprint, but a relevant spatial 'Discrete Management Unit' (DMU) that includes the direct footprint and potential secondary/indirect impacts. In this case, the entire Mwache forest which is 417ha translated to 1030.43acres total tree cover of Mwache Forest.

Mwache forest can be categorised into 3nr main distinct ecological set up which include

- **Section 1 Kaya Mutswakara Kaya Mutswakara:** This kaya is located to the right side of River Mwache as it flows into the creek is among the Sacred Mijikenda Forests that are listed under UNESCO World Heritage Sites. The Kaya is among the Mijikenda Kaya Forests consist of 10 separate forest sites spread over some 200 km along the coast containing the remains of numerous fortified villages, known as kayas, of the Mijikenda people. These Section is protected by the National Museums of Kenya (NMK) and the proposed pipeline is not traversing through section

- **Section 2 Mwache Creek:** This forest section is comprised of Mangrove vegetation with dominant mangrove species being the *Rhizophora mucronata* (mkoko) and *Sonneratia alba.* The Mangroves act as natural barriers, protecting coastlines from erosion and storm surges, while also providing crucial habitats for diverse marine species. The creek's waters support fisheries, and the mangrove forests offer resources like timber and fuel. Additionally, the creek is a source of freshwater and sediment, impacting the surrounding environment and agricultural practices. The pipeline will not

[1] The South Mainland pipeline does not traverse the forest but rather Note that the pipeline section from the trunk undeveloped open farmlands to the existing wayleave of Marere Water Transmission pipeline that crosses Mwache Creek at an existing pipeline bridge

directly interact with this section but will be laid along an existing wayleave of Marere Water Pipeline that already has an existing cleared wayleave.

- **Section 3 Mwache Forest to the left Bank of Mwache River:** This forest section comprised of a mix of regenerating and natural vegetation. This section the forest has been fragmented and he Gami Quarry is located within Mwache Forest and the Standard Gauge Railway Line that traverses the forest. This section of the forest. The trunk main section 1.5km will traverse through Mwache forest at the western side close to Standard Gauge Railway Line alignment.

This approach is precautionary, intending to take direct and indirect impacts into account, and to acknowledge the inherent connectivity of ecological systems. Hence, crucially, Critical Habitat is identified irrespective of the type or scale of the development or impact: it is value-based, not risk-based. An area can be Critical Habitat despite zero predicted impacts on the biodiversity for which it was designated. Therefore, developments can take place within Critical Habitat, but only if it can be demonstrated it will not have significant impacts on the biodiversity for which it was designated as Critical Habitat (a set of conditions described in Paragraph 17 of PS6).

2.3 Provision for Additional Surveys

To address data gap triggered by lack seasonality data considering that the survey was conducted once during the Month of April – May 2025. The study recommends series of 3nr other additional assessments including; (i) supplementary monitoring 1 in October to November 2025 during the short rains. (ii) January to February 2026 During Dry Season and finally (iii) April to May 2027 during long rains. The additional multi seasonal surveys proposed will factors in all the 3 fragments of the forest.

2.4 Field Assessment Methodology

2.4.1 Literature Review and Stakeholder Consultations

The assessment involved consultations with Local Kenya Forest Services (KFS) at Mwache Station, Local Community Forest Associations, Tsunza and Bonje Beach Management Unit (BMUs). The survey also relied on rich information available from local Community Leader who understand better (Indigenous Knowledge) with regards to some the species with the Forest.

The assessment further reviewed below listed reports / literature.

- Review existing biodiversity studies (previous EIAs, CHAs, KBAs, conservation plans).
- Use species databases such as IUCN Red List and IBAT.
- Identify potential CH-qualifying species and ecosystems before field verification.
- Kenya National Museums of Kenya (NMK), Kenya Forest Services (KFS) and Kenya Wildlife Services (KWS) Data Sets

Local Community Forest Associations proposed local guides who guided the team during gathering of field data and during community consultation activities, the local guides were crucial during identification of fauna and floral species during the field surveys including provision of local names, uses and pointing out various threats that the ecosystem is currently experiencing.

2.4.2 Field Surveys

To include the entire set of ecosystem structural and functional components that comprise the habitat and capture the broadest possible range of floral and faunal composition in the demarcated forest patch, the surveys employed a mix of field and laboratory methods. These encompassed a combination of rapid assessment field survey; ground transect and fixed plots along the 37nr Ways Points along the pipeline as indicated in **Figure 2.1 on Page 16.**

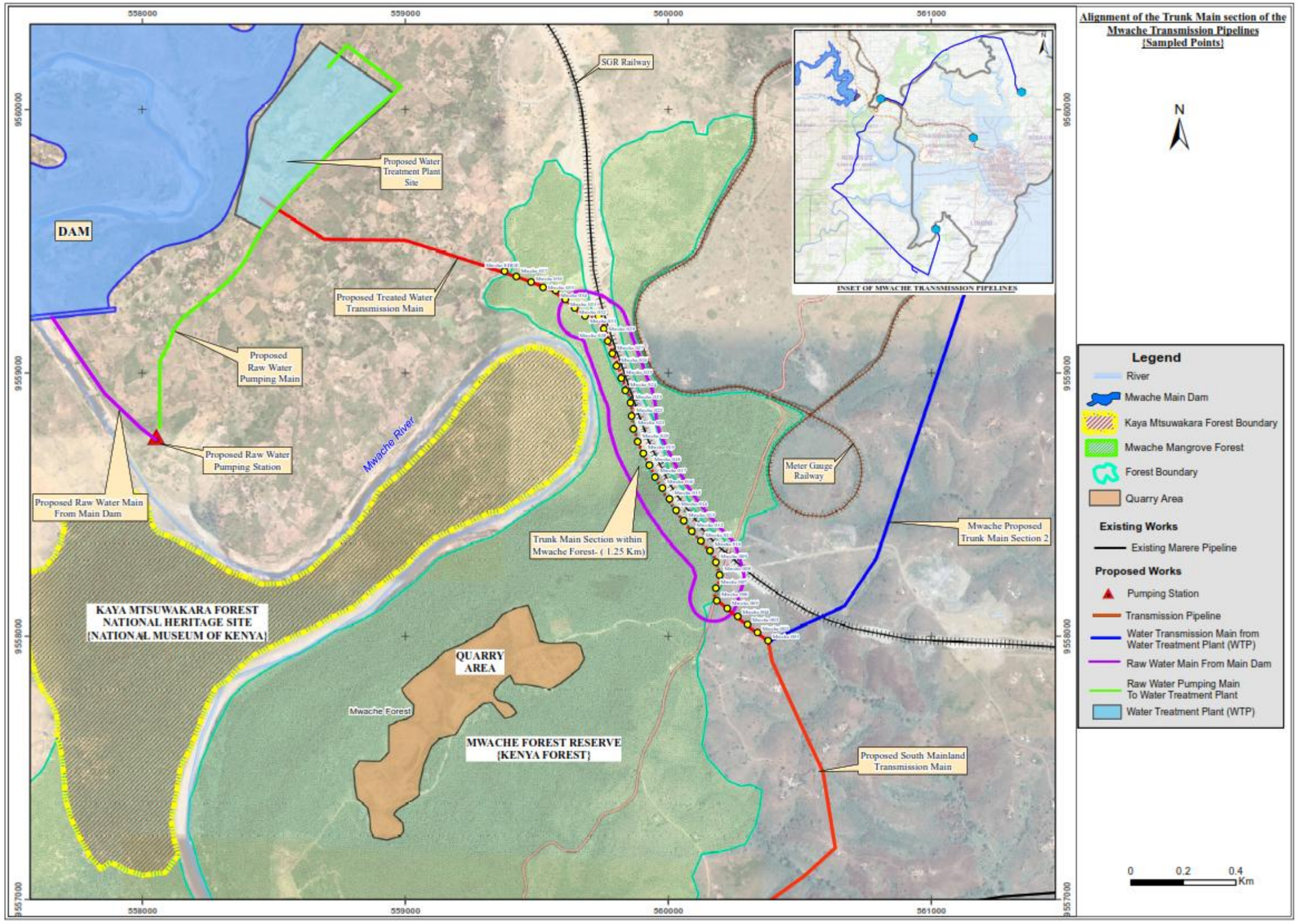


Figure 2.1: Sampling alignment Along the Trunkline in Purple Polygon

The transect formed a baseline along which quantitative and qualitative measurements were made on species abundance. We created a total of eight quadrants of within the forest strip along the proposed pipeline alignment reaching up to where the proposed pipeline leaves the forest at Waypoint 21 and sits on SGR wayleave to Way Point 1 where the pipeline intersects the proposed South Mainland alignment.

For vegetation analysis, we modified the *Braun-Blanquet* relevé approach (*Mueller-Dombois & Ellenberg 1974*). Sampling began on the actual forest edge at Waypoint 38 (**Photograph1 below**) and sampling plots, measuring 20*20m, were located at equal intervals on alternate sides along the transect - every 100 meters. Each was marked with hand-held GPS (*Garmin International*) and spanning the entire project area.

Photograph 1: Waypoint 38 (-3.988854, 39.535744) actual forest margin.

Data on basic habitat characteristics were collected withing the plot - including percentage of plant cover, substrate type, and horizontal or vertical complexity. The coordinates for starting points of each plot were recorded, and all the main microhabitats identifiable were noted. A perpendicular line was established every 5m along one edge of the plot – dividing it into four segments. The vegetation intercepting the line was sampled for tree/herb species and physical parameters within a 1m square quadrat. The species identity and density of trees and shrubs was established along each of the lines. The corresponding percentage (%) ground cover of grasses and other herbaceous plants within the quadrat was similarly sampled.

Photograph 2: Quadrants Measurement within the Forest

The diameter at breast height (DBH) was measured using vernier callipers for trees and saplings. Trees with diameter at breast height [DBH] ≥5cm and height≥3metres) were categorized as upper-canopy, while immature trees were with DBH<5cm and height 1-3m were under-story. Those with height <1metre were samplings and all those whose first set of true leaves have just emerged were termed seedlings. Woody plants with small, multiple or non-persistent stems were categorized as shrubs. The numbers of individuals present were counted, while percentage foliar cover was established using a densitometer or a canopy cover grid. Field identification was completed with laboratory analyses, and verified at the University of Nairobi Herbarium using specimens collected and pressed in the field.

Photograph 3: Recording of Species observed within the quadrant

Other direct visual observations made inside and within the vicinity of the plot included indicators of presence for anima life - direct or indirect signs. Bird species diversity was estimated using timed-species counts TSCs of a duration of 30 minutes each (carefully selected in order to control for differences in sampling effort). Bird sightings and identification were verified by comparing with National Museums of Kenya field reports, and counterchecked with an experienced ornithologist. Active searches for smaller living organisms were undertaken and identification performed to the extent possible. Indicators for such included spoor or animal tracks, burrows, vocal signals, faecal pellets, scents etc.

3. FIELD RESULTS

Having taken DBH and other measurements in the field, we calculated the species presence in terms of **density, frequency and dominance2.** This enabled us to compile **relative density, relative frequency and relative dominance 3.** We finally calculated the **Importance Value Indices (IVI) which is a sum of all three** *(Nguyen et al, 2014).* It is a numerical value that represents how much a species influences the overall structure and function of a particular community, a tool for assessing a species' overall relevance/ The findings are documented in the checklist of the 45 floral species encountered in the forest patch spanning the pipeline route, in the **Table 3.1** below.

3.1 Trees and Shrubs

The tree and shrub diversity of the forest patch is dominated by *Obetia radula*, a tree and grows primarily in the seasonally dry tropical forests of eastern Africa and western Indian Ocean islands. It has the highest importance value (56.102) of all the species encountered (Table 1). Thirty-four of these were trees or small shrubs with the potential of developing into full-grown trees. The second most noticeable is *Enchephalartos hildebrandtii*, a cycad native to eastern African coasts at elevations up to 600m asl. The IVIs for the 12 most abundant species are illustrated in Figure **3-1 on Page 22** while Table 3.1 below presents Trees and Shrubs Abundance and Cover.

Table 3-1: Trees and Shrubs Abundance and Cover

#	Species	Rel. dens	Rel. freq	Rel. dom / basal area	Imp value
1	*Obetia radula*	9.15	3.09	43.86	56.10
2	*Enchephalartos hildebrandtii*	1.72	4.12	17.65	23.49
3	*Grewia plagiophylla*	3.92	7.22	6.12	17.26
4	*Milletia usaramensis*	1.96	2.06	9.18	13.20
5	*Bullockia mombazensis*	1.57	5.15	3.59	10.31
6	*Canthium mombazense*	1.57	5.15	3.59	10.31
7	*Markhamia zanzibarica*	4.66	4.12	1.35	10.13
8	*Terminalia obicularis*	5.39	2.06	1.76	9.22
9	*Chrysophyllum viridifolium*	5.39	2.06	0.45	7.90
10	*Donella viridifolia*	5.39	2.06	0.45	7.90
11	*Maytenus heterophylla*	3.59	3.09	0.95	7.63
12	*Garcinia livingstonei*	2.45	4.12	0.47	7.04
13	*Zanthoxylum chalybeum*	0.98	1.03	4.90	6.91
14	*Psydrax parviflora*	2.61	3.09	1.19	6.90
15	*Atrabotrys modestus*	2.45	4.12	0.30	6.87
16	*Croton dichogamus*	4.41	2.06	0.38	6.85

[2] Where Frequency = area of plots in which a species occurs ÷total area sampled; Dominance = total basal area of a species ÷ total area sampled; Density = number of individual plants belonging to a species ÷total area sampled.
[3] Where relative density = (density of a species ÷ total density of all species)*100; relative frequency = (frequency of a species ÷total frequency of all species)*100; relative dominance = dominance of a species ÷ total dominance of all species)*100

#	Species	Rel. dens	Rel. freq	Rel. dom / basal area	Imp value
17	*Lonchocarpus bussei*	1.23	4.12	0.90	6.25
18	*Vachelia zanzibarica*	2.45	2.06	1.73	6.24
19	*Grewia forbesii*	1.72	4.12	0.31	6.15
20	*Terminalia spinosa*	3.43	2.06	0.59	6.08
21	*Asteranthes asterias*	4.90	1.03	0.13	6.06
22	*Phyllanthus reticulata*	2.29	3.09	0.21	5.59
23	*Ormocarpum trichiocarpum*	1.23	4.12	0.15	5.50
24	*Vepris trichocarpa*	2.94	2.06	0.24	5.24
25	*Senegalia mellifera*	1.96	2.06	1.08	5.11
26	*Capparis tomentosa*	1.63	3.09	0.16	4.88
26	*Rinorea spp*	2.94	1.03	0.10	4.07
28	*Uvaria acuminata*	2.94	1.03	0.04	4.02
29	*Strychnos spinosa*	1.47	2.06	0.19	3.73
30	*Rhus natalensis*	0.98	2.06	0.12	3.17
31	*Combretum spp*	1.96	1.03	0.16	3.15
32	*Rhoicissus revoilii*	1.96	1.03	0.13	3.12
33	*Senna siamea*	1.96	1.03	0.10	3.09
34	*Lantana camara*	0.98	2.06	0.04	3.08
35	*Caturagerum nilotica*	0.98	2.06	0.03	3.07
36	*Hemenodictylon parvifolium*	0.98	2.06	0.02	3.07
37	*Ozoroa insignis*	0.98	1.03	0.70	2.72
38	*Vachelia tortilis*	0.98	1.03	0.17	2.18
39	*Commiphora edulis ssp shimperiana*	0.98	1.03	0.16	2.17
40	*Vepris uginifolia*	0.98	1.03	0.15	2.16
41	*Calliandra calothysus*	0.98	1.03	0.12	2.13
42	*Commiphora shimperi*	0.98	1.03	0.05	2.06
43	*Polysphaeria parvifolia*	0.98	1.03	0.03	2.04
44	*Acalypha fruticosa*	0.98	1.03	0.02	2.03
45	*Tinnaea aethiopica*	0.98	1.03	0.01	2.02

Photograph 4: Dominant *Obetia Radula*[4] within the forest

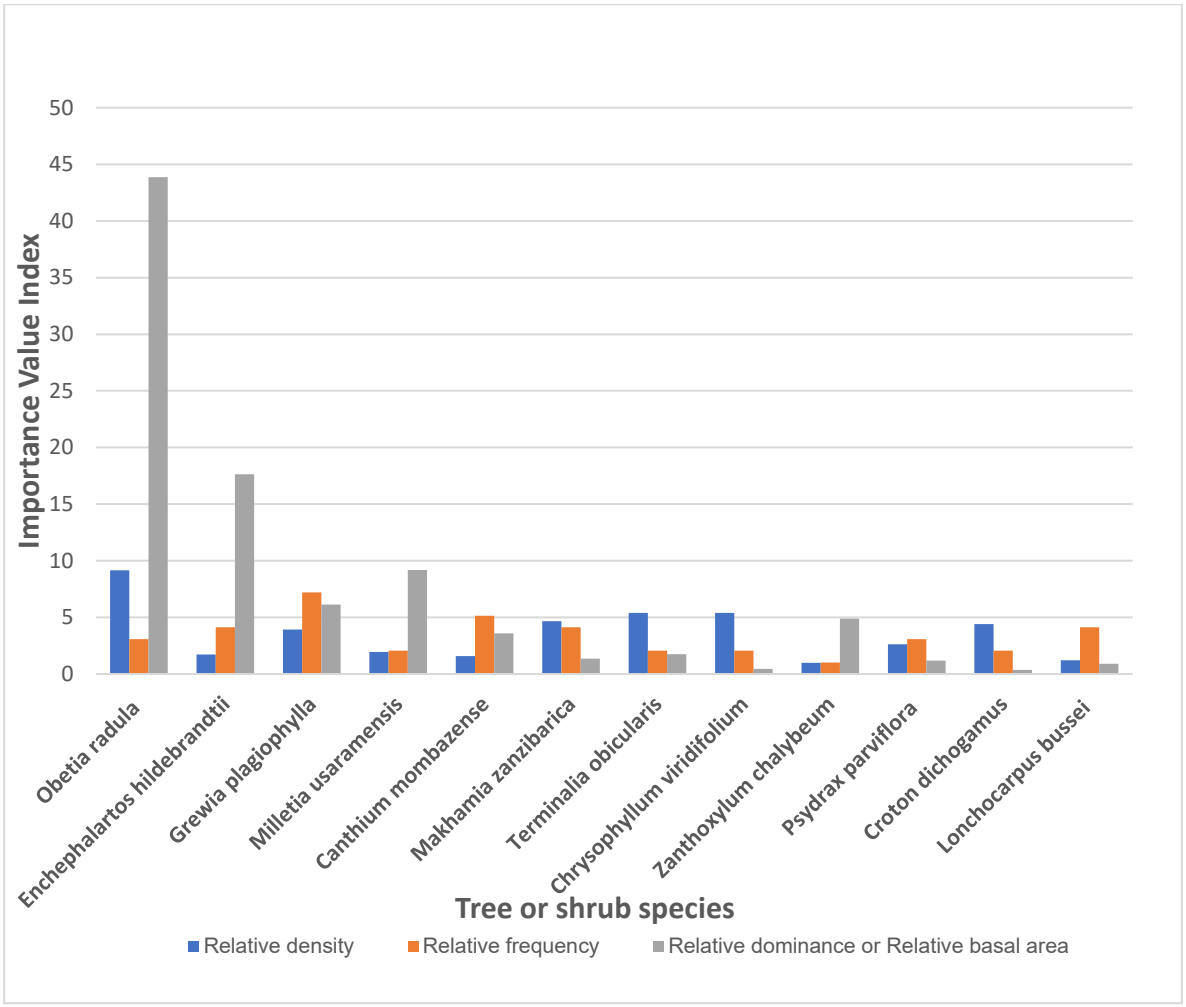


Figure 3.1: Importance Value Index for the 12 most common trees and shrubs

[4]IUCN Assessed in 2022 as "Least Concern"

The Importance Value Index (IVI) in ecology is a measure of a species' dominance in an ecosystem, reflecting its overall importance. It combines parameters like relative density, relative frequency, and relative dominance to provide a comprehensive assessment. From field assessment, the most dominant species with the highest Importance Value Index (IVI) are; *Obetia radula, Enchephalartos hildebrandtii* and *Grewia plagiophylla at 56.10%, 23.49% and 17.26%* while species*; Polysphaeria parvifolia, Acalypha fruticose and Tinnaea aethiopica* at; 2.04%, 2.03% and 2.02% respectively.

Photograph 8: *Enchephalartos hildebrandtii and Obetia radula assessed with high % of IVI*

Milletia usaramensis and the East African Maytenus heterophylla are assessed as vulnerable under the IUCN Red list for Threatened Category

Therefore, Obetia radula and *Enchephalartos hildebrandtii* are the most important species within the forest alignment, (IVI) will be essential in informing conservation strategies that will be formulated as part of this assessment and play critical role in comparison of the species trend before and after pipeline construction

3.2 Herbs and Grasses

The most common herbs and grasses were *Periploca linearifolia*, a twining climber or liane with milky latex and known for its traditional values, and *Panicum maximum*, a densely clumping perennial grass. Other common grasses were *Chloris roxburghiana* and *Cynodon dactylon*, both important pasture species sensitive to land degradation and overgrazing as detailed in **Table 3.2** below.

Table 3-2. Common herbs and Grasses

Species	H/G	Maximum % cover
Periploca linearifolia	H	40%
Panicum maximum	G	30%
Chloris roxburghiana	G	20%
Cynodon dactylon	G	10%
Asystacia gangetica	H	<10%

Species	H/G	Maximum % cover
Cenchrus cilliaris	G	<10%
Cissamperos pareri	H	<10%
Crotolaria spp	H	<10%
Cynanchum spp	H	<10%
Gnidia spp	H	<10%
Heteropogon contortus	G	<10%
Melhania velutina	H	<10%
Sida ovata	H	<10%
Solanum incanum	H	<10%
Tephrosia villosa	H	<10%

Photograph 5: Dominant *Periploca linearifolia* grasses within the forest

3.3 Avian Species

Birdlife was profiled all along the transect alignment within forest, notable species encountered during a cursory survey and during TSC were the African or fork-tailed drongo (*Dicrurus adsimilis,* LC), black swift (*Apus barbatus LC*), black kite (*Milvus migrans LC*), paradise fly-catcher (*Terpsiphone viridis LC*), ring-necked dove (*Streptopelia capicola LC*), pied crow (*Corvus albus LC*), pied wagtail (*Motacilla aguimp LC*), speckled mousebird (*Colius striatus LC*), village or spot-backed weaver (*Ploceus cucullatus spilonotus NE*) and an unidentified hornbill. The scientific names used here follow https://ebird.org/explore.

Photograph 5: African Folk Tailed Drongo *Dicrurus adsimilis* and the black swift (*Apus barbatus*)

3.4 Mammals

Among the mammals identified were the African civet (*Civettictis civetta*), vervet monkey (*Cercopithecus aethiops*), Kenya coast galago or dwarf bushbaby (Paragalago cocos), Kirk's dik-dik (Madoqua kirkii), duiker (*Cephalophus silvicultor*), Clawless Otter (*Aonyx capensis*), squirrels, rabbit, rats and mice..

Photograph 5: African civet (*Civettictis civetta*[5]) and Paragalago cocos[6]

[5] IUCN Assessed in 2008 as "Least Concern"
[6] IUCN Assessed in 2016 as "Threaten"[6]

3.5 Review of IBAT

IBAT provides initial screening for Critical Habitat values. Performance Standard 6 (PS6) defines these values for Critical Habitat (PS6: para. 16) and legally protected and internationally recognized areas (PS6: para. 20). PS6 will be triggered when IFC client activities are located in modified habitats containing "significant biodiversity value," natural habitats, Critical Habitats, legally protected areas, or areas that are internationally recognized for biodiversity. References to PS6 and Guidance Note 6 (GN6) are provided to guide further assessment and detailed definitions where necessary.

Appendix (2) presents species that are potentially found within 50km of the area of interest. However, field survey focused on the actual species enumerated within alignment of the Project. While a detailed assessment of terrestrial fauna and floral species listed under IBAT assessed, against the GN6.1 (criteria 1–5) is presented in a matrix provided as **Appendix 3**

3.6 Ecological Services of Mwache Dam

The Mwache Forest, particularly the mangrove ecosystem within it, provides numerous crucial ecosystem services. These include provisioning services like timber and fuel, regulating services like coastal protection and carbon sequestration, and supporting services like habitat provision for diverse species:

- Coastal Protection: The mangrove ecosystem acts as a natural barrier, reducing the impact of waves and currents on the coastline.
- Carbon Sequestration: Mangroves are highly effective at absorbing and storing carbon dioxide from the atmosphere, helping to mitigate climate change.
- Water Quality Improvement: Mangroves filter out pollutants and sediments from the water, improving water quality.
- Soil Conservation: The intricate root systems of mangrove trees help stabilize the shoreline and prevent soil erosion.
- Habitat for Biodiversity: Mwache Forest, with its diverse habitats, supports a wide range of plant and animal species, including fish, birds, and other wildlife.
- Nutrient Cycling: Mangrove ecosystems play a crucial role in nutrient cycling within the coastal environment

4. CRITICAL HABITAT ASSESSMENT DETERMINATION

The KBA Standard (IUCN, 2016) defines a set of criteria and associated quantitative thresholds for identifying KBAs in an objective, repeatable and transparent way. The general approach for identifying KBAs was informed by The IUCN Red List of Threatened Species™ (IUCN, 2012a, hereafter the IUCN Red List) and by the Red List of Ecosystems (RLE, Keith et al., 2013), which use criteria and quantitative thresholds to identify threatened species and ecosystem types respectively.

An initial screening of the species identified as present in the relevant assessment areas was completed to identify a list of candidate species for assessment against IFC PS6 criteria for Critical Habitat (CH). This initial screening discounted Least Concern and Near Threatened species (for Criterion 1), non-range restricted species (for Criterion 2) and non-migratory / congregatory species (for Criterion 3).

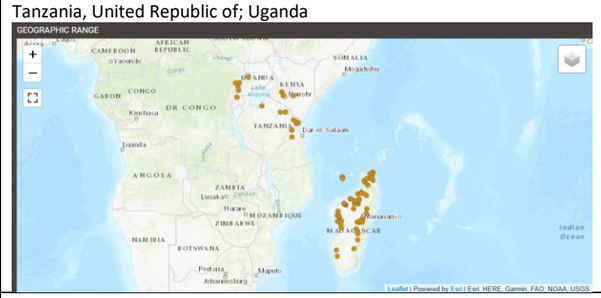
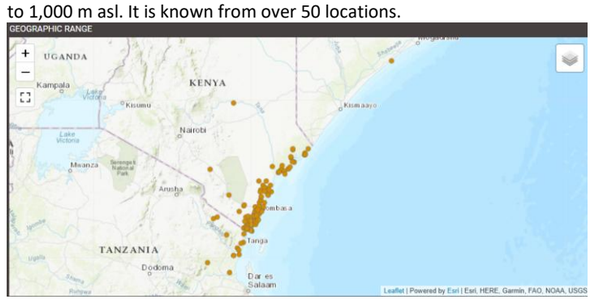
4.1 INTERPRETATION OF FIELD RESULTS

4.1.1 Flora (Trees, Shrubs and Grasses)

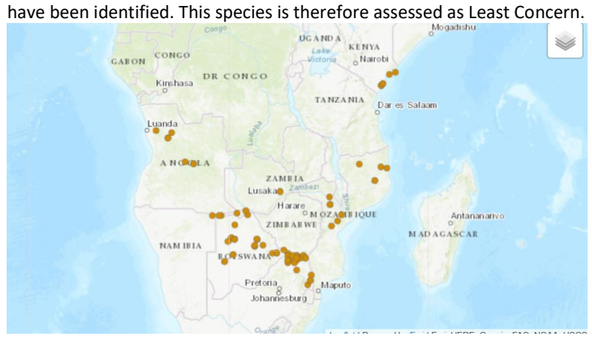
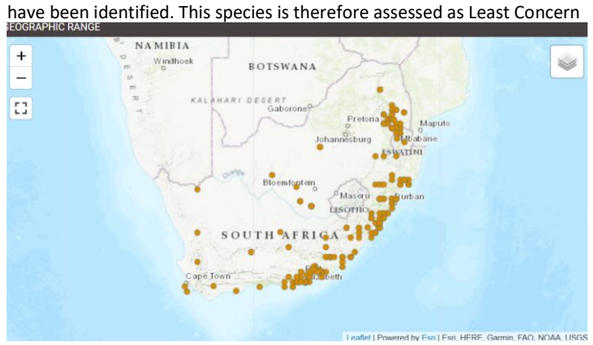
Evaluation Against the IUCN Red list Category and assessment against IFC PS 6

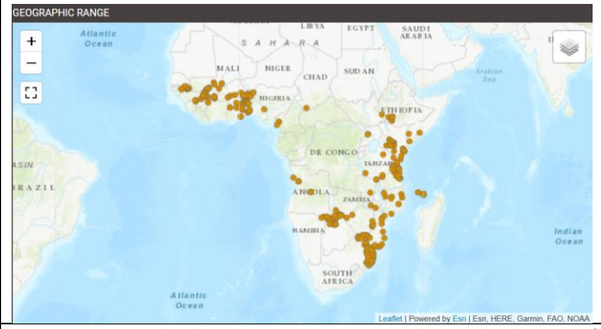
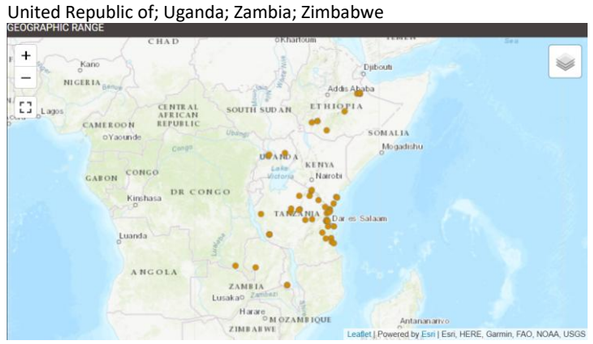
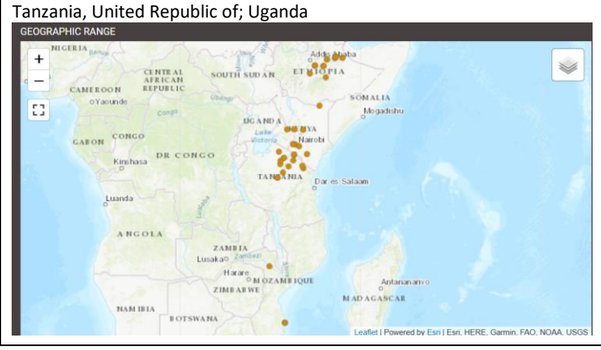
Based on the review of the list of plant species detected in field as detailed under table 3-1 and 3-2 above, the taxa were evaluated against IUCN Red List Threatened Category (Critically Endangered, Endangered or Vulnerable) and against IFC PS6 criteria for CH as presented in **Table 4.1 on Page 31**

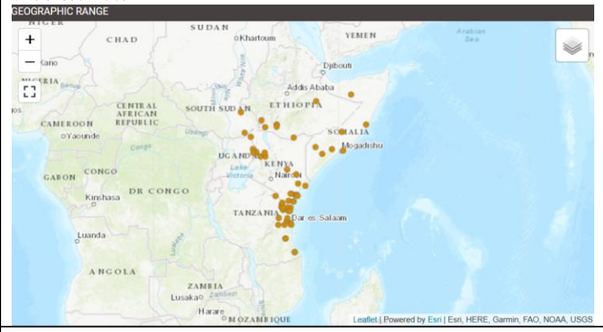
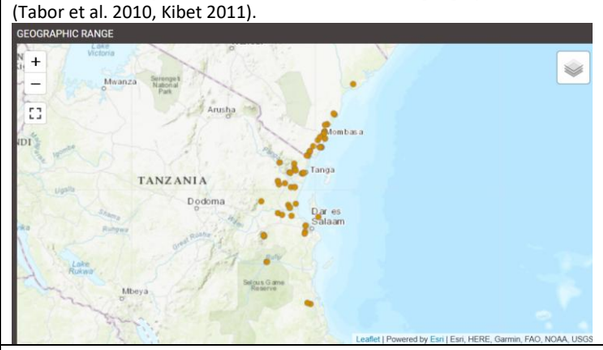
Table 4-1: Initial Screening of CH-qualifying FLORA Species as Per IUCN Red list and IFC PS 6

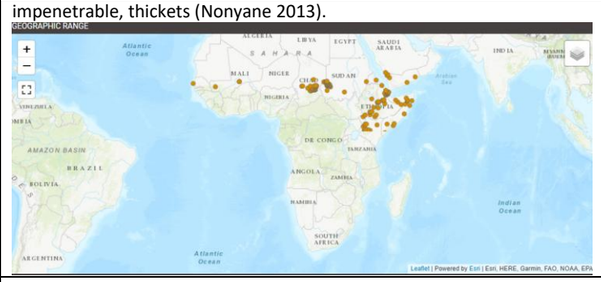
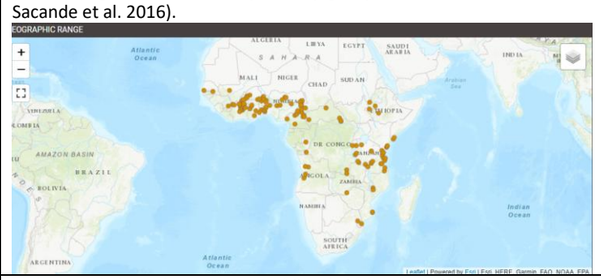
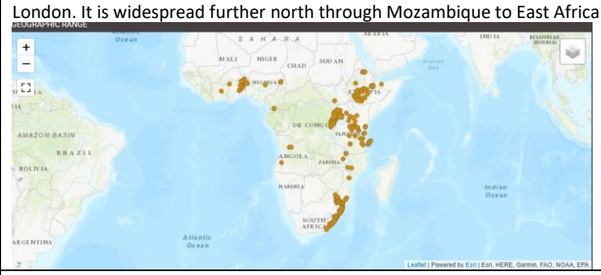
#	Species (English& Traditional and Scientific Name)	IUCN Red List[7]	IFC PS 6 criteria[8]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Congregatory			
1	stinging-nettle tree (*Obetia Radula)* 	LC	No	NO EOO is 267,3368 km^2	Yes	Forest and shrubland of because the species occur in Burundi; Comoros; Congo, The Democratic Republic of the; Kenya; Madagascar; Rwanda; Tanzania, United Republic of; Uganda 	The species has a wider range of distribution along the coastline and it's unlikely that unlikely to conclude that Mwache forest is a critical habitat for *Obetia radula*	Out
2	Mombasa Cycad (*Enchephalartos hildebrandtii)* 	LC		NO EOO is 147,358km^2	Yes	Encephalrtos hildebrandtii occurs in the coastal and near-coastal districts of Kenya and Tanzania including Zanzibar Island (Tanzania). Subpopulations are found from the Lindi administrative region, Tanzania in the south to Garissa and Lamu counties, Kenya in the north. Reports of similar cycads from northern Mozambique may also turn out to be E. hildebrandtii. Plants are found from sea level up to 600 m asl	It is mainly found in coastal evergreen bushland and dry lowland forest, in red loams and sandy soils among grass and coral rocks which are wide spread along the coastline	Out
3	*Mkone* *Grewia plagiophylla* 	LC	No	NO EOO is 256,052km^2	Yes	Grewia plagiophylla is native to lowland forest, riverine and coral-rag thicket, and 'Acacia'-Commiphora bushland of Kenya, Somalia and Tanzania. It has an estimated area of occupancy of 496 km2 and an estimated extent of occurrence of 256,052 km2. It is known from sea level to 1,000 m asl. It is known from over 50 locations. 	Considering the coverage of the taxa along the coastal kenya, Tanzania and Somalia, it's unlikely that Mwache forest holds hold ≥10% of the global population size and ≥10 reproductive units of a restricted-range species and therefore does not trigger CH	Out
4	small panga-panga or lesser Millettia: *Milletia usaramensis*	NE[9]						
5	Mombasa Bullockia *Bullockia mombazensis*	NE *(See footer 9)*						
6	*Canthium mombazense*	NE *(See footer 9)*						
7	Bell bean tree or maroon bell-bean: *Markhamia zanzibarica*	LC	No	NO	No	Widely distributed in Angola; Botswana; Congo, The Democratic Republic of the; Kenya; Malawi; Mozambique; Namibia; South Africa; Zambia; Zimbabwe	This tree species has a very wide distribution, large does not trigger any of the IFC GN 6 Criterion and therefore is screened out	Out

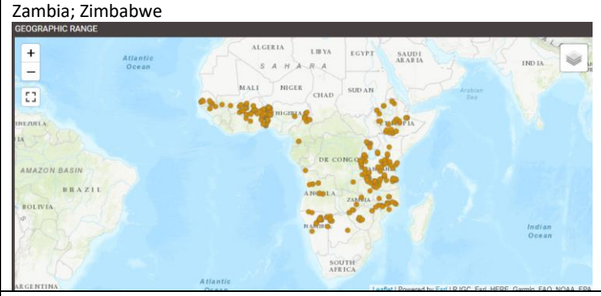
[7] 1CR = Critically Endangered, EN = Endangered, NT = Near Threatened, VU = Vulnerable, LC = Least Concern, NE = Not Evaluated, DD = Data Deficiency
[8] 2IFC PS6 species Criterion 1: Critically Endangered and/or Endangered species, Criterion 2: Endemic and/or Restricted-range species, Criterion 3: Migratory and/or congregatory species
[9] These category of species were recorded on site but there was no literature, record or data from the local guides or from secondary data sources including KFS, IUCN and IBAT, these category of species will require further assessments

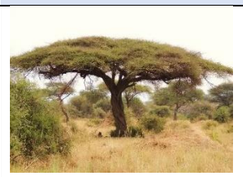
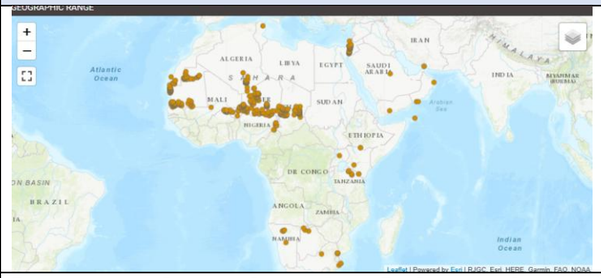
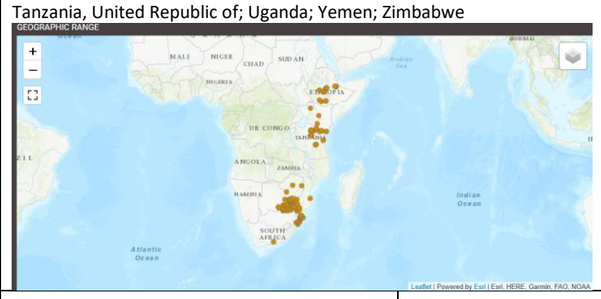
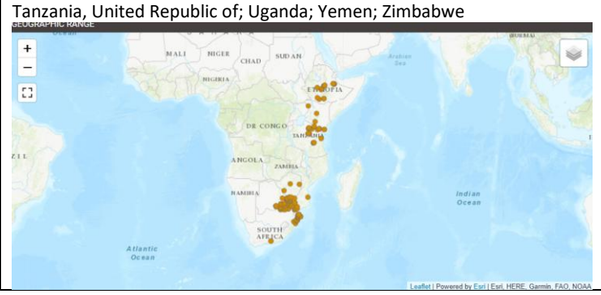
#	Species (English& Traditional and Scientific Name)	IUCN Red List[7]	IFC PS 6 criteria[8]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Congregatory			
				EOO is 450,6026.59km^2		This tree species has a very wide distribution, large population, is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern. 		
8	Kalahari cluster-leaf *Terminalia obicularis*	NE *(See footer 9)*						
9	fluted milkwood *Chrysophyllum viridifolium* 	LC	No	NO EOO is 1,809,654 km^2	No	This species is native to Kenya, Mozambique, Zimbabwe, Eswatini and South Africa (Kwazulu Natal) between 30–1,660 m asl (Mackinder et al. 2016). It has an estimated extent of occurrence of 1,809,654 km^2. The area of occupancy as measured by currently known records is 108 km^2, but this is likely to be a significant underestimate. Likewise, there are 20 locations known but more are expected 	The tree species has a wider range of occurance and is unlikely that the numbers recorded along the pipeline corridor achieve the thresholds of triggering CH	Out
10	*Donella viridifolia*	LC	Ditto	Ditto	Ditto	Tree is in the same taxa as (9) above	Ditto	Ditto
11	spike thorn or angle-stem spikethorn *Maytenus heterophylla* 	LC	No	NO EOO is 974,071.87km^2	No	This tree species has a very wide distribution, large population, is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern 	This tree species has a very wide distribution, and therefore not triggering IFC PS GN 6 and by extension CH	Out

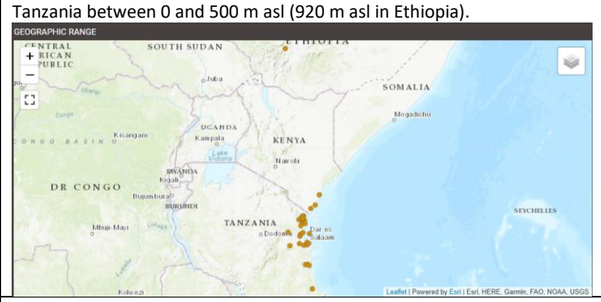
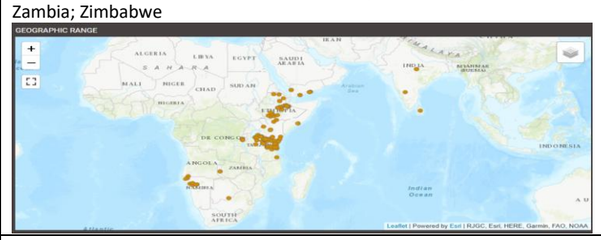
#	Species (English& Traditional and Scientific Name)	IUCN Red List[7]	IFC PS 6 criteria[8]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Congregatory			
12	African mangosteen, lowveld mangosteen, Livingstone's garcinia or imbe *(Garcinia livingstonei)* 	LC	No	NO EOO is 16,019,311 km²	No	This tree or shrub species, which yields a popular fruit, has a wide distribution in Africa and is occasionally cultivated elsewhere. While threats to the habitat are resulting in an estimated slow, steady decline in numbers, the wide distribution and range of habitats ensure that for the foreseeable future there will be large numbers left. This species is therefore assessed as Least Concern 	Garcinia livingstonei is a tree or shrub and has a widespread African distribution, from Guinea in the West to Somalia in the East, and to South Africa in the South. Its minimum area of occupancy is 1,348 km² based on currently known records, but this is likely to be an underestimate. Tree population based on global statistics does not meet the threshold of triggering CH as provided by IFC PS 6	Out
13	Knobwood, Mukenea, Oloisuki, and Gadda *Zanthoxylum chalybeum* 	LC	no	NO EOO is 2330751.05km²	No	The tree is well distributed in Burundi; Congo, The Democratic Republic of the; Ethiopia; Kenya; Malawi; Rwanda; Somalia; South Sudan; Tanzania, United Republic of; Uganda; Zambia; Zimbabwe 	This tree species has a very wide distribution, large population, is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern.	Out
14	*Psydrax parviflora*	NE *(See footer 9)*						
15	Climbing Shrub" or "Climbing Vine *Atrabotrys modestus*	NE *(See footer 9)*						
16	East African Croton *Croton dichogamu* 	LC	No	NO EOO is 1468158.57km²		The tree is well distributed within Ethiopia; Kenya; Mozambique; Rwanda; Tanzania, United Republic of; Uganda 	This tree species has a very wide distribution, large population, is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern, CH not triggered	Out

#	Species (English& Traditional and Scientific Name)	IUCN Red List[7]	IFC PS 6 criteria[8]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Congregatory			
17	Small Apple-leaf *Lonchocarpus bussei*	NE *(See footer 9)*						
18	Zanzibar acacia *Vachelia zanzibarica*	NE *(See footer 9)*						
19	Warty donkey-berry *Grewia forbesii*	NE *(See footer 9)*						
20	Spiny Terminalia *Terminalia spinosa* 	Least Concern	No	NO EOO is 1968252km^2	No	Terminalia spinosa is a tree up to 20 m high occurring in South Sudan, Ethiopia, Somalia, Uganda, Kenya and Tanzania. Its minimum AOO is 296 km^2 based on currently known records, but this is likely to be an underestimate 	Terminalia spinosa is a tree up to 20 m high occurring in South Sudan, Ethiopia, Somalia, Uganda, Kenya and Tanzania. Though it occurs in a common habitat and is known from more than eighty collections, threats to the habitat are probably causing a slow decline in populations. Due to a large distribution area and 30–50 locations the species is assessed as Least Concern and population of this species within Mwache do not meet the thresholds of triggering CH	Out
21	*Asteranthes asterias* 	Near Threatened (Under criteria B1+2b)	Yes	NO EOO is 109,561 km^2	Yes	This shrub is known to occur in coastal dry forest and in *Brachystegia* woodland. Due to the forest/woodland conversion to agriculture and the growing need of land for human settlement, a continuing decline in the extent and quality of habitat is inferred across its geographic distribution (Tabor et al. 2010, Kibet 2011). 	This species is endemic from the coastal region of Kenya and Tanzania. It is also found on the Zanzibar Island. Its extent of occurrence (EOO) is large at 109,561 km^2, and it grows from sea level to 850 m. Within the EOO, the area of occupancy (AOO), calculated using herbarium specimens' occurrences, is at only 212 km^2. This apparently low AOO is thought to be the result of under-collecting this relatively common species. Although listed as NT under IUCN, the numbers counted within the pipeline alignment does not meet the threshold of triggering CH	Out
22	Black-Honey Shrub *Phyllanthus reticulata*	NE *(See footer 9)*						
23	Hairy caterpillar-pod *Ormocarpum trichiocarpum*	NE *(See footer 9)*						
24	Flaky-Barked Cherry-Orange *Vepris trichocarpa*	NE *(See footer 9)*						
25	Black thorn *Senegalia mellifera*	Least Concern	no	NO	No	This species of spiny shrub or small tree grows in savanna, dry woodland and bush. In Southern Africa the twigs and pods are browsed by animals including black rhino, kudu, eland and giraffe (Nonyane 2013). This species spreads rapidly, both from seed and vegetatively, and can form	This species of spiny shrub or small tree is widespread in Africa and the Arabian Peninsula. It is recorded to occur in Angola, Chad, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Mozambique, Namibia, Saudi Arabia, Somalia, South Africa, South Sudan, Sudan, Tanzania, Uganda, Yemen, Zambia and Zimbabwe. It has been introduced to India. The species wide extend does not trigger CH	Out

#	Species (English& Traditional and Scientific Name)	IUCN Red List[7]	IFC PS 6 criteria[8]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Congregatory			
						impenetrable, thickets (Nonyane 2013). 		
26	woolly caper bush *Capparis tomentosa*	NE *(See footer 9)*						
26	hairy-leaved violet-bush *Rinorea spp*	NE *(See footer 9)*						
28	Pointed Clusterpear *Uvaria acuminata*	Least Concern	No	NO EOO is 223,000km^2	No	An aromatic shrub, small tree or liane found in a variety of habitats including thickets, dry shrubby forest, wetter evergreen lowland forest and woodland. Is often found on forest margins and in clearings	Fairly widespread in coastal Kenya, Tanzania and in northern Mozambique. Also reported from Somalia and Madagascar in Flora Somalia. The population within Pipeline alignment and by extension Mwache forest do not meet the threshold of triggering CH	Out
29	Spiny Monkey Orange *Strychnos spinosa* 	Least Concern	No	NO EOO is 14,000,000km^2	No	his tree species reaches heights of up to 6 m (Sacande et al. 2016). It grows in a wide variety of habitats including dry woodland, thicket and savanna vegetation. The leaves are grazed by cattle, elephants and other wild animals (e.g. baboons, monkeys, bushpigs, nyala and eland) (Le Roux 2005, Sacande et al. 2016). 	This tree species has an extensive African distribution. It is an important agroforestry species due to its high nutritional value. It has an estimated extent of occurrence of at least 14,000,000 km^2 and will have significantly more than 10 locations. It is therefore assessed here as Least Concern and does not trigger CH as provided by IFC PS 6	Out
30	Natal sumac *Rhus natalensis* 	Least Concern	No	NO EOO is 15,747,352.26km^2	No	widespread along the east coast of South Africa, from Kosi Bay to East London. It is widespread further north through Mozambique to East Africa 	his tree species has a very wide distribution, large population, is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern and does not trigger CH	Out
31	bushwillows or combretums *Combretum spp*	NE *(See footer 9)*						
32	Bushveld Grape, Grape Ivy, and Warty Grap *Rhoicissus revoilii*	Least Concern	No	NO EOO is 13957254.81km^2	No	Burundi; Congo, The Democratic Republic of the; Djibouti; Eswatini; Ethiopia; Ghana; Kenya; Lesotho; Malawi; Mozambique; Rwanda; Somalia; South Africa; South Sudan; Tanzania, United Republic of; Uganda; Zambia; Zimbabwe	This tree species has a very wide distribution, large population, is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern and does not trigger CH	Out

#	Species (English& Traditional and Scientific Name)	IUCN Red List[7]	IFC PS 6 criteria[8]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Congregatory			
								
33	Kassod tree, Siamese cassia, and Thailand *shower* *Senna siamea*	Least Concern	No	NO	No	This species is native to east Asia, however the species has been widely introduced inside and outside its native range and therefore the species native range is under contention 	Senna siamea is a small tree native to east Asia. The species' native range is under contention but here it is assessed as occurring in Myanmar, Viet Nam, Lao PDR, Thailand and Cambodia. It is recommended that the origin of the species in China, Sri Lanka, Malaysia and Indonesia is confirmed. Across the globe the species has been introduced and grown for timber, fuel wood or for ornamental value. Its use for reforestation activities is also growing. Overall, the species is widespread and its populations is not considered to be in decline or threatened. The species is globally assessed as Least Concern, this tree is not endemic to East Africa and the thresholds recorded to not trigger CH	Out
34	*Lantana camara*	Least Concern					This an invasive weed	Out
35	*Caturagerum nilotica*	NE *(See footer 9)*						
36	Yellow Firebush *Hemenodictylon parvifolium*	NE*(See footer 9)*						
37	Currant Resin Tree *Ozoroa insignis* 	Least Concern	No	NO EOO is 17685662.12 km^2	No	Estimated extent of occurrence (EOO) (km^2) 17685662.12 and is common in ngola; Benin; Botswana; Burkina Faso; Burundi; Cameroon; Central African Republic; Chad; Congo, The Democratic Republic of the; Côte d'Ivoire; Djibouti; Ethiopia; Ghana; Guinea-Bissau; Kenya; Malawi; Mali; Mozambique; Namibia; Niger; Nigeria; Rwanda; Senegal; Somalia; South Sudan; Sudan; Tanzania, United Republic of; Togo; Uganda; Yemen; Zambia; Zimbabwe 	This tree species has a very wide distribution, large population, is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern and also does not trigger CH	Out
38	Umbrella thorn acacia *Vachelia tortilis*	LC	No	NO EOO is 34,991,567 km^2	No	This fast-growing species generally grows in deciduous woodland, shrub and sand dune habitats. It is drought resistant, can tolerate poor soils, strong salinity and seasonal waterlogging. Regeneration is facilitated after ingestion by livestock (Wickens 1995)	The geographic range of this tree species is from Uganda to Egypt, through Sinai to the Arabian Peninsula (Board of Trustees, RBG Kew 2019). The extent of occurrence (EOO) is estimated as 34,991,567 km^2. Vachellia tortilis has been introduced to other parts of the world, the population assessed do not trigger any criterion of IFC PS 6 and therefore CH is not triggered	Out

#	Species (English& Traditional and Scientific Name)	IUCN Red List[7]	IFC PS 6 criteria[8]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Congregatory			
								
39	Glossy-leaved corkwood *Commiphora edulis ssp shimperiana* 	LC	No	NO EOO is 3338179.30 km^2	No	Tree is common in Botswana; Burundi; Congo, The Democratic Republic of the; Eritrea; Ethiopia; Kenya; Mozambique; Somalia; South Africa; Sudan; Tanzania, United Republic of; Uganda; Yemen; Zimbabwe 	This tree species has a very wide distribution, large population, is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern and does not trigger CH	Out
40	*Vepris uginifolia*	NE *(See footer 9)*						
41	red calliandra, powderpuff, and fairy duster tree *Calliandra calothysus*	NE*(See footer 9)*						
42	Glossy-leaved Corkwood *Commiphora shimperi* 	Least Concern	No	NO EOO is 3338179.30 km^2	No	Common in Botswana; Burundi; Congo, The Democratic Republic of the; Eritrea; Ethiopia; Kenya; Mozambique; Somalia; South Africa; Sudan; Tanzania, United Republic of; Uganda; Yemen; Zimbabwe 	This tree species has a very wide distribution, large population, is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern and does not trigger CH	Out

#	Species (English& Traditional and Scientific Name)	IUCN Red List[7]	IFC PS 6 criteria[8]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Congregatory			
43	*Polysphaeria parvifolia* 	Least Concern	No	NO EOO is 910027 km²	No	This species is found in South Sudan, Ethiopia, Somalia, Kenya and Tanzania between 0 and 500 m asl (920 m asl in Ethiopia). 	This shrub or small tree is found in South Sudan, Ethiopia, Somalia, Kenya and Tanzania between 0 and 500 m asl (920 m asl in Ethiopia).With its very large extent of occurrence, large population, large number of locations, and lack of severe threats, this species is assessed as Least Concern, CH not triggered	Out
44	Birch leaved acalypha *Acalypha fruticose* 	Least Concern	No	NO EOO is 17766578.96 km²	No	Common in Botswana; Burundi; Djibouti; Eritrea; Ethiopia; India; Kenya; Malawi; Mozambique; Myanmar; Namibia; Saudi Arabia; Somalia; South Sudan; Sri Lanka; Sudan; Tanzania, United Republic of; Uganda; Yemen; Zambia; Zimbabwe 	This tree species has a very wide distribution, large population, is not currently experiencing any major threats and no significant future threats have been identified. This species is therefore assessed as Least Concern. CH not triggered	Out
45	Black Sunbell *Tinnaea aethiopica*	NE *(See footer 9)*						

4.1.2 Fauna (Birds and Mammals)

Impact of Active Quarry Within the Forest

The assessment recorded low numbers of Birds and Mammals within the Pipeline alignment because of impacts of an active quarry that often blow explosive to break the rock with objective of generating ballast, concrete blocks to pre-cast products. Drilling, blasting and transportation of materials have effects on air quality. Drilling and blasting of the rock and transporting the rock on unpaved roads using trucks introduces dust into the atmosphere. During field assessment period the, the team overheard blasting operations and the noise levels were very high. This noise occurred occasional as a one-off event at each quarry, however it became regular as it spread among the different operators. **Photograph 9** below illustrates photographs of existing quarry while **Figure 4-1** on **Page 36** presents the distance (720m) of the quarry to the proposed pipeline route within the forest.

Photograph 9: Quarrying Activities within Mwache Forest

The stress conditions triggered by the quarry has cumulatively resulted to migration of fauna to the southern sections of the forest away from the proposed pipeline route that is located within close proximity to the quarry. Analysis of the observed species against provisions of IUCN Red list and IFC PS 6 is presented in Figure **Tables 4.2 on Page 41**

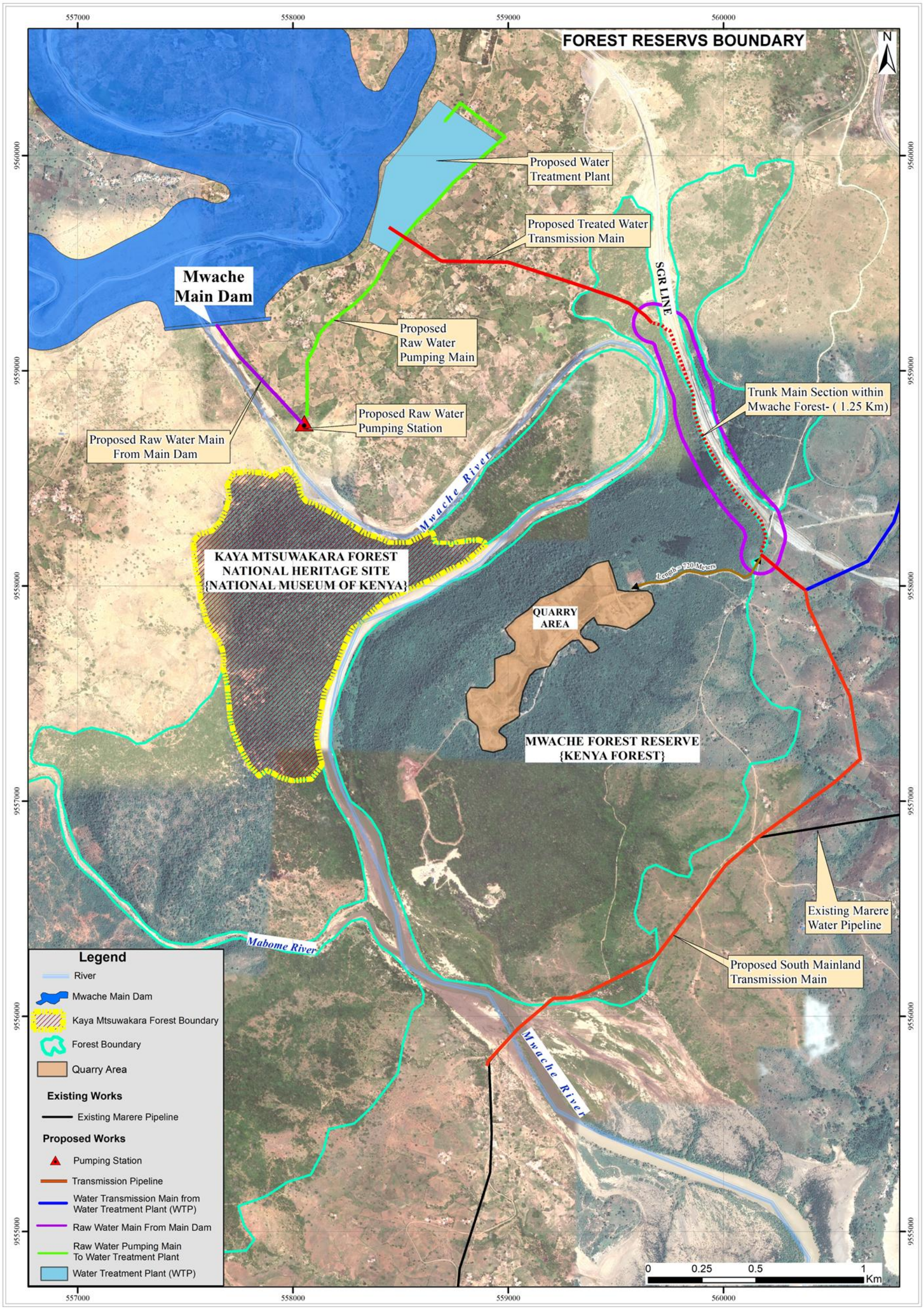
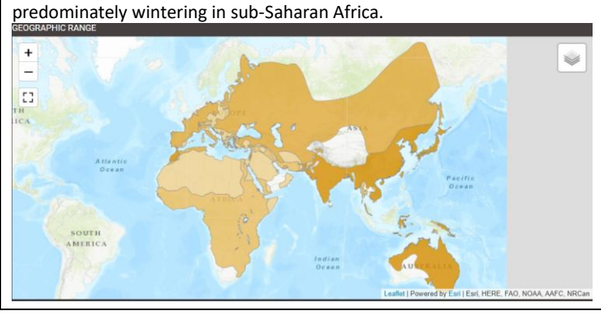
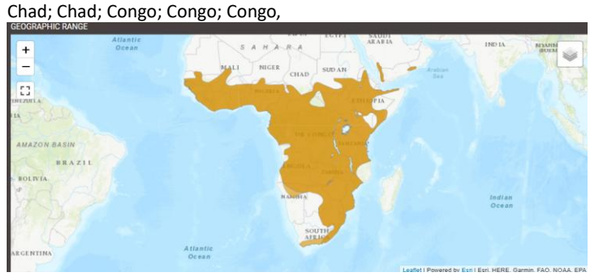


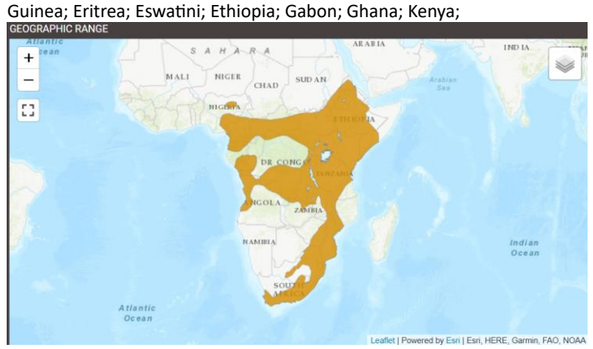
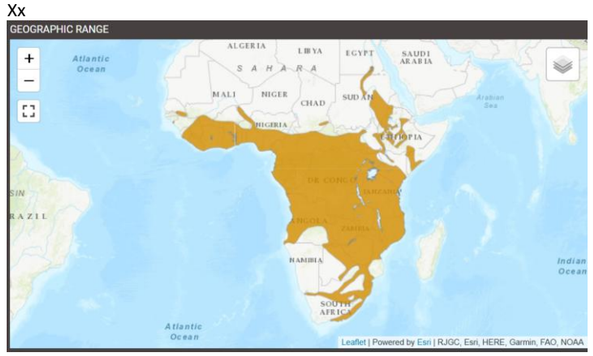
Figure 4.1: Map Illustrating Distance of Quarry from the Pipeline Route Within the Forest

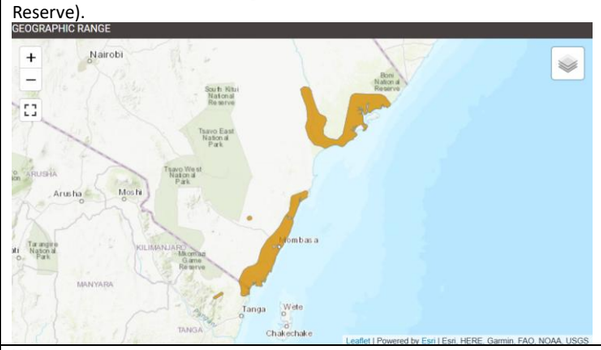
Table 4-2: Initial Screening of CH-qualifying FAUNA Species as Per IUCN Red list and IFC PS 6

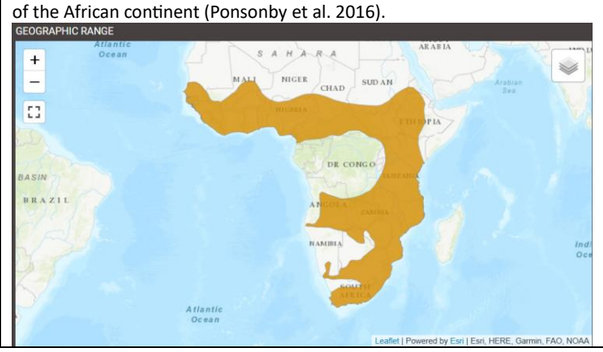
#	Species (English& Traditional and Scientific Name)	IUCN Red List[10]	IFC PS 6 criteria[11]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Migratory / Congregatory			
Birds								
1	African or fork-tailed drongo *Dicrurus adsimilis* 	LC	no	NO EOO 25900000Km^2	No	Subspecies modestus is widespread in open and forested habitats, with the exception of primary forest on the central massif, and is commonest in open plantations and in edge habitats (Atkinson et al. 1991, J. Baillie and A. Gascoigne in litt. 2000) 	*Dicrucus adsimilis* has a very large range extending from Mauritania, Senegambia and Guinea east in savanna belt to northern Cameroon, southern Chad, central and southern Sudan, Ethiopia, Eritrea and Somalia, south to Central African Republic, The Democratic Republic of the Congo, Congo, Uganda, Kenya, Tanzania, Gabon, Angola, Zambia, Malawi, Mozambique, Zimbabwe, Namibia, Botswana, South Africa, Swaziland and Lesotho. The species has a wider occurrence range and is unlikely it will trigger CH	Out
2	MadagascarSwift Apus balstoni 	LC	no	NO EOO 928,000Km^2	No	This species has a very large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence <20,000 km2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). 	Despite the fact that the population trend appears to be decreasing, the decline is not believed to be sufficiently rapid to approach the threshold for Vulnerable under the population trend criterion (>30% decline over ten years of three generations). The population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure). For these reasons the species is evaluated as Least Concern.	Out
3	black kite *Milvus migrans* 	LC	no	NO EOO 115653659Km^2	Yes	Very widely distributed, breeding from Australia to Spain and Morocco, with the northern extent of migratory breeders extending to northern Russia and Mongolia. Migratory over much of the Eurasian range, predominately wintering in sub-Saharan Africa. 	This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (extent of occurrence <20,000 km^2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population trend appears to be stable, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (>30% decline over 10 years or three generations). The population size is extremely large, and hence does not approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in 10 years or three generations, or with a specified population structure). For these	Out

[10] 1CR = Critically Endangered, EN = Endangered, NT = Near Threatened, VU = Vulnerable, LC = Least Concern, NE = Not Evaluated, DD = Data Deficiency
[11] 2IFC PS6 species Criterion 1: Critically Endangered and/or Endangered species, Criterion 2: Endemic and/or Restricted-range species, Criterion 3: Migratory and/or congregatory species

#	Species (English& Traditional and Scientific Name)	IUCN Red List[10]	IFC PS 6 criteria[11]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Migratory / Congregatory			
							reasons the species is evaluated as Least Concern and does not trigger CH	
4	paradise fly-catcher *Terpsiphone viridis* 	LC	no	NO EOO 25000000Km²	Yes	Very widely distributed, breeding from, ngola; Angola; Benin; Benin; Botswana; Botswana; Burkina Faso; Burkina Faso; Burundi; Burundi; Cameroon; Cameroon; Central African Republic; Central African Republic; Chad; Chad; Congo; Congo; Congo, 	This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence under 20,000 km² combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (under 10,000 mature individuals with a continuing decline estimated to be over 10% in ten years or three generations, or with a specified population structure). The population trend appears to be stable, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (over 30% decline over ten years or three generations). For these reasons the species is evaluated as Least Concern	Out
5	ring-necked dove Streptopelia capicola 	LC	no	NO EOO 25000000Km²	Yes	Widely spread over Angola; Botswana; Burundi; Congo; Congo, The Democratic Republic of the; Eritrea; Eswatini; Ethiopia; Gabon; Kenya; 	This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence <20,000 km2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population trend appears to be increasing, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations). The population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure). For these reasons the species is evaluated as Least Concern and does not trigger CH	Out
6	pied crow Corvus albus 	LC	no	NO EOO 32900000Km²	no	Wide range including Angola; Benin; Botswana; Burkina Faso; Burundi; Cameroon; Central African Republic; Chad; Comoros; Congo; Congo, The Democratic Republic of the; Côte d'Ivoire; Djibouti; Equatorial Guinea; Eritrea; Eswatini; Ethiopia; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Kenya; Lesotho; 	This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence under 20,000 km² combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (under 10,000 mature individuals with a continuing decline estimated to be over 10% in ten years or three generations, or with a specified population structure). The population trend appears to be stable, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (over 30% decline over ten years or three generations). For these reasons the species is evaluated as Least Concern and does not trigger CH	Out

#	Species (English& Traditional and Scientific Name)	IUCN Red List[10]	IFC PS 6 criteria[11]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Migratory / Congregatory			
7	speckled mousebird *Colius striatus* 	LC	no	NO EOO 6300000Km^2	no	Widely distributed in ngola; Botswana; Burundi; Cameroon; Central African Republic; Congo; Congo, The Democratic Republic of the; Equatorial Guinea; Eritrea; Eswatini; Ethiopia; Gabon; Ghana; Kenya; 	This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence under 20,000 km² combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (under 10,000 mature individuals with a continuing decline estimated to be over 10% in ten years or three generations, or with a specified population structure). The population trend appears to be increasing, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (over 30% decline over ten years or three generations). For these reasons the species is evaluated as Least Concern and not triggering CH	Out
8	village or spot-backed weaver *Ploceus cucullatus spilonotus*	NE						
9	pied wagtail *Motacilla aguimp* 	LC	no	NO EOO 25100000Km^2	no	Xx 	This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence <20,000 km2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population trend appears to be stable, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations). The population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure). For these reasons the species is evaluated as Least Concern not triggering CH	Out
Mammals								
1	African civet *Civettictis civetta* 	LC	No	No EOO 25100000Km^2	No	African Civet is widely distributed in Africa from Senegal and Mauritania to southern Sudan, Ethiopia, Djibouti, and southern Somalia southwards in all countries to northeastern Namibia, north and east Botswana, and northeastern South Africa (Ray 2013). It is present on Zanzibar Island (Pakenham 1984, Stuart and Stuart 1988) and has been introduced to Sao Tome Island (Dutton 1994). The species is recorded from almost sea level to altitudes of 5,000 m a.s.l. on Mt Kilimanjaro (Moreau 1944).	African Civet is listed as Least Concern because the species has a wide distribution range, is present in a variety of habitats, is relatively common across its range, is present in numerous protected areas, and has a total population believed to be relatively stable and therefore does not trigger CH	Out

#	Species (English& Traditional and Scientific Name)	IUCN Red List[10]	IFC PS 6 criteria[11]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Migratory / Congregatory			
								
2	vervet monkey *Chlorocebus pygerythrus* 	LC	No	No	No	Ss 	Vervet Chlorocebus pygerythrus is assessed as Least Concern. This species has a wide, albeit much fragmented, geographic range in which it is locally abundant. Although C. pygerythrus is in decline overall, there is no evidence of a significant range-wide population decline that would warrant listing in a higher category of threat	
3	Kenya coast galago or dwarf bushbaby Paragalago cocos 	LC	No	No EOO 11000Km^2	No	Paragalago cocos is endemic to the coastal region of Kenya and northern Tanzania (Butynski et al. 2006). From the north coast of Kenya to the northern coast of Tanzania (Mgambo Forest Reserve and Kilulu Hill Forest Reserve). 	Listed as Least Concern, Paragalago cocos is fairly widespread, locally abundant, and able to persist in secondary and/or highly fragmented vegetation. Although it is affected by habitat loss in some parts of its geographic range, there are no major threats to the species and therefore does not trigger CH	Out
4	Kirk's dik-dik Philantomba monticola 	LC	No	No	No	Widely distributed in central, eastern and southern Africa, from the Cross River in Nigeria to south-west South Sudan and southwards to central Angola, and Zambia, Malawi, eastern Zimbabwe, and parts of central Mozambique.	This is a widespread and abundant species with total population numbers estimated at more than seven million. Its ability to withstand hunting pressure and habitat degradation enable it to adapt to increasing human colonization of its forest habitats, although even this abundant, highly resilient species is suffering some decline in its distribution as human populations continue to grow and expand and rates of harvest are known to be increasing. Bush meat and other surveys indicate that population declines of this species may be close to or have already reached the thresholds for Near Threatened under criterion A, however until this	

#	Species (English& Traditional and Scientific Name)	IUCN Red List[10]	IFC PS 6 criteria[11]			Habitat and Distribution	Rationale for Critical Habitat Screening	Screened In or Out
			Endemic (EN)	Restricted Range (RR)	Migratory / Congregatory			
							is confirmed, the species remains listed as Least Concern and does not trigger CH	
5	Clawless Otter *Aonyx capensis* 	NT	No	No	No	Although this species has a large distribution range, it remains restricted to areas of permanent fresh water, with sufficient shoreline cover and an abundant prey base. Thus, while the distribution range is large, the spatial size of their occupied habitats is much smaller and unknown, particularly due to the widespread habitat destruction and pollution reported for much of the African continent (Ponsonby et al. 2016). 	Thus, due to inferred cumulative effects of the threats, it is suspected that the African Clawless Otter population underwent a reduction in population by at least 20% in the past three generations (13 years based on Pacifici et al. 2013). Therefore, the species is assessed as Near Threatened (nearly meets criterion A2cde). Additionally, the exacerbation of these threats may lead to a suspected future population decline of at least 20% over the next three generations (nearly meets criterion A3), further supporting the Near Threatened assessment and not trigger CH	Out

4.2 STAKEHOLDER CONSULTATIONS

The assessment made use of traditional knowledge through engagement of local community elder from the local Duruma Community. The elder was in charge of interpreting biological resources that were observed by the assessment team including assistance in identifying local names and value of such resources. Additionally, stakeholder consultations were undertaken with relevant Beach Management Unit (BMU) and Community Forest Association (CFA). The forums were held as per indicated schedule as indicated in **Table 4.3** below.

Table 4-3: Schedule of Stakeholder Consultations

#	Meeting Detail	Date and Venue
1	Bonje Beach Management Unit (BMU) Meeting	13th March 2025 at Bonje
2	Mkupe Beach Management Unit (BMU) Meeting	14th March 2025 at Mkupe

The community recognizes critical role that Mwache forest plays including habitats for diverse species, and contributes to the local economy through eco-tourism and sustainable resource management. The forest also provides materials like timber, fuel, local vegetables and other resources for the local population. **Table 1.4** on page 22 presents a summary of discussions held with the community.

Table 4-4: Stakeholder Consultations Issues

#	Topic	Discussion
1	Importance of Mwache Forest	It plays a crucial role in coastal protection, provides habitats for diverse species, and contributes to the local economy through eco-tourism and sustainable resource management They provide materials like timber, fuel, local vegetables and other resources for the local population.
2	Importance of Creek / Mangroves	Mangroves provide traditional ropes used in fishing sector Vegetation within mangrove provide medicinal value Provide breeding ground for fish, crabs, prawns, oysters, snails, Mollusca, Mangrove provide timber to the local for construction sector (residential structures and boat making) Tourist attracting Creeks help in control of storm and ocean wave surge Provision of clean air
3	Threats to the Creeks / Mangroves and Forest Ecosystem	Charcoal burning Over collection of firewood Clearing for farming Overfishing and bait collection Oil spills Sedimentation / erosion Human settlement Drought Plastic and other solid Wastes
4	Hot Spots	Gami Quarries Ltd is a locally incorporated Kenyan Company has continuously opened an active quarry within the forest for mining ballast, concrete blocks to pre-cast products. *Mbele, Goro, Darajani, Difu, Mwanzenge, Maweni, Ngondi, Nianze, Mbagani,* all affected by charcoal burning and deforestation
5	Suggested Mitigations Measures to Threats	Tree planting and re- afforestation Programs Stakeholder Sensitisation (Community) programs on conservation Restoration Programs of Mangroves in Degraded areas Beach Clean-up and Waste Management Programs

#	Topic	Discussion
		Bee Keeping Activities Termination of quarrying activities within Mwache Forest

5. MITIGATION, OFFSET, MONITORING AND IMPLEMENTATION

5.1 MITIGATION HIERARCHY

The proposed pipeline will have an impact on terrestrial habitats (and associated fauna and flora) within the forest Corridor (i.e. 900 m). Habitat losses caused by land clearing and cut and fill for access road and pipeline wayleave, need to be minimized, Revegetating and reforesting degraded areas. A number of measures have been developed to avoid impacts, as much as feasible, on key species and habitats using mitigation hierarchy presented in **Figure 5.1 below**.

Figure 5.1: Mitigation Hierarchy

5.1.1 Avoidance Measures

A number of measures have been developed to avoid impacts, as much as feasible, on key species listed under Tables 4.1 and 4.2 of this report, as described below

Action A1: Avoid placing construction equipment, stockpiles, locating contractors' camps, lay bay areas

- Avoid placing construction equipment, stockpiles, locating labour camps and spoiled disposal sites in within pipe line alignment and within the forest.
- The supervising engineer will engage an ecologist whole will be on hand to supervise the selection of above facilities and provide advice to the workforce

Action A2: Avoid disturbance to priority nocturnal fauna from project-related light, noise and vibration impacts.

- [12]Project construction will not be undertaken at dusk, dawn and at night to avoid disturbance to nocturnal and crepuscular fauna (Birds, Mammals, Reptiles and Invertebrate identified under 4.1.2) from increased light, noise and vibration.

Action A3: Avoid adversely impacting flora through the open-burning of wastes and forest fires.

- Avoid the open-burning of wastes and forest fires by the workers.

Action A4. Avoid adversely impacting wildlife species (recorded under 4.2 through illegal hunting and trafficking from project-related employees or contractors

- Project staff and contractors will be banned from hunting, buying and collecting natural resources (e.g., wildlife, aquatic animals) within the project area to minimize impacts to fauna and their habitats.

[12] Although we note and as earlier documented, the Forest has an active quarry that operates, the quarry is associated with blasting activities that already have interrupted habitat setup in terms of fauna population.

Action A5. Avoid introduction of invasive species and pests

- A washdown procedure will be employed to prevent invasive weed spread and potential contamination of the project area from the receiving environment.
- Non-invasive local plant species will only be used for revegetation
- Best practice organic waste management procedures will be followed to avoid attracting pests

5.1.2 Mitigation and Minimization Measures

Biodiversity management controls have been designed to mitigate high-risk potential impacts during the construction and operation phases of the pipeline within the 1.5km that traverses Mwache forest. Implementation of these best-practice mitigation measures will reduce as much as feasible the residual impacts on priority biodiversity features.

Action B1: Minimise clearance of forest flora listed under table 4.1 of this report).

- An ecologist will be on hand to supervise the habitat (tree and bushes) clearance works and provide advice to the workforce.
- Vegetation located on the steep slopes of mountains within the project area will also be preserved where possible to minimize the risk of erosion. ·
- Storage areas will be located in areas away from natural forest, headstreams and drainage
- Controls of forest/bushfire including a Project ban on open-burning of waste
- An ecologist hired by the supervising engineer will be on hand to supervise re-routing of sections that interphase with critical habitat.
- Pre-clearance checks will be undertaken prior to the commencement of works to avoid cutting unnecessary trees along the pipeline.
- Controls of forest/bushfire including a Project ban on open-burning of waste.

Action B2: Minimize impacting fauna, flora within the forest through spills of hazardous materials

- Avoid spills of oil, chemicals and other hazardous materials into the rivers.
- Stockpiles of materials and hazardous compounds (including asphalt, oil, diesel and chemicals) will not be located near any surface watercourses and standing waterbodies (i.e., rivers, streams).
- Emergency response procedures will be prepared for the Project which will include a protocol for responding to accidental spills and leakages of diesel fuel, non-hazardous waste and hazardous compounds.

Action B3. Minimize the impact of an accidental spill of hazardous materials on into the environment.

- Staff and contractors will receive training in spill events management.
- Staff and contractors will strictly adhere to a hazard control regulation

Action B4. Minimize introduction of invasive species and pests

- Actively monitor and eradicate invasive vascular plant species along the pipeline Wayleave.

Action B5. Minimize the indirect impacts to natural habitats with exploitation of natural resources and illegal hunting from Project-related facilitated access.

- Consultation with local authorities (Kasemeni Location Chief and Local Forester at Mwache Forest Station) to minimise the impacts of in-migration on natural resource (including the collection of timber, non-timber products and hunting) during the operation phase. ·
- Collaboration with Local Forester at Mwache Forest to ensure indirect impacts to forested area are adequately mitigated; ·
- Promote environmental preservation and conservation practices by local communities through establishing stakeholder engagement network. ·
- Prohibit hunting and natural resource collecting by the pipeline maintenance personnel and contractors when at work. To be communicated through induction and training to all personnel (employees and contractors)

5.1.3 Rehabilitation / Restoration Measures

The Project will set targets/actions to successfully rehabilitate and restore habitats within the Project area, a summary of the measures is presented below.

Action C1. Restore the physical landscapes that have been impacted by Project activities.

- All rubbish and waste materials within the Project area (including the project footprint, the working width, borrow pits, stockpiling areas and contractor facility area) will be cleared of all rubbish and waste material in accordance with the Project's waste management principles.
- The physical landscape of the Project area (i.e., escarpments and embankments) will be restored by clearing the area of debris, filling holes with recycled material from the road works.

Action C2. Establish and implement a Tree Planting Scheme for the Project

- A Tree planting scheme should be developed and implemented by the Project or the contractor in consultation with Coast Water Works Development Agency (CWWDA) safeguards officer and Mwache Forest Station officers
- A number of trees and bushes will be planted along the service roads along the pipeline alignment. The species of trees to be planted should be native tree species, from the assessment the prominent species will be; *Obetia radula, Enchephalartos hildebrandtii or Grewia plagiophylla, these were assessed with the* highest Importance Value Index (IVI). The monitoring measure has provided for tracking Plant Survival at 2,5 and 10 years and will be reported in terms of survival rate and percentage of canopy recovery. These clauses will be included in the proposed Service Level Agreement (SLA) with Kenya Forest Services
- All closure borrow pits will be rehabilitated to an acceptable manner as close to the original land by planting native trees or bushes, and that can provide natural habitats for wildlife

Action C3. Undertake regular watering and monitoring to minimize the risk of poor species establishment following planting.

All planted trees, bushes, grasses, herbs, including vulnerable species planted will be regularly watered by the contractors until successful establishment has been achieved. The supervising engineer should monitor the

establishment of all planted vascular plants on a regular basis following the completion of the construction works. Any dead vascular plants will also be replaced as 'like for like' during the agreed timeframe.

5.1.4 Offset and Additional Actions

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant negative residual impacts on biodiversity that arise from a project development (BBOP, 2012; ICMM IUCN, 2012; McKenny and Kiesecker, 2010; World Bank Group, 2016). The goal of biodiversity offsets is to achieve "no-net-loss", and preferably a "net gain" of biodiversity in terms of species composition, habitat structure, ecosystem function and human use and cultural values associated with biodiversity. Ultimately, a biodiversity offset is a commitment by the developer to compensate for residual impacts on biodiversity after appropriate avoidance, minimisation and on-site rehabilitation measures have been taken into account according to the mitigation hierarchy (DEADP, 2007).

Ecological equivalence in biodiversity offsets aims to ensure that the biodiversity values lost at an impacted site are fully compensated for by equivalent gains at an offset site. This is achieved by carefully matching the habitat type, species composition, and ecological condition of the impacted area with the offset area. Long-term protection and monitoring are also crucial to ensure the offset's effectiveness and permanence. In additional to the Permit / License we propose to develop and Service Level Agreement (SLA) between Kenya forest Service (KFS) and Coast Water Works Development Agency (CWWDA). The SLA will describe details related to Ensuring Ecological Equivalence for the selected off set in terms of (i) Habitat Type, (ii) Species Composition, (iii) Ecological Condition, (iv Long-term Protection) and (v) Monitoring.

Offset will provide for action listed below.

- Justification of ecological equivalence
- Location and selection criteria of offset site
- Monitoring & evaluation plan for the offset
- Long-term commitment arrangements (e.g., stewardship, management responsibility, permanence)

In Kenyan Context,

As per the Kenya Forest Act 2016, The Kenya Forest Service (KFS) plays a crucial role in issuing user permits, primarily to manage and conserve forests and forest resources. KFS is responsible for issuing various types of permits, including timber harvesting licenses, special use licenses, and cultivation permits, as well as other authorizations like concession agreements, joint management agreements, and contracts.

These permits are issued to individuals and entities to undertake activities within forests, ensuring compliance with relevant legislation and promoting sustainable forest management. For the pipeline Section through Mwache Forest Kenya forest Services will issue a special use licenses to Coast Water Works Development Agency (CWWDA) through modalities as summarized below

- CWWDA to formally apply for approval to lay the pipeline within Mwache Forest, the application to be addressed to the Chief Conservator of Forest (CCF), Kwale County.
- The application will clearly indicate the scope of works planned to be undertaken within the forest.
- The application will include a clear Layout Plan and indicate the proposed pipeline route
- The CCF will review the application and communicate the decision of KFS officially to CWWDA.
- After approval is granted by KFS, CWWDA will undertake survey of the pipeline route.

- After Survey works is completed, CWWDA will further apply through the CCF for approval or authority to commence pipeline construction.
- KFS will undertake a census of trees that will be affected the pipeline corridor and bill CWWDA. From our estimate is that the tree carrying density per 1 acre is approximated at 177, this implies that for the **3.33acres of Mwache pipeline wayleave a total of 589 trees at an estimated cost of Ksh 17,670,000 or Euro 121,862** will be required to offset the loss.
- This application will be reviewed and approval granted to CWWDA by KFS for construction works upon CWWDA paying the cost of offsetting the trees that shall be fell along the alignment. This will be through issuance of a special user's license that will be renewed on an annual basis.
- Mapping of the offset site, assessment of its ecological baseline, and monitoring plan to track offset success.

World Bank Context

Guidance Note ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources describes as Critical Habita as and areas with high biodiversity importance or value, including:

- Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches;
- Habitat of significant importance to endemic or restricted-range species;
- Habitat supporting globally or nationally significant concentrations of migratory or congregatory species;
- Highly threatened or unique ecosystems; and (e) Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).

From the species analysis undertaken in (Chapter 4), none of the above criterion indicated above was achieved, and therefore the forest section the will interphase with the Mwache Pipeline Project is not a critical Habitat. However, as provided under GN24.1 (ESS 6), where the project occurs legally protected forest like the case of Mwache Forest. the Borrower will ensure that any activities undertaken are consistent with the area's legal protection status and management objectives. The Borrower will also identify and assess potential project-related adverse impacts and apply the mitigation hierarchy so as to prevent or mitigate adverse impacts from projects that could compromise the integrity, conservation objectives, or biodiversity importance of such an area. The note further guides that that the borrower will.

- Demonstrate that the proposed development in such areas is legally permitted;
- Act in a manner consistent with any government recognized management plans for such areas;
- Consult and involve protected area sponsors and managers, project-affected parties including Indigenous Peoples, and other interested parties on planning, designing, implementing, monitor ing, and evaluating the proposed project, as appropriate; and
- Implement additional programs, as appropriate, to promote and enhance the conservation aims and effective management of the area

Table 5-1 on Page 53 presents Biodiversity Management Plan, this plan will be updated and enhanced in collaborating with KFS to make its more specific, measurable, achievable, relevant, time-bound. This is because certain specific measures will be more elaborate after KFS undertakes a census of all trees that will be cleared along the pipeline alignment. At this stage, aspects such as 70% tree survival triggers replanting will be incorporated in the plan.

Table 5-1: Biodiversity Management Plan

Hierarchy Level	Mitigation Action	Management Responsibility	Timeline	Budget (Euro)
Avoidance Measures	• Avoid placing construction equipment, stockpiles, locating contractors' camps, lay bay areas • Avoid disturbance to priority nocturnal fauna from project-related light, noise and vibration impacts. • Avoid adversely impacting flora through the open-burning of wastes and forest fires. • Avoid adversely impacting wildlife species (recorded under 4.2 through illegal hunting and trafficking from project-related employees or contractors • Avoid introduction of invasive species and pests	Ecologist at the Supervising Engineer who reports to Safeguards Officer at CWWDA	Pre Construction and to continue into Construction Stage of the Project	Euro 35,000
Mitigation and Minimization Measures	• Minimize clearance of forest flora listed under table 4.1 of this report of natural habitats and more specifically vulnerable tree species discussed under section (4.1). • Minimize impacting fauna, flora within the forest through spills of hazardous materials • Minimize the impact of an accidental spill of hazardous materials on into the environment. • Minimize introduction of invasive species and pests • Minimize the indirect impacts to natural habitats with exploitation of natural resources and illegal hunting from Project-related facilitated access.	Ecologist at the Supervising Engineer who reports to Safeguards Officer at CWWDA	Pre Construction and to continue into Construction Stage of the Project	Euro 25,000
Rehabilitation / Restoration Measures	• Restore the physical landscapes that have been impacted by Project activities. • Establish and implement a Tree Planting Scheme for the Project • Undertake regular watering and monitoring to minimize the risk of poor species establishment following planting.	Ecologist at the Supervising Engineer who reports to Safeguards Officer at CWWDA and Kenya Forest Services (KFS)	Post Project Stage of the Project	Euro 25,000
Kenya forest Service off set of Impacted	• CWWDA to formally apply for approval to lay the pipeline within Mwache Forest, the application to be			Euro 121,862

Hierarchy Level	Mitigation Action	Management Responsibility	Timeline	Budget (Euro)
Trees along the pipeline alignment	addressed to the Chief Conservator of Forest (CCF), Kwale County. • The application will clearly indicate the scope of works planned to be undertaken within the forest. • The application will include a clear Layout Plan and indicate the proposed pipeline route • The CCF will review the application and communicate the decision of KFS officially to CWWDA. • After approval is granted by KFS, CWWDA will undertake survey of the pipeline route. • After Survey works is completed, CWWDA will further apply through the CCF for approval or authority to commence pipeline construction. • KFS will undertake a census of trees that will be affected the pipeline corridor and bill CWWDA. From our estimate is that the tree carrying density per 1 acre is approximated at 177, this implies that for the 3.33acres of Mwache pipeline wayleave a total of 589 trees at an estimated cost of Ksh 17,670,000 or Euro 121,862 will be required to offset the loss. • This application will be reviewed and approval granted to CWWDA by KFS for construction works upon CWWDA paying the cost of offsetting the trees that shall be fell along the alignment. This will be through issuance of a special user's license that will be renewed on an annual basis.			
Estimated Budget in Euros				**Euros 206,862**

5.2 MONITORING AND EVALUATION PLAN

The Monitoring and Evaluation Plan will be aligned with the Mwache South Mainland (ESIA) and Environmental and Social Management Plan (ESMP). This will incorporate a Biodiversity Monitoring and Evaluation Program to assess the efficacy of the avoidance and mitigation measures and to inform the requirement for adaptive management. This could potentially be a collaborative approach with Mwache Forest Station Forester and other local government agencies including Kasemeni Location Chief. A draft set of monitoring actions has been developed based on the avoidance and mitigation measures designed for the Project. Where possible, thresholds will be established for each monitoring approach that will alert the Project that mitigation measures need to be adapted and revised.

5.2.1 Monitoring of pre-clearing/removal of trees.

Monitoring of pre-clearing of trees and bushes within the Water Pipeline Alignment is expanded to ensure that only trees surveyed and marked by ecologist to be removed. In addition, routine records of forest/bushfire in the contiguous forest alongside the pipeline assess the efficiency of minimization measure on control of forest/bushfire as consequence of the Project activities. Indicator: 589 trees will be removed

5.2.2 Monitoring Habitat Restoration

The status of the planted trees, shrubs and vulnerable species will be closely monitored until successful establishment has been achieved. The number of trees and quadrats of grass land will serve as an indicator of success for the wider restored habitats. Regular walkover assessments will also be undertaken to assess establishment over time. In the event of dieback, areas of dead vascular plants will be replaced either through plug planting or seeding. This will be undertaken by contractors under supervision of supervising engineer in consultation with local government offices

Indicators:

- Changes in indicators of plant health (i.e., leaf coloration, wilting, etc.)
- Changes in plant numbers
- Changes in coverage
- Plant Survival at 2,5 and 10 years

Summary of recommended monitoring approaches

Table 5-2: Summary of recommended monitoring approaches

Monitoring types	Indicators	Triggers for adapted management	Frequency	Responsibility
Monitoring of pre clearing/removal of trees and forest fire	589 trees will be removed	increase in tree numbers cut, and frequency of bush fire	Ongoing	ES Unit, Ecologist
Monitoring Habitat Restoration	Changes in indicators of plant health and in plant numbers	Plant dieback	Until establishment	ES Unit, Ecologist

5.3 IMPLEMENTATION RESPONSIBILITIES

Construction Period

The roles, responsibilities and monitoring systems for the delivery of avoidance, mitigation and management measures are detailed in the Project's Environmental and Social Management Plan (ESMP), the Environmental Monitoring Plan (EMP); a summary which relates to biodiversity management is presented in **Table 5.3** below. It is anticipated that this will be updated with more detailed descriptions as the Project progresses.

Table 5-3: Summary of staff roles and responsibilities related to biodiversity management

#	Entity	Responsibility
1	Project Manager and the Environmental and Social Unit Manager at Coast Water Works Development Agency (CWWDA)	• Overall responsibility for the implementation of this management plan · • Updating this management plan • Make the plan available to all employees and contractors • Provide leadership on biodiversity matters within the Project Environmental Team. • Work effectively with relevant department managers to develop best practice standards to ensure compliance with biodiversity requirements • Oversee the implementation of the biodiversity management actions in accordance with this plan • Lead stakeholder consultation • Disseminate data to biodiversity specialists to enable evaluation of the effectiveness of programmes in achieving biodiversity objectives • Monitor and report on compliance with the Project's biodiversity actions, commitments and legal obligations • Provide technical and strategic advice on biodiversity matters to the Project Manager
2	Environmental and biodiversity / Ecology advisor	• Provide training and guidance to staff and contractors on the requirements of this management plan • Assist with the implementation of the biodiversity management actions in accordance with this management plan • Enforce the biodiversity 'permit to work' systems • Monitor and report on compliance in accordance with the national legislation and regulatory requirements, ESMP, ESAP and BMP • Assist in the delivery of biodiversity monitoring, data analysis and reporting. • Assist with stakeholder consultation · assist with training and capacity building of employees and contractors
3	Ecological clerk of works	• As part of the contractor's team, the ecological clerk of works will provide technical guidance on the implementation of the BMP • Coordinate the pre-construction surveys, biodiversity checks and monitoring in accordance with the BMP, ESMP and ESIA · • Undertake supervisory tasks including the supervision of the habitat clearance works. · • The provision of biodiversity inductions and presentation to all contractors and staff • Management of the biodiversity 'permit to work systems and compliance monitoring and enforcement.
4	General staff and contractors	• Comply with requirements of the BMP, ESIA, ESAP and ESMP, relevant to their specific job requirements

#	Entity	Responsibility
		• Uphold the Project's biodiversity objectives as defined in the BMP and ESMP • Use appropriate materials, equipment, machinery and vehicles to minimize EHS and Biodiversity risks • Attend training and site inductions • Reporting of accidents and incidents
5	Supervising engineer	• Undertake daily monitoring of implementation of ESMP / EIA, OHS and Social requirements • Input into monthly reporting • Ensure the training of workers, use of appropriate equipment, machinery and vehicles and compliance with health and safety procedures and protective equipment • Documentation and reporting of occupational accidents, diseases and incidents • Compliance monitoring • The provision of quarterly reports on status of implementation of the criteria on ESMP, ESIA, ESMP, OHS and social and environmental mitigation measures
6	Kenya Forest Services (KFS)	• CWWDA to formally apply for approval to lay the pipeline within Mwache Forest. Application to be addressed to the Chief Conservator of Forest (CCF) – Kwale County. • The application will clearly indicate the Scope of Works planned to be undertaken within the forest. • The application will include a clear Layout Plan and indicate the proposed pipeline route • The CCF will review the application and communicate the decision of KFS officially to CWWDA. • After approval is granted by KFS, CWWDA will undertake survey of the pipeline route. • After Survey works is completed, CWWDA will further apply through the CCF for approval or authority to commence pipeline construction. • This application will be reviewed and approval granted to CWWDA by KFS for construction works. • KFS also will the undertake the offset of trees affected within the project corridor as discussed under 5.1.4
7	Local Administration (Deputy County Commissioner Samburu and Kasemeni Location Chief)	• The office of Sub County Commissioner supports CWWDA initiative of expanding water distribution networks within Mombasa and Kwale Counties • The office of Sub County Commissioner is ready to assist CWWDA to mobilise any stakeholder consultations that might be required through project implementation stage • Local administration would ask to be involved in any stakeholder workshops that might be organized by CWWDA with regards to the Project • The DCC office advises consultations with Kenya Forest Services (KFS) given that the pipeline section traverses through Mwache forest.

Post Construction period

Kenya Forest Services (KFS) and Coast Water Works Development Agency (CWWDA) have internally Environmental and Social capacity that will be utilised to supervise initiatives such as care of trees at the offset location for a duration of 2.5, 5 and 10 years. However, if deemed necessary externally capacity can be procured through CWWDA.

5.5 IMPLEMENTATION BUDGET

Table 5.4 below presents an estimated budget that will be set aside for implementation of recommendations presented in this report, the budget will be secured by CWWDA prior to commencement of the Project

Table 5-4: Implementation budget

#	Item	Estimated Budget (Euros)
1	Implementation of Mitigation Measures	**206,862**
2	Capacity Building and Training of CWWDA safeguards team	14,000
3	Community Engagement and Grievance Resolution	10,000
4	Hiring of Biodiversity Advisor (At the Supervising Engineer) for 12 months	70,000
5	Hiring of Biodiversity Clerk (At the Contractor) for 12 months	70,000
	Sub Total 1	**370,862.00**
6	Contingencies 5%	18,543.10
	GRAND TOTAL	**389,405.10**

6. CONCLUSION

The trunk main section 1.5km will traverse through Mwache forest which is Mwache is a gazetted forest reserve located in Kwale County, and covers approximately 417 hectares. The pipeline alignment was adopted after analysis of 3nr different Pipeline route options as discussed in sub section (1.5) of this report. From the analysis, route Option 2 where the Pipeline within 4m wide corridor of the Mwache forest adjacent to the SGR Reserve involves Section 1; Initial 400m section of the pipeline within the forest to be laid fully within the forest due to hydraulic considerations. The width of forest affected under this option will be 8m. The area of forest land affected on this 400m long section is 0.33Ha. Section 2; 1.1km section of the pipeline along the alignment of the SGR. The pipeline on this section will be laid within a 4m wide corridor adjacent to the existing SGR reserve, hence affecting only a 4m wide section of the forest for the 1.1km section of pipeline along the railway. The area of forest land affected on this 1.1km long section is 0.44Ha.

The International Finance Corporation (IFC) Performance Standards PS6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC 2012, 2019) was the key standard that was reviewed for this assessment. The standard guided assessment of Project impacts on biodiversity values along the 1.5km section that interphases with the Mwache Forest. IFC Guidance Note (GN) 6 paragraphs GN70–83 provides that biodiversity values should be screened using critical habitat criteria and thresholds including (i). Criterion 1: Critically Endangered (CR) and Endangered Species (EN) applicable thresholds being areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥ 0.5% of the global population and ≥ 5 reproductive units GN16 of a CR or EN species). (ii) Criterion 2: Endemic and Restricted-range Species for terrestrial vertebrates and plants, restricted-range species are defined as those species that have an Extend of Occurrence (EOO) less than 50,000 square kilometres (km2) and (iii) Criterion 3: Migratory and Congregatory Species, being areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.

From the flora and fauna species analysis undertaken in this assess, none of the species collected along the sampling polygon along the pipeline corridor met the thresholds detailed by the IFC PS 6 Guidance Note GN70–83. Further, assessment of species listed under IBAT was undertaken applying the thresholds provided under GN6.1 (criteria 1–5) that assessed presence or absence of the species, habitat suitability, observation status and threshold status (Appendix 3), similarly, no species met the thresholds of triggering either of the criterion detailed in para above.

Therefore, the assessment confirms that the proposed Project activities will not lead to measurable adverse impacts on biodiversity values within the water pipeline alignment. Further, the Project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species including the ones listed under IBAT for the 50km radius. This report presents a robust, appropriately designed, and long-term biodiversity monitoring and evaluation program that is based on the data collected in the field and literature. This plan will be updated and enhanced in collaborating with Kenya Forest Service (KFS) to make its more specific after finalisation of KFS 100% Census of floral biodiversity that will be enumerated within the pipeline alignment at the permitting stage.

Further, the pipeline activity complies with forest management plan for Mwache Forest which provides for participatory forest management planning to ensure its sustainable use and conservation. This is enhanced by continuous involvement of Kenya Forest Services (KFS) through the permitting and planting and care of offset mitigatory trees and at the time upgraded of Biodiversity Management Plan (BMP) that will be enhanced after KFS concluded census of trees that will be cleared within the pipeline alignment.

7. REFERENCES

The assessment made reference to below listed report and guidelines.

- *BIODIVERSITY MANAGEMENT PLAN (BMP) UPPER CISOKAN PUMPED STORAGE HYDROPOWER, Achieving Biodiversity Conservation through Integrated Catchment Management: MASTER DEVELOPMENT UNIT – UIP JBT I APRIL 2021*
- *Brauneder KM, Montes C, Blyth S, Bennun L, Butchart SHM, Hoffmann M, et al*. (2018) Global screening for Critical Habitat in the terrestrial realm. PLoS ONE 13(3): e0193102 https://doi.org/10.1371/journal.pone.0193102
- *Effects and Impacts of Quarrying on Forest Land: The Case of Gami Quarries, Mwache Forest, Kwale County, Kenya*; Saeed Mwaguni & Daniel Munga2 Dept. of Environment and Health Sciences & Department of Pure and Applied Sciences, Technical University of Mombasa, Tom Mboya Avenue, P.O Box 90420-80100, Mombasa, Kenya 2015
- *Global Standard for the Identification of Key Biodiversity Areas (Version 1.0)*: Prepared by the IUCN Species Survival Commission and IUCN World Commission on Protected Areas in association with the IUCN Global Species Programme: 23 March 2016
- *Guidelines for using A Global Standard for the Identification of Key Biodiversity Areas Version 1.2: Prepared by the KBA Standards and Appeals Committee of the IUCN Species Survival Commission and IUCN World Commission on Protected Areas 2022*
- IFC. Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. International Finance Corporation; 2012. *Available from: www.ifc.org*
- *Mueller-Dombois Dieter and Heinz Ellenberg*. "Vegetation types: a consideration of available methods *and their suitability for various purposes." (1974).*
- *Guidance Notes to the Standard on Biodiversity Offsets: A tool to assess adherence to the BBOP Principles on Biodiversity Offset Design and Implementation; Published 20 March 2012*
- *On-Farm Tree Growing Opportunities and Constraints in Murang'a County, Kenya P. Gachie J, Kipsat, J., Cheboiwo, M, Esitubi, J., Mwaura, P.,Wairimu and M., Gathogo. Kenya Forestry Research Institute, 2 Esri Eastern Africa*
- *Musila, Simon Nganda, Manohar, Sayam and Mango, Nelson (2017), The abundance of bird species in three sections of Kwale District's coastal forests in Kenya. OCEAN LIFE Volume 1, Number 2 E-ISSN: 2580-4529Pages: 69-83 DOI: 10.13057/oceanlife/o010205;* https://www.researchgate.net/publication/370044018_ [accessed Apr 24 2025].
- *Mwaguni, Saeed, and Daniel Munga (2015)*. "The Effects and Impacts of Quarrying on Forest Land: The Case of Gami Quarries, Mwache Forest, Kwale County, Kenya."
- World Conservation Congress 2016 resolution 67. Best practice for industrial-scale activities. IUCN (2016). IUCN Resolutions, Recommendations and Other Decisions. *Gland, Switzerland: IUCN. 106pp.*
- *Nguyen H, Lamb D, Herbohn J, Firn J (2014)* Designing Mixed Species Tree Plantations for the Tropics: Balancing Ecological Attributes of Species with Landholder Preferences in the Philippines. *PLoS ONE 9(4): e95267. doi:10.1371/ journal. pone.0095267*

8. APPENDICES

Appendix 1: Meeting Notes of Bonje and Mkupe Consultative Forums and Attendance Lists

REPUBLIC OF KENYA

NOTES OF MEETING HELD ON 13TH AND 14TH MARCH 2025 BETWEEN BONJE AND MKUPE BEACH MANAGEMENT UNITS (BMU) AND COMMUNITY FOREST ASSOCIATION (CFA)

VALUE OF MWACHE FOREST TO COMMUNITY

AGENDA

1. What are the economic activities in your area
2. What is the value of trees with Mwache Forest and Mangroves at the Creek (list and rank)
3. What are the threats facing Mwache Forest and Mangroves
4. What Interventions should be adopted to address the threats

Importance of Mwache Forest

- It plays a crucial role in coastal protection, provides habitats for diverse species, and contributes to the local economy through eco-tourism and sustainable resource management
- Community members are being trained in sustainable farming, beekeeping, and other ventures to diversify their income sources and reduce reliance on natural resources.
- They provide materials like timber, fuel, local vegetables and other resources for the local population.

Importance of Creek / Mangroves

- Mangroves provide traditional ropes used in fishing sector
- Vegetation within mangrove provide medicinal value
- Provide breeding ground for fish, crabs, prawns, oysters, snails, Mollusca,
- Mangrove provide timber to the local for construction sector (residential structures and boat making)
- Tourist attracting
- Creek help in control of storm and ocean wave surge
- Provision of clean air

Threats to the Creeks / Mangroves

- Charcoal burning
- Over collection of firewood
- Clearing for farming
- Over fishing and bait collection
- Oil spills
- Sedimentation / erosion
- Human settlement
- Drought
- Plastic and other solid Wastes

Degradation Hot Spots

- Gami Quarries Ltd is a locally incorporated Kenyan Company has continuously opened an active quarry within the forest for mining ballast, concrete blocks to pre-cast products.
- Mbele, Goro, Darajani, Difu, Mwanzenge, Maweni, Ngondi, Nianze, Mbagani, DOE all affected by charcoal burning and deforestation

Activities to be adopted in Specific Area

- Tree planting and re- afforestation Programs
- Stakeholder Sensitisation (Community) programs on conservation
- Restoration Programs of Mangroves in Degraded areas
- Beach Clean-up and Waste Management Programs
- Bee Keeping Activities

REPUBLIC OF KENYA

COASTAL WATER SECURITY AND CLIMATE RESILIENCE PROJECT (CWSCRP)

ATTENDANCE LIST

Activity: FGD at Bonje BMU Date: 13-03-25 Venue: Bonje

S/No	Name	Institution	Designation	Telephone	Sign
1.	Daniel Mazera Dzeri	BONJE B.M.U	DATA COLLECTOR	0716173728	
2.	VUNGWE N. VUNGWE	BONJE B.MU	KAMATI	0729249025	
3.	OMARI B. MUSSAH	BONJE-B.M.U	MEMBER	0768309507	
4.	Rajab T. Chudunda	Bonje . B.mu	member	0704559296	
5.	MGALLA JAMES BIAU	BONJE BMU	KAMATI	0769505365	
6.	DENA MKALA	BUNJE BMU	Treasurer	0728779205	
7.	DZERI KASIMBI	BONJE BMU	COMMITEE	0758903148	
8.	HAMIS BONGO CHIRUNGA	BOKOFA	MEMBER	0700794448	
9.	MIKONO MWACHANDE MWAMBO	BOCOFA	MEMBER	0748382299	
10.	MWANAJUMA MAZERA	BOCOFA	MEMBER	0706789724	
11.	Chimoyo . C . Chimoyo	BOCOFA	MEMBER	0720108846	
12.	CHIMERAH NZUNGU	BOCOFA	MEMBER	0700774576	CHIMERAH
13.	AGNES RIZIKI JOHNSON	BOCOFA	MEMBER	0714906061	RIZIKI
14.	KWEKWE M. MWAZEMBE	BOCOFA	MEMBER	0704625340	KWEKWE
15.					
16.					
17.					

REPUBLIC OF KENYA

COASTAL WATER SECURITY AND CLIMATE RESILIENCE PROJECT (CWSCRP)

ATTENDANCE LIST

Activity FGD at Mkupe BMU Date 14-03-25 Venue Mkupe

S/No	Name	Institution	Designation	Telephone	Sign
1.	MASUDI MOHAMED BAKARI	MKUPE BMU	CHAIRMAN	0724469333	
2.	NAHERA MDUNE JUMAA	MKUPE BMU	TREASURER	0726626885	
3.	ROBERT MWAKWA SAMSON	MKUPE BMU	COMMITEE	0728201515	
4.	HAMISI NYAE MARKALE	MKUPE BMU	MEMBER	0793663692	
5.	HAMISI MWATELA CHIGAMBA	MKUPE BMU	MEMBER	0711933628	
6.	WILLIAM TSORI RAI	MKUPE BMU	MEMBER	0714008875	
7.	CHAKA NDORO	MKUPE BMU	MEMBER	0704926354	
8.	MWAKAMWENGA CHIGAMBA	MKUPE BMU	COMMITEE	0721928601	
9.	KALUME MRUI KALUME	MKUPE BMU	MEMBER	0717721409	
10.	KHAMISI ABDALLAH NGONYO	MKUPE BMU	COMMITEE	0720073548	
11.	ALI MWATELA KAMANGA	MKUPE BMU	MEMBER	0728008536	
12.	KELVIN AHEKA MALONGO	Kefs	Corporal/fisheries	0720157688	
13.					
14.					
15.					
16.					
17.					

Appendix 2: IBAT Results Presented as a Separate Document

Appendix 3: Screening of IBAT Results Against IFC GN 6 GN70–83 – Criteria Thresholds (Presented as a Separate matrix)