ERM

PREPARED FOR

Safaricom

# The Daraja Fibre Optic Cable Project

## Environmental and Social Impact Assessment Report

DATE
18 June 2025

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0750910

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SIGNATURE PAGE

# The Daraja Fibre Optic Cable Project

## Environmental and Social Impact Assessment Report

0750910

**Document Authentication**

This Environmental and Social Impact Assessment (ESIA) Report is submitted to National Environment Management Authority (NEMA) in conformity with the requirements of the amended Environmental Management and Coordination Act, 1999 (amended in 2015) and the Environmental (Impact Assessment and Audit) Regulations, 2003 (amended in 2022). The legislation requires that every development project listed in the Act assesses the environmental, social and economic impacts and prepare an EIA report for approval by the Authority before the commencement of the project development.

**Prepared for:** Safaricom Plc

**Prepared by:** Environmental Resources Management Ltd

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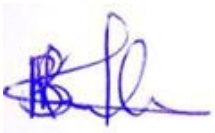
**Jonathan Perry**
Partner

**DECLARATION BY THE LEAD EIA/ENVIRONMENTAL ASSESSMENT (EA) EXPERT:**

I hereby certify that the contents of this ESIA report for the proposed fibre-optic subsea cable (i.e. the Daraja Project) have been prepared in accordance with the Environmental (Impact Assessment and Audit) Regulations, 2003 (amended in 2022) and that the methodology conform with the amended Environmental Management and Coordination Act, 1999 (amended in 2015).

**Name**: Boaz Bett (NEMA Reg. No.: 6994)

**Designation:** Lead EIA/EA Expert

**Signature**:  **Date**: 18.06.2025

**Email Address**: boaz.bett@erm.com

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**PROJECT PROPONENT: Safaricom Plc**

**DECLARATION BY THE PROJECT PROPONENT:**

I hereby certify that the contents of this ESIA report are correct and true to the best of my knowledge. I also confirm that the Daraja Project shall implement the Environmental and Social Management Plan (ESMP) and follow the mitigation measures provided in this report during the installation of the subsea cable.

**Name**: Valentine Cheruiyot

**Position**: Manager-Climate Change and Environment

**Signature**: Valentine **Date**: 18.06.2025

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On behalf of Safaricom Plc

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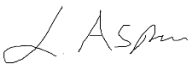
| Name of Professional | Organisation | Role in the Project | SIGNATURE |
|---|---|---|---|
| Jonathan Perry | ERM (UK) | Consulting Partner |  |
| Clare Robertson | ERM (UK) | Project Manager |  |
| Boaz Bett | ERM (Kenya) | NEMA Lead Expert<br><br>NEMA Registration Number 6994<br>NEMA Licence Number NEMA/EIA/ERPL/20363 |  |
| Mercy Kuria | ERM (Kenya) | NEMA Lead Expert; Stakeholder Engagement Expert<br><br>NEMA Registration Number 6704<br>NEMA Licence Number NEMA/EIA/ERPL/20326 |  |
| Alistair de Sousa | ERM (Kenya) | ESIA Associate Expert<br><br>NEMA Registration Number 11749<br>NEMA Licence Number NEMA/EIA/ERPL/20286 |  |
| Kamau Njuguna | ERM (Kenya) | ESIA Associate Expert<br><br>NEMA Registration Number under review | No longer at company at the time of writing this ESIA Report |
| Lewis Aspin | ERM (UK) | Marine Ecologist |  |
| Lumka Notuku | ERM (South Africa) | Stakeholder Engagement Expert |  |
| Dr. Mohamed Omar | Wildlife Research and Training Institute | Wildlife Service Marine Habitat Assessment Specialist |  |

The NEMA certificates for ERM (Kenya) (firm of experts) and ESIA Lead Experts for the Daraja Project can be found in **Appendix A**.

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## ACRONYMS AND ABBREVIATIONS

| Acronym | Description |
|---|---|
| AI | Artificial Intelligence |
| ALARP | As Low As Reasonably Practicable |
| AOI | Area of Influence |
| ASN | Alcatel Submarine Networks |
| BID | Background Information Document |
| BMH MBA | Beach Manhole |
| BMU | Beach Management Unit |
| BU | Branching Unit |
| Bonn Convention | Convention on the Conservation of Migratory Species of Wild Animals |
| BPEO | Best Practicable Environmental Option |
| bsl | Below Sea Level |
| BWM | Ballast Water Convention |
| CAK | Communication Authority of Kenya |
| CBO | Community Based Organisation |
| CDA | Coast Development Authority |
| CEC | County Executive Commissioner |
| CIDP | County Integrated Development Plan |
| CIEEM | Chartered Institute of Ecology and Environmental Management |
| CITES | Convention on the International Trade in Endangered Species |
| CLS | Cable Landing Station |
| cm | Centimetre |
| COLREGs | International Regulations for Preventing Collisions at Sea |
| CORDIO | Coastal Oceans Research and Development in the Indian Ocean |
| CSR | Corporate Social Responsibility |
| CRS | Cable Route Survey |
| DARE 1 | Djibouti Africa Regional Express 1 |
| DOSHS | Directorate of Occupational Health and Safety Services |
| DP | Dynamic Positioning |
| DTS | Desktop Study |
| E&S | Environmental and Social |
| EA | Environmental Audit |
| EACC | East African Coastal Current |
| EASSy | Eastern African Submarine Cable System |

| Acronym | Description |
|---|---|
| EEZ | Exclusive Economic Zone |
| EIA | Environmental Impact Assessment |
| EL | Environmental Licence |
| EMCA | Environmental Management and Co-ordination Act No. 8 of 1999 (amended in 2015) |
| EPR | Extended Producer Responsibility |
| ERM | Environmental Resources Management Ltd. |
| ESIA | Environmental and Social Impact Assessment |
| ESMP | Environmental and Social Management Plan |
| FBO | Faith Based Organisation |
| FGD | Focus Group Discussion |
| GHG | Greenhouse Gas |
| GoK | Government of Kenya |
| GPS | Global Positioning System |
| GRM | Grievance Redress Mechanism |
| ha | Hectare |
| HDD | Horizontal Directional Drilling |
| HP | Horsepower |
| H&S | Health and Safety |
| HSE | Health Safety and Environment |
| HWM | High Water Mark |
| HQ | Headquarter |
| IAS | Invasive Alien Species |
| IBA | Important Bird Area |
| ICPC | International Cable Protection Committee |
| ICT | Information and Communication Technology |
| IEMA | Institute of Environmental Management and Assessment |
| IMO | International Maritime Organisation |
| IOMOU | Indian Ocean Memorandum of Understanding |
| IPCC | Intergovernmental Panel on Climate Change synthesis report |
| IUCN | International Union for Conservation of Nature |
| KCGS | Kenya Coast Guard Service |
| KES | Kenyan Shilling |
| KFS | Kenya Forest Service |
| kg | Kilogram |

| Acronym | Description |
|---|---|
| kHz | Kilohertz |
| kJ | Kilojoule |
| km | Kilometre |
| KMA | Kenya Maritime Authority |
| KMFRI | Kenya Marine Fisheries Research Institute |
| kmph | Kilometre per Hour |
| KPA | Kenya Ports Authority |
| KWS | Kenya Wildlife Service |
| L | Litres |
| LAT | Lowest Astronomical Tide |
| LWM | Low Water Mark |
| m | Metre |
| m/s | Metres per Second |
| MARPOL 73/78 | International Conventions for the Prevention of Pollution at Sea from Ships |
| MICDE | Ministry of Information, Communications and The Digital Economy |
| mm | Millimetres |
| MMNP | Mombasa Marine National Park |
| MMNPR | Mombasa Marine National Park and Reserve |
| MMNR | Mombasa Marine National Reserve |
| MoD | Ministry of Defence |
| MPA | Marine Protected Area |
| MRI | Magnetic resonance imaging |
| MSP | Marine Spatial Plan |
| NBSAP | National Biodiversity Strategy and Action Plan |
| NDC | Nationally Determined Contribution |
| NEM | Northeast Monsoon |
| NEMA | National Environment Management Authority |
| NGO | Non-Governmental Organisation |
| NLC | National Lands Commission |
| nm | Nautical Mile |
| NMK | National Museums of Kenya |
| $NO_x$ | Nitrogen Oxides |
| NtM | Notice to mariners |
| OOS | Out-Of-Service |

| Acronym | Description |
|---|---|
| OSHA | Occupational Safety and Health Act |
| PBT | Persistent, Bio-accumulative, and Toxic |
| PEACE | Pakistan and East Africa Connecting Europe cable |
| PLGR | Pre-Lay Grapnel Run |
| PLB | Post-Lay Burial |
| PLI | Post-Lay Inspection |
| PLIB | Post-Lay Inspection and Burial |
| PLSE | Pre-Laid Shore End |
| PPE | Personal Protective Equipment |
| PRIB | Post-Repair Inspection and Burial |
| PRO | Producer Responsibility Organisation |
| PSU | Practical Salinity Units |
| PVC | Polyvinyl Chloride |
| RC | Route Clearance |
| RCP | Representative Concentration Pathway |
| ROV | Remotely Operated Vehicle |
| SDG | Sustainable Development Goal |
| SEA | Strategic Environmental Assessment |
| SEM | Southeast Monsoon |
| SME | Subject Matter Expert |
| $SO_2$ | Sulphur Dioxide |
| SOLAS | Safety of Life at Sea |
| SOPEP | Shipboard Oil Pollution Emergency Plan |
| SSW | South-Southwest |
| TEAMS | The East African Marine System |
| TOL | Temporary Occupation Licence |
| ToR | Terms of Reference |
| TS | Territorial Sea |
| UK | United Kingdom |
| UNCLOS | United Nations Convention on the Law of the Sea |
| UNEP | United Nations Environment Program |
| USD | United States Dollars |
| vPvB | very Bio-accumulative |
| WHO | World Health Organisation |

| Acronym | Description |
|---|---|
| WIO | Western Indian Ocean |
| WMP | Waste Management Procedure |
| WRTI | Wildlife and Research Training Institute |

# EXECUTIVE SUMMARY

## THE DARAJA PROJECT

The Daraja Fibre Optic Cable Project (i.e. the 'Daraja Project' or the 'subsea cable') will span approximately 4,108 kilometres (km), interconnecting landings at Salalah in Oman and Mombasa in Kenya, and will deliver increased capacity, quality and availability of internet connectivity to consumers and businesses.

The Daraja Project is expected to go live in 2026, delivering much-needed internet capacity and enhanced reliability between Oman and Kenya and supplementing the fast-growing capacity demand in the countries. The Daraja Project will underpin the further growth of 4G, 5G and fixed broadband access for hundreds of thousands of people.

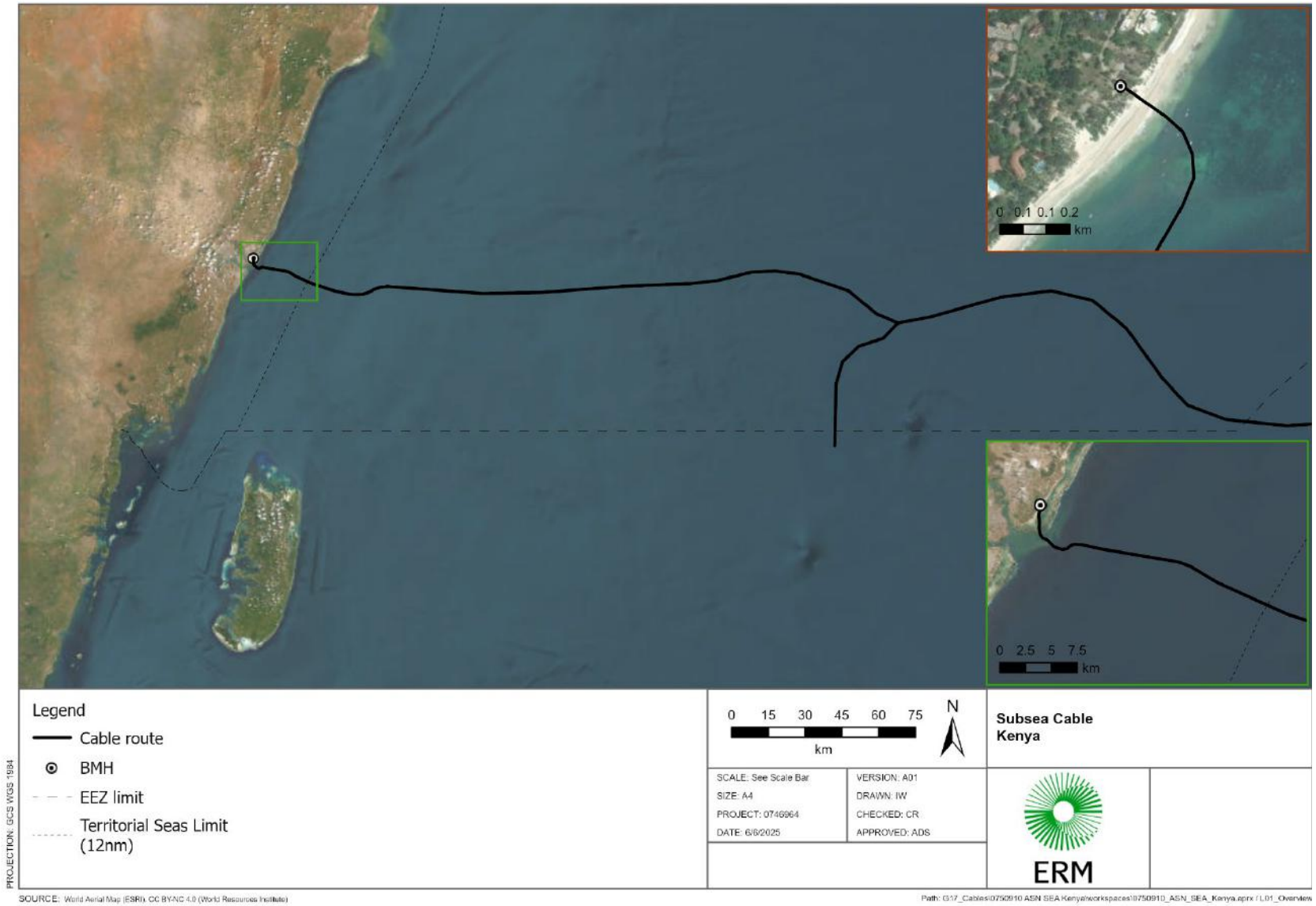
The Daraja Project will require installation and operation of the subsea cable through the Kenyan Exclusive Economic Zone (EEZ) and Territorial Sea (TS), and landing at Nyali Beach in Mombasa, Kenya (**Figure 1**). The subsea cable will be laid by a cable-lay vessel until the ship reaches a shallow-water depth of around 15 metres (m). From this point, a smaller vessel and divers will be used to install the subsea cable in shallow water and pull the subsea cable to shore.

The Daraja Project will also involve the construction of a beach manhole (BMH MBA) on the beach to facilitate the connection of the subsea cable to the terrestrial portion of the Project. The beach and BMH MBA sites will be restored to their original state after construction. The only element visible will be the manhole cover.

The terrestrial portion of the Daraja Project will be installed from the BMH MBA to a Cable Landing Station (CLS), where it will be connected to various configurations of terrestrial fibre-optic cable systems. Safaricom Plc will complete the terrestrial portion of the Daraja Project which is outside the scope of this ESIA study of the beach and marine elements of the Daraja Project.

Further information can be found in **Chapter 2** and **Chapter 3** of this ESIA Report.

## FIGURE 1 DARAJA PROJECT WITHIN KENYAN WATERS



## PROJECT ALTERNATIVES

**Chapter 4** of this ESIA Report identifies and analyses the project alternatives, as a requirement of the ESIA study process, outlined in Regulation 16 (b) of EIA Regulation 2003 (amended 2022).

The preferred route for the subsea cable and the preferred landing site that are presented in this ESIA Report have been selected based on an extensive desktop and field analysis of alternative options during the preliminary design phase of the Daraja Project. This analysis includes consideration of sensitive environments and habitats, seabed substrate, and other physical, biological and socio-economic factors, as well as the technical feasibilities of the Daraja Project components. For this reason, alternative options (e.g. technology alternatives, route alternatives, BMH MBA construction, and project development) are not presented here as options for the Daraja Project, having already been eliminated during the alternatives assessment because they were not feasible.

Therefore, the only alternative to that described in this report would be the option of not implementing the activity, or the 'No Project' option. Under the 'No Project' option, the Daraja Project will not take place. This will mean that the potentially negative impacts resulting from the proposed installation, construction and operation would not occur. Similarly, the potentially positive socio-economic impacts (including increased broadband, internet connectivity and telecommunications capacity for Kenya) will also not occur. The demand for internet connectivity is rising in the country as a result of e-commerce and digital education programmes.

## OBJECTIVES OF THE ENVIRONMENTAL IMPACT ASSESSMENT

The Kenya Government policy on all new projects, programmes or activities requires that an Environmental and Social Impact Assessment (ESIA) study be carried out for a project deemed as a high-risk project. This is to take into consideration the potentially significant impacts on the environment during the design, installation, construction, operation and decommissioning of the Daraja Project. The categorisation of the Daraja Project was confirmed by Mr. Joseph Makau and Mr. Godfrey Wafula, National Environment Management Authority (NEMA) representatives in the Nairobi Headquarter (HQ) office, on 1 October 2024.

The objectives of this ESIA Report are to:

- Identify elements of the environment likely to be affected by the Daraja Project and / or likely to cause potentially adverse impacts to the Daraja Project, including the natural and man-made environment;
- Identify and assess any potential losses or damage to flora, fauna and natural habitats; and
- Identify potential negative impacts and propose mitigation measures to minimise potential pollution, environmental disturbance, and social and economic impacts during the subsea cable installation and operation.

A Scoping Report / Terms of Reference (ToR) for the Daraja Project was prepared and submitted to NEMA on 3 February 2025. Following acceptance of the Scoping Report / ToR on 11 March 2025, the ESIA study for the Daraja Project within Kenyan waters has been carried out in line with the requirements of the Environmental Management and Coordination Act

(EMCA), 1999 (amended in 2015) (hereafter referred to as 'EMCA 1999 [amended 2015]') and EIA Regulation 2003 (amended 2022), among other relevant laws.

Further information on relevant laws for the Daraja Project can be found in **Chapter 5** of this ESIA Report.

## PUBLIC CONSULTATION

**Chapter 6** of this ESIA Report describes the stakeholder engagements conducted for the ESIA study. Stakeholder engagements (including public consultation) were carried out on 1-4 October 2024 and 17-22 February 2025, in accordance with EIA Regulation 2003 (amended 2022). The third public consultation will be carried out during disclosure of this ESIA Report.

The stakeholders invited were from the following groups:

- National Government authorities;
- Mombasa County Government authorities;
- Sub-County Government Authorities including village elders and heads;
- Non-Governmental Organisations (NGOs), Community Based Organisations (CBOs) and Faith Based Organisations (FBOs);
- Members of the Community including Nyali Beach Management Unit (BMU) members, traders and business operators and private business owners.

The objectives of the stakeholder engagement and public consultation included providing the stakeholders with information to better understand the Daraja Project and to obtain feedback from them that will inform the development of the ESIA study. During the scoping workshop, many questions were raised and points made, but the stakeholders were generally positive about the Daraja Project. The engagement materials and meeting minutes from stakeholder engagement are provided in **Appendix H**.

## BASELINE INFORMATION

**Chapter 7** of this ESIA Report describes the specialist studies undertaken for the Daraja Project, including a cable route survey (CRS) to review the geophysical and geotechnical characteristics of the proposed subsea cable corridor (completed by EGS in 2025); and a marine ecological impact assessment, completed by the Wildlife Research and Training Institute (WRTI) in May 2025.

The specialist studies, along with information collected via desktop literature searches and stakeholder engagements have been used to review the baseline information for the Daraja Project Area of Influence (AOI), described in **Chapter 8** of this ESIA Report.

The ESIA Report considered the baseline conditions with respect to receptors that may be affected by the Daraja Project. The ESIA Report boundaries have been defined on a receptor basis to determine the wider physical, biological and socio-economic value that may be associated with the Daraja Project's activities.

## IMPACT IDENTIFICATION AND ASSESSMENT

**Chapter 9** of this ESIA Report describes the methodology used to assess the potential impacts identified in the ESIA Report. The assessment methodology takes into account the requirements of the EMCA 1999 (amended 2015), as well as relevant best international

practices, including the United Kingdom (UK) Institute of Environmental Management and Assessment (IEMA) and the UK Chartered Institute of Ecology and Environmental Management (CIEEM).

The Impact Assessment (**Chapter 10**) identifies and evaluates the potential positive and negative physical, biological and socio-economic impacts across the Daraja Project's life cycle (i.e. during pre-installation, installation, construction, and the operational phase). The magnitude of these potential impacts have been evaluated by considering their duration, reversibility and scale. The significance of these impacts have been determined in a matrix that considered the magnitude and the receptor sensitivity.

Most of the Daraja Project's negative impacts are likely to occur during the installation phase, such as (but not limited to) the disturbance to marine life, vessel traffic, air pollution and resuspended sediments. No negative impacts are anticipated during the operation phase, except in the unlikely event of a cable repair being required. The Daraja Project will have positive socio-economic impacts during its operation phase, such as better internet connectivity, leading to more employment opportunities.

## ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The assessment of impacts for the Daraja Project considers the implementation of inherent mitigation (i.e. inbuilt control measures) designed to avoid or reduce potential impacts on sensitive receptors. Additional mitigation measures have been proposed to reduce potential impacts as far as reasonably practicable. In particular those that would affect receptors with higher sensitivity (e.g. sensitive species or local communities), and where a targeted mitigation measure can readily be applied to reduce the likelihood or magnitude of the potentially adverse impact.

The proposed mitigation measures have been identified for the installation phase (including pre-installation) that will require implementation as part of the Daraja Project. Such mitigation is also relevant to the operational phase relating to any subsea cable repair activities that may take place. The mitigation measures are summarised in an Environmental and Social Management Plan (ESMP) described in **Chapter 11** of this ESIA Report. The ESMP will support successful implementation of the Daraja Project while respecting and conserving the social and environmental aspects of Kenya.

## CONCLUSIONS AND RECOMMENDATIONS

As summarised in **Chapter 12** of this ESIA Report, generally, subsea cable installation activities result in temporary and localised effects. Once installed, the footprint of the subsea cable is very small (in comparison to other seabed infrastructure such as pipelines or power cables) and the operation of subsea cables does not have any significant ongoing environmental impact.

During this ESIA study, inbuilt controls and additional mitigation and management measures have been identified as part of the Daraja Project to manage the anticipated impacts. Measures will be implemented so that the Daraja Project is compliant with both national regulations and relevant international conventions and good practices.

All mitigation measures listed in the ESMP will be implemented during the Daraja Project (throughout installation and operation where applicable) to maintain ongoing compliance and

to reduce potential negative impacts to a level that is deemed acceptable for the Daraja Project to proceed.

The assessment has concluded that with the inbuilt controls and specified mitigation measures in place, the planned activities are predicted to only have negative residual impacts of **Minor** Significance post mitigation, with the remainder being assessed as **Not Significant**. For unplanned events the impacts have been reduced to a level that is **As Low As Reasonably Practicable (ALARP)**.

# 1. ABOUT THIS STUDY AND REPORT

This document is the output of the Environmental and Social Impact Assessment (ESIA) Study for the proposed Daraja subsea fibre optic telecommunication cable in Kenya (also referred to as the 'subsea cable' or the 'Daraja Project'). This study is being submitted to the National Environment Management Authority (NEMA) as part of the application process for an environmental Licence (EL) for the Daraja Project. This ESIA Report includes the Kenyan marine element of the Daraja Project only. Environmental assessments and other applicable permitting procedures for the subsea cable installation and landings in other countries in the Daraja Project are being applied for through the relevant national government entities.

Safaricom Plc is the Project Proponent for the Daraja Project. Safaricom will be working with Alcatel Submarine Networks (ASN), who has been awarded the contract to design, build and install the Daraja subsea cable. Subsequently, ASN has appointed Environmental Resources Management (ERM) as the independent environmental and social (E&S) expert to undertake an ESIA study for the Daraja Project in Kenya, only.

## 1.1 OBJECTIVES OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

The objectives of this ESIA Report are to:

- Identify elements of the environment likely to be affected by the Daraja Project and / or likely to cause potentially adverse impacts to the Daraja Project, including the natural and man-made environment;
- Identify and assess any potential losses or damage to flora, fauna and natural habitats; and
- Identify potential positive and negative impacts and propose mitigation measures to minimise potential pollution, environmental disturbance, and social and economic impacts during the subsea cable installation and operation.

## 1.2 SCOPE OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

The Kenya Government policy on all new projects, programmes or activities requires that an ESIA study be carried out at the planning stages of a proposed project. This is to take into consideration the potential significant impacts on the environment during the design, construction, installation, operation and decommissioning of a proposed project.

The ESIA study for the Daraja Project has been carried out in line with the requirements of the Environmental Management and Co-ordination (EMCA) Act No. 8 of 1999 (amended in 2015) (hereafter referred to as 'EMCA 1999 [amended 2015]'), and Environmental (Impact Assessment) and Audit regulations, 2003 (hereafter referred to as 'EIA Regulation 2003 [amended 2022]'), among other relevant laws.

The tasks undertaken in preparation of this ESIA Report include:

- Collecting baseline information of the proposed Daraja Project area;
- Describing the proposed Daraja Project;
- Identifying and describing the legislative and regulatory framework applicable to the Daraja Project;

- Identifying and assessing potential environmental and social impacts that may arise from the Daraja Project construction, installation, and operations;
- Identifying occupational health and safety (H&S) concerns during the installation of the subsea cable;
- Public participation;
- Proposing feasible mitigation measures;
- Developing an Environmental and Social Management Plan (ESMP); and
- Preparing and submitting an ESIA Report to NEMA.

The current application for an EL for the Daraja Project includes activities and infrastructure associated with the marine portion of the subsea cable, including the nearshore and beach installation, and the construction of a beach manhole (BMH MBA).

### 1.2.1 STRUCTURE OF THE REPORT

**Table 1-1** presents the ESIA Report structure, as outlined in section 18 of the EIA Regulation 2003 (amended 2022), and indicates where this information can be found in this report.

TABLE 1-1 CONTENTS OF THIS ENVIRONMENT IMPACT ASSESSMENT REPORT AS OUTLINED IN SECTION 18 OF THE EIA REGULATION 2003 (AMENDED 2022)

| Section 18 (1) | Contents Required by the EIA Regulation 2003 (amended 2022) | Chapter / Section |
|---|---|---|
| (a) | The proposed location of the project | **Chapters 2 and 3** |
| (b) | A concise description of the national environmental legislative and regulatory framework, baseline information | **Chapter 5** |
| (c) | Any other relevant information related to the project; the objectives of the project | **Chapter 2** |
| (d) | The technology, procedures and processes to be used, in the implementation of the project | **Sections 3.2 and 3.3** |
| (e) | The materials to be used in the construction and implementation of the project | **Sections 3.2 and 3.3** |
| (f) | The products, by-products and waste generated project | **Section 3.6** |
| (g) | A description of the potentially affected environment | **Chapter 8** |
| (h) | The environmental effects of the project, including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated | **Chapter 10** |
| (i) | Alternative technologies and processes available and reasons for preferring the chosen technology and processes | **Chapter 4** |
| (j) | Analysis of alternatives, including project site, design and technologies and reasons for preferring the proposed site, design and technologies | **Chapter 4** |
| (k) | An environmental and social management plan proposing the measures for eliminating, minimising or mitigating adverse impacts on the environment; including the cost, time frame and responsibility to implement measures | **Chapter 11** |
| (l) | Provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of | **Chapter 11** |

| Section 18 (1) | Contents Required by the EIA Regulation 2003 (amended 2022) | Chapter / Section |
|---|---|---|
| | carrying out activities or major industrial and other development projects | |
| (m) | The measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies | **Chapter 11** |
| (n) | An identification of gaps in knowledge and uncertainties which were encountered in compiling the information | **Section 1.4** |
| (o) | An economic and social analysis of the project | **Chapters 8 and 10** |
| (p) | An indication of whether the environment of any other state is likely to be affected and the available alternatives and mitigating measures | N/A |
| (q) | Such other matters as the Authority may require | N/A |

## 1.3 APPROACH

### 1.3.1 SCREENING

The Daraja Project was screened to determine the need to undertake an ESIA based on:

- The characteristics of the proposed Daraja Project activities;
- The characteristics of the Daraja Project area (and area of influence [AOI]); and
- The Second Schedule (as amended) of the Government of Kenya's EMCA 1999 (amended 2015), which lists three (3) categories of projects — telecommunications infrastructure is listed as a Medium Risk Project requiring a submission to NEMA (see **Section 5.1** for more detail).

Based on the above-listed criteria, it was concluded that an ESIA study would be required. The categorisation of the Daraja Project as a High-Risk project was confirmed by Mr. Joseph Makau and Mr. Godfrey Wafula, NEMA representatives in the Nairobi Headquarters (HQ) office, on 1 October 2024. Due to the nature of the Daraja Project, it is required that a full ESIA study be undertaken. A Scoping Report / Terms of Reference (ToR) was therefore prepared and submitted to NEMA on 3 February 2025.

#### 1.3.1.1 TERMS OF REFERENCE REPORT

A Scoping Report / ToR for the proposed Daraja Project was prepared in accordance with the following legal framework:

- General Guidelines for Conducting ESIAs in Kenya, in accordance with EIA Regulations 2003 (amended 2022);
- EIA Regulations 2003 (amended 2022); and
- Environment Impact Assessment Guidelines and Administrative procedures, 2002.

Under these regulations, an ESIA study is required to be prepared and submitted to the NEMA prior to the commencement of a proposed project. The Scoping Report / ToR for the Daraja Project included, but is not limited to, the following:

- A comprehensive description of the Daraja Project, including location, materials and technologies used and the process of installing the subsea cable;

- Identification of potential environmental and social impacts of the Daraja Project and provision of mitigation measures;
- Identification of relevant regulations relating to the Daraja Project, both international and national; and
- Provision of an analysis of the Daraja Project alternatives.

The Scoping Report / ToR was submitted to NEMA on 3 February 2025. NEMA requested additional information, and this was duly responded to on 7 March 2025. NEMA approved the Scoping Report / ToR on 11 March 2025 with conditions and instructed the ESIA study to proceed.

### 1.3.2 DESK-BASED REVIEW AND BASELINE COLLECTION OF DATA

A literature review was undertaken to gather background information of the Daraja Project and the Daraja Project area. This step also included a review of the Kenyan legislation and policies, as well as environmental impact reports from other studies, to review similar topics and the geographic location to the Daraja Project. These latter steps were undertaken to determine the baseline conditions and establish the legal, institutional and biological / physical / socio-economic environmental setting of the Daraja Project.

This step also included a review of the findings from the initial site visit undertaken during the scoping phase in October 2024. The environmental consultants who undertook the initial site visit in October 2024, also conducted a second site visit in February 2025.

### 1.3.3 SITE VISITS

#### 1.3.3.1 INITIAL SITE VISIT

An initial site visit was undertaken on 1-4 October 2024 to gather detailed environmental and social baseline data, and to undertake preliminary stakeholder engagement. Information regarding the proposed Daraja Project was presented to stakeholders via presentation slides. The environmental consultants used this visit to identify formal stakeholders and to introduce the Daraja Project. The team carried out formal in-person stakeholder engagements with the National Government authorities in Nairobi and Mombasa, and Mombasa County and Sub-County Administrative authorities. Informal meetings were also held with some members of the Nyali Beach community, including a member of the Beach Management Unit (BMU), members of the Nyali Beach community organisations and some traders. Details of these engagements are included in **Section 6.7** and in **Appendix H.**

Site walkovers were also undertaken to four (4) potential landing sites in order to scope out those sites that potentially had higher impacts or more constraints and advise on the landing site with the lowest level of likely environmental and social impacts.

Further information about the stakeholders who were engaged during this site visit can be found in **Chapter 6**.

#### 1.3.3.2 SECOND SITE VISIT

Similar to the first site visit, the environmental consultants undertook stakeholder interviews. This site visit occurred between 17-22 February 2025. By this time, further design elements of the subsea cable, the route and the landing site had been confirmed by the Project Proponent.

Information regarding the Daraja Project was shared via the Daraja Project's Background Information Document (BID) (**Appendix H**).

A public consultation meeting was also undertaken during this visit. Further information about the stakeholders who were engaged during this site visit, as well as summaries from these meetings, can be found in **Chapter 6**.

### 1.3.4 SPECIALIST STUDIES

To support the baseline understanding of the Daraja Project, two (2) specialist studies were undertaken:

1. A marine cable route survey (CRS) was undertaken by EGS and completed in February 2025. The CRS was conducted to better understand the bathymetry / submarine topography of the proposed subsea cable route so that areas obstacles / objects and potential areas of interest (e.g. shipwrecks) could be avoided by the Daraja Project. For further information on the CRS, see **Section 7.1**.
2. A marine ecological impact assessment was undertaken by the Wildlife Research and Training Institute (WRTI), and completed in May 2025. This assessment was conducted to review and assess the coastal and marine environment crossed by the subsea cable route through the Mombasa Marine National Park and Reserve (MMNPR). Existing information and expert opinions were solicited regarding the flora, fauna, corals and other components of the marine and coastal ecosystem for a comprehensive understanding of the area and to assess the potential impacts of the Daraja Project. WRTI conducted a site visit on 21 February 2025 to assess the existing environment at the landing site on Nyali Beach. See **Section 7.2** for further information on the findings of the assessment.

The findings of both these studies have been used to support the assessment of potential impacts of the Daraja Project, as well as identifying possible mitigation measures.

### 1.3.5 STAKEHOLDER ENGAGEMENT

In accordance with Regulation 17 of the EIA Regulation 2003 (amended 2022), stakeholder engagement is a mandatory process. The consultants adhered to NEMA's guidelines and regulations.

Details on the stakeholder engagement process can be found in **Chapter 6** and in **Appendix H**.

## 1.4 ASSUMPTIONS, LIMITATIONS AND GAPS IN KNOWLEDGE

In undertaking this investigation and compiling the ESIA study, the following assumptions and limitations have been identified:

- The information provided by the Project Proponent, subsea cable system designer and installer is accurate, up-to-date and complete;
- The information provided by subject matter experts (SMEs) / specialists is accurate, sufficient and unbiased; and
- Any limitations and gaps in knowledge that have been encountered by the specialists are identified in the specialist reports.

# 2. DARAJA PROJECT

## 2.1 HIGH-LEVEL OVERVIEW OF THE PROJECT

**Title of the Project**: The Daraja Fibre Optic Cable Project

**Project Proponent**: Safaricom Plc (Licensed Landing Provider) (**Appendix B**)

- PIN number: P051129820X
- Address: P.O BOX 66827 – 00800 Safaricom House, Waiyaki Way, Nairobi, Kenya
- Contact person: Ms. Valentine Cheruiyot (Manager-Climate Change and Environment)

**Location of the Project**: Mombasa, Kenya

The Daraja Project is a planned subsea fibre optic telecommunication cable with a total estimated length of 4,108 kilometre (km), interconnecting landings at Salalah in Oman and Mombasa in Kenya, with a subsea cable branch extending to the Kenyan and Tanzanian EEZ boundary (**Figure 2-1**).

**Nature of the Project:** laying of a submarine telecommunications cable and landing of the subsea cable on the Kenyan shoreline.

The Daraja Project will require installation and operation of the subsea cable through the Exclusive Economic Zone (EEZ)[1] and Territorial Sea (TS)[2] of Kenya. The Daraja Project will also involve a separate shore-end subsea cable installation in the Mombasa nearshore and beach environment, and construction of a new Beach Manhole (BMH MBA) on the beach to facilitate the connection of the subsea components to future terrestrial cable components.

The total length of the Kenyan segment of the Daraja Project is approximately 511 km, from the Kenyan EEZ to the proposed BMH MBA at Nyali Beach, Mombasa. The subsea cable will split into two (2) separate branches from a Branching Unit (BU) within the Kenyan EEZ, with the northern branch landing on Nyali Beach, Mombasa, Kenya where it will connect to the proposed BMH MBA. The southern branch traverses from the Kenyan EEZ southwards towards Tanzanian waters. It should be noted that the southern branch of the subsea cable will be installed in two (2) phases. The first phase will include installing 14 km of the southern branch subsea cable from the BU within the Kenyan EEZ, and the second phase will include the installation of the remainder of the southern branch subsea cable towards Tanzanian waters (an additional 45 km within the Kenyan EEZ).

The terrestrial portion of the Daraja Project will be installed from the BMH MBA to a Cable Landing Station (CLS), where it will be connected to various configurations of terrestrial fibre-optic cable systems. Safaricom Plc will complete the terrestrial portion of the Daraja Project using existing infrastructure plus some additional ducting along road verges, this work is outside the scope of this ESIA study of the beach and marine elements of the Daraja Project.

The system is expected to go live in 2026 and will deliver much-needed internet capacity and enhance reliability between Oman and Kenya; and underpin the further growth of 4G, 5G and fixed broadband access for hundreds of thousands of people.

[1] As defined by the United Nations Convention on the Law of the Sea (UNCLOS) (1982), the EEZ is an area beyond and adjacent to a coastal state's territorial sea, extending to a limit of 200 nautical miles (nm) (approximately 370 km) from its baseline.
[2] As defined by the UNLOS (1982), territorial waters (or territorial sea) is the 12 nm zone (approximately 22 km) from the baseline or low water line along the coast.

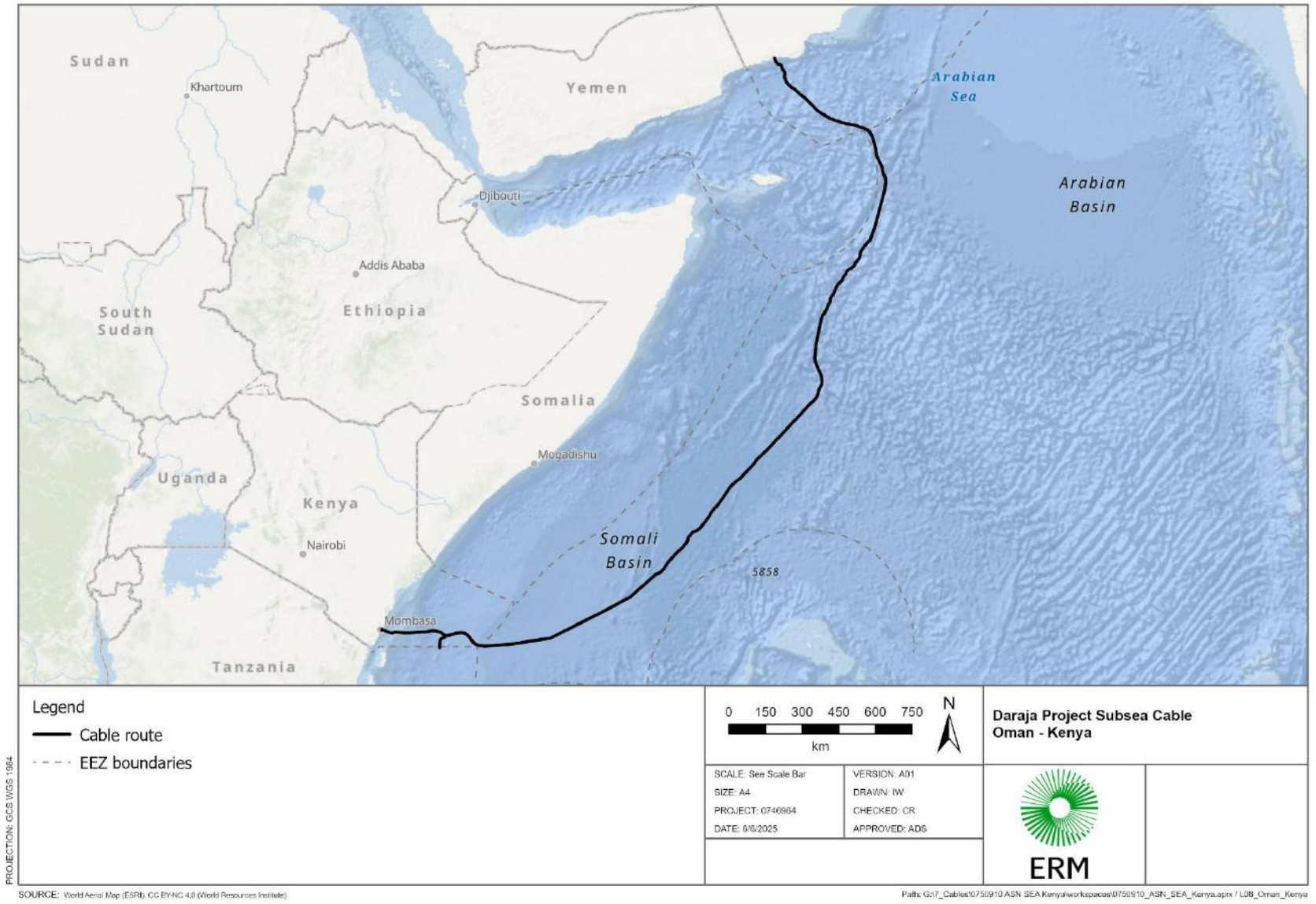
The activities associated with the installation of the fibre-optic cable system in Kenya are listed in the EMCA 1999 (amended 2015) as potentially having a negative impact on the environment and as requiring an EL from the NEMA.

**AOI:** The AOI for the Daraja Project is defined as the geographic area likely to be affected directly by the Daraja Project facilities and activities; indirectly as a secondary effect of a direct effect; and as a result of an unplanned event such as an accident.

Under this definition, the direct AOI is the footprint of the main trunk of the subsea cable route within the Kenya EEZ; the northern branch (entering and traversing the Kenyan TS towards the landing site on Nyali Beach) and the southern branch (traversing towards Tanzanian waters); the BMH MBA, and associated temporary construction areas.

Further information on the Daraja Project can be found in **Chapter 3**.

## FIGURE 2-1 THE DARAJA PROJECT OVERVIEW



## 2.2 HISTORY OF SUBMARINE CABLES

Historically, international telecommunication was carried by submarine telegraph cables, radio and other analogue channels. Submarine telegraph cable was first used around the 1850s and fibre-optic submarine cables in the 1980s, revolutionising the way international communication is conducted. Fibre-optic submarine cables now carry up to 95% of international voice and data traffic (ICPC, 2016). In Kenya, there are currently eight (8) subsea cable landings in Kenya including Africa1, Djibouti Africa Regional Express 1 (DARE 1), the Pakistan and East Africa Connecting Europe cable (PEACE), The East African Marine System (TEAMS), the Eastern African Submarine Cable System (EASSy), Lion2, 2Africa and SEACOM (Submarine Cable Map, 2024). These cables have provided the country and other East African countries with improved internet bandwidth.

## 2.3 PROJECT OBJECTIVES AND JUSTIFICATION

The level of broadband traffic has been growing in the past three (3) decades. Consumer appetites and demand for new applications and technological advances such as Artificial Intelligence (AI), cloud computing, on-demand video and social media has driven the growth. The demand for new connectivity is driven by a business environment in which ultra-broadband access is essential for sustainable growth and development.

Fibre optic cables have evolved into the world's information infrastructure backbone. The rising demand for bandwidth by users of the internet and the ongoing international trend of privatisation of national telecommunications companies have considerably outstripped the resources available through satellite voice and data transmission over the last two (2) decades. In addition, subsea cables' carrying capacity is much higher (measured in terabits per second), while satellites typically offer only 1,000 megabits (0.001 terabit) per second and display higher latency (Douglas, 2015).

Subsea cable networks have a relatively small footprint in the marine environment. The potential impacts from subsea cable activities on marine biodiversity are generally minimal, with varying spatial intensities throughout the subsea cable lifecycle. Further information on subsea cables and marine biodiversity from the United Nations Environment Program (UNEP) can be found in **Appendix B**.

Without subsea cable networks telecommunication carriers may need to rely on radio or satellite systems. This would have several drawbacks, including reduced speed and reliability compared to subsea cable systems which provide high reliability and a large carrying capacity, allowing greater data access at a lower cost. Subsea cables provide a more robust and resilient solution compared to satellite systems.

The purpose of the Daraja Project is to significantly increase the capacity, quality and availability of internet connectivity within Kenya and to the rest of the world. Kenya is among the fastest-growing economies in Sub-Saharan Africa, with an average economic growth of 5.7% per year as of 2019. The economic expansion experienced in the current decade has been boosted by a stable macro-environment, positive investor confidence and a resilient service sector. The digital economy has propelled economic growth, with new and existing businesses operating on the digital space (World Bank, 2020).

The Information and Communication Technology (ICT) sector in Kenya has grown an average of 10.8% annually since 2016, becoming a significant source of economic development and job

creation. However, for the country to keep up with the emerging digital innovations and demand for digital connectivity such as the Digital Learning Programme and business environment, digital transformation is required.

The Daraja Project's objective is to directly connect Kenya to Oman, benefitting both businesses and consumers by enhancing capacity and reliability for internet services, video conferencing, advanced multi-media and fixed broadband access. The Daraja Project will also underpin future mobile and fixed broadband access. This will help African leaders to implement their 2030 visions and meet many of the Sustainable Development Goal (SDG) challenges related to or depending on internet connectivity. In Kenya specifically, digital enhancements will support the Government of Kenya in delivering some of its objectives under Kenya's Vision 2030, including telecommunications improvement (GoK, 2007). The location of the Daraja Project within Mombasa is also critical, as the landing site on Nyali Beach must be less than 5 km from the closest existing CLS. Therefore, if the subsea cable is damaged, internet connectivity can easily be re-routed via another cable.

## 2.4 PARTIES INVOLVED IN THE DARAJA PROJECT

The Daraja Project is composed of a Project team including the Project Proponent (Safaricom Plc) and Environmental Assessment Experts. The Project team for the ESIA study includes the following entities:

- Edge Network Services Limited as the Daraja Project's investor;
- Safaricom Plc as the Project Proponent and applicant for the EL from NEMA;
- ASN has been contracted to design, manufacture, install and obtain permits for the cable system on behalf of the Project Proponent;
- ERM has been contracted to undertake the ESIA study for the Kenyan segment of the Daraja Project;
- WRTI: Through Kenya Wildlife Service (KWS), ERM subcontracted the WRTI for a marine ecological impact assessment;
- EGS: As part of the cable route planning, ASN commissioned a specialist marine survey company, EGS, to perform a CRS (completed in February 2025).

# 3. PROJECT DESCRIPTION

## 3.1 LOCATION

The Daraja Project will be installed within the Kenyan EEZ (**Figure 3-1**), with a BU within the EEZ separating the subsea cable into a northern branch and a southern branch. The southern branch will traverse from the Kenyan EEZ into Tanzanian waters, and installation will be conducted in two (2) phases. The northern branch will be traverse into the Kenyan TS (**Figure 3-2**), with a landing on Nyali Beach within Nyali Sub-county, Mombasa County. The proposed subsea cable will be buried where possible and the northern branch of the subsea cable will be buried across Nyali Beach from where the subsea cable meets the shore to the location at which a new BMH MBA will be installed, as shown in **Figure 3-3**. The route is described in more detail in **Section 3.1.2**. In Kenya, the subsea cable includes:

- Approximately 484 km of the subsea cable running through the Kenyan EEZ, entering from the south-west; of which approximately 59 km of the subsea cable run southward to Tanzanian waters, from the BU in the Kenyan EEZ;
- Approximately 27 km of the subsea cable running through the TS (north of the southern subsea cable branch), landing in Mombasa, Kenya; and
- At the landing site the subsea cable will cross the beach and be connected to a new BMH MBA, that the Daraja Project proposes to install.

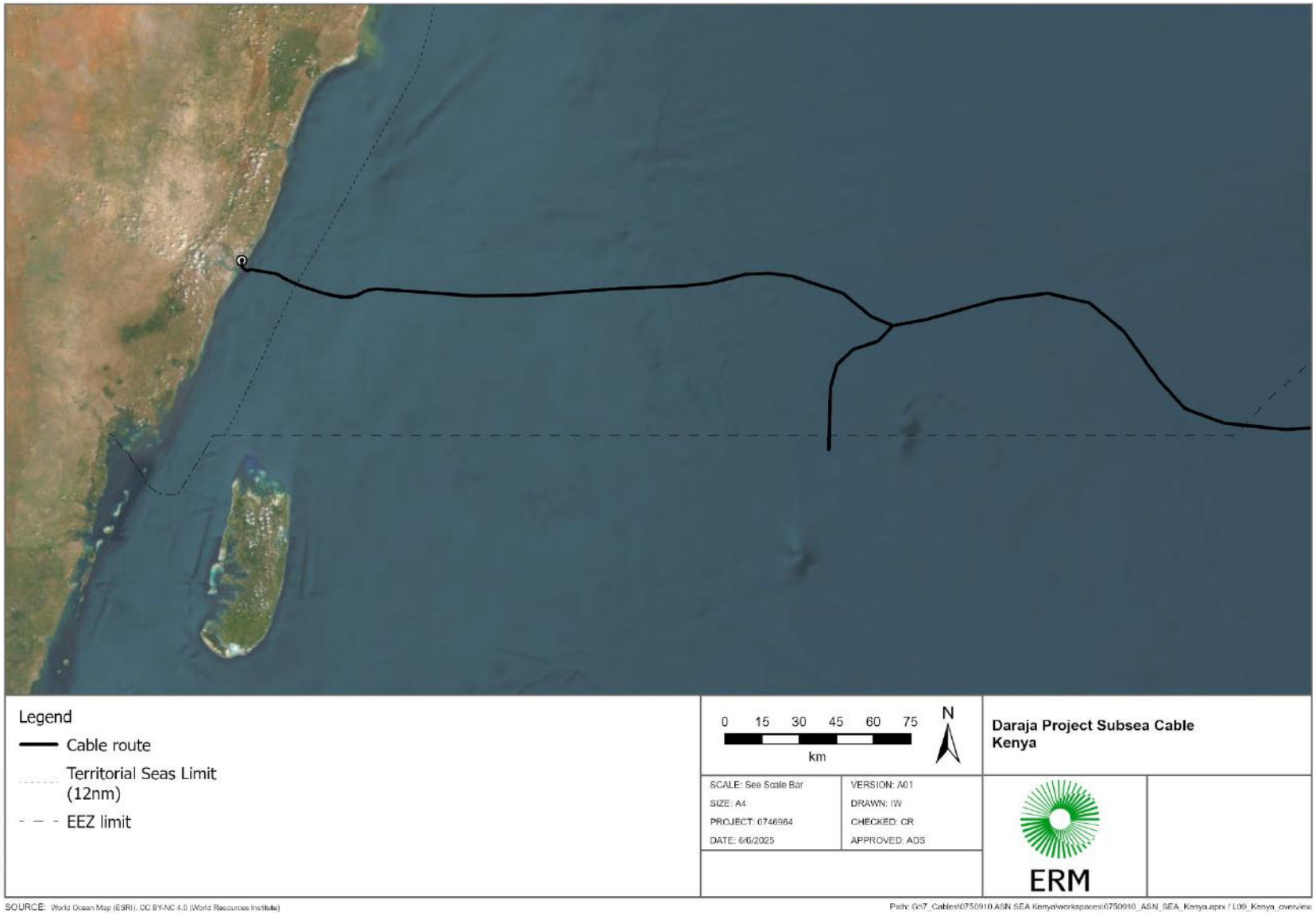
**Table 3-1** below provides a summary of the coordinates for the Daraja Project at Mombasa, Kenya.

TABLE 3-1 KENYA SUBSEA CABLE LOCATIONS

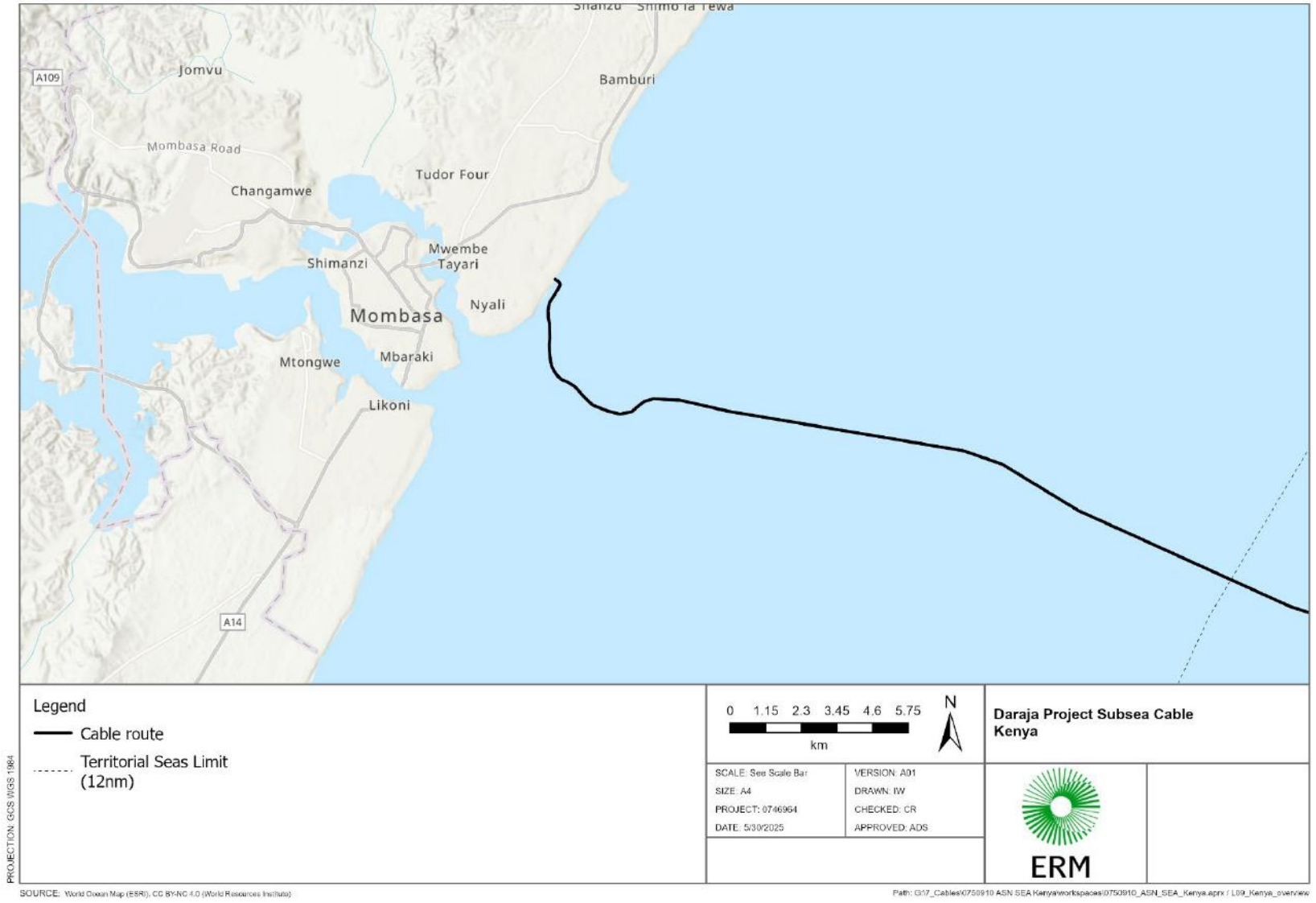
| Location Description | Latitude | Longitude |
|---|---|---|
| Phase 1 Enter Kenyan EEZ | 004° 38.284' S | 043° 23.791' E |
| Phase 1 BU in Kenyan EEZ | 004° 17.177’ S | 042° 04.295' E |
| Phase 1 Southern subsea cable branch stub | 004° 21.582' S | 041° 58.886' E |
| Phase 2 Southern subsea cable branch extension to Kenyan EEZ / Tanzanian EEZ boundary | 004° 44.170’ S | 041° 50.357' E |
| Phase 1 Northern subsea cable branch enter Kenyan TS | 004° 08.065' S | 039° 54.376' E |
| Phase 1 Proposed BMH MBA location | 004° 02.819' S | 039° 42.603' E |

Note: WGS84 Datum in degrees decimal minutes.

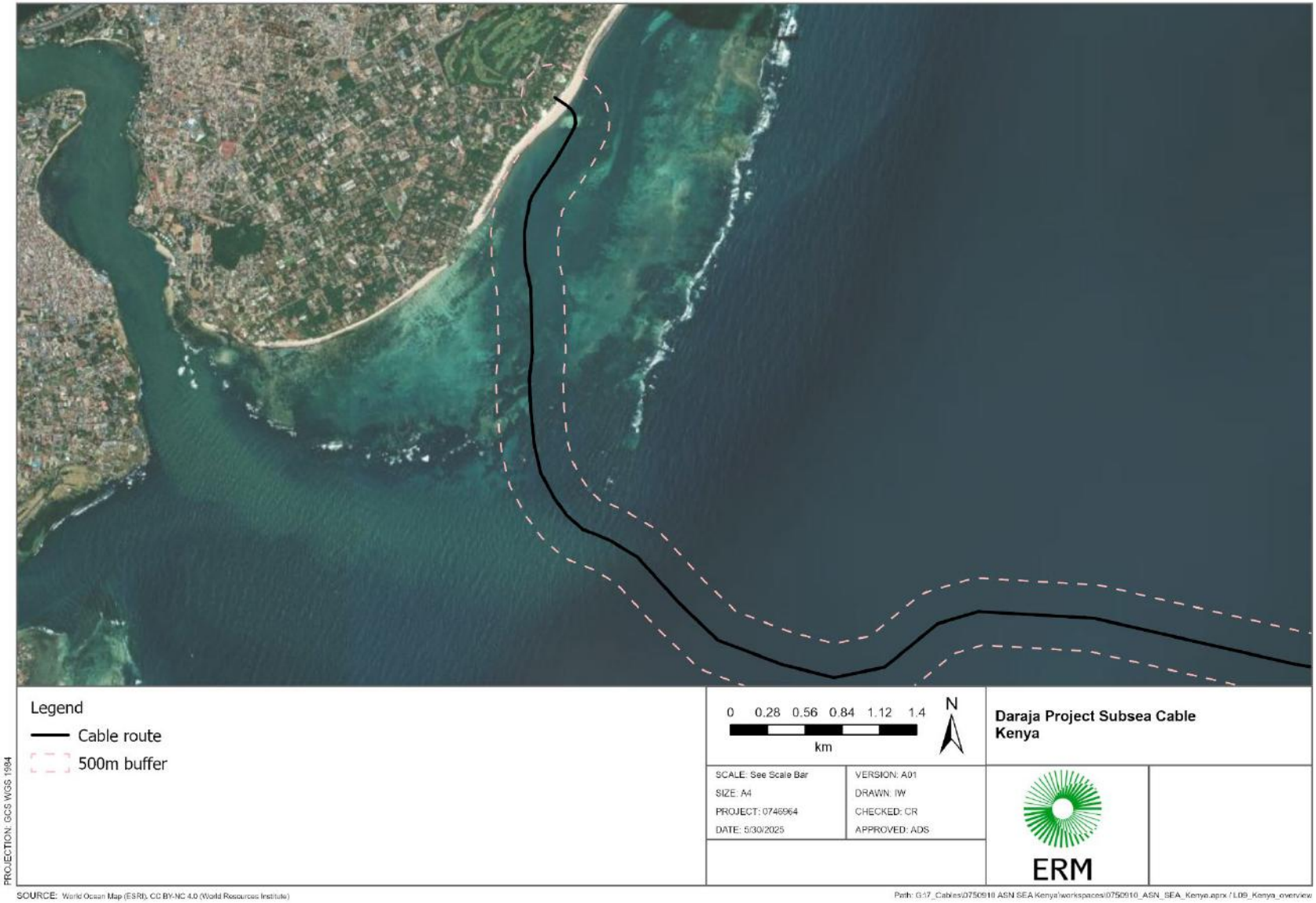
## FIGURE 3-1 SUBSEA CABLE OVERVIEW: KENYAN EEZ



## FIGURE 3-2 SUBSEA CABLE OVERVIEW: KENYA TS



## FIGURE 3-3 MOMBASA LANDING SITE OF THE SUBSEA CABLE



### 3.1.1 OFFSHORE

The subsea cable route is developed and refined through an iterative process of reviewing desktop and CRS information. The CRS consists of geophysical and geotechnical surveys along the proposed subsea cable route in Kenyan waters. The surveys (completed in February 2025) provide detailed information to inform the selection of the final preferred subsea cable route. The preferred route is developed to avoid sensitive marine environmental and physical features (i.e. seamounts, rocky outcropping) as far as is reasonably practicable.

The Daraja Project is located in an area that also includes shipping and fishing activities and has, therefore, been engineered to minimise interaction with existing seabed infrastructure and areas of greatest anthropogenic activity. The Daraja Project aims to utilise areas with relatively low usage from other maritime industries as far as possible to maximise burial potential and system security. To achieve this, the effect of environmental and anthropogenic factors on the subsea cable routing, engineering, installation, and repair were considered.

### 3.1.2 ONSHORE

The subsea cable will land at a landing site on Nyali Beach, which is a popular destination for international and domestic tourists, with hotels and tourist related activities and enterprises present, and will be connected to the new BMH MBA.

Further alternative landing sites and BMH locations were considered during route planning but subsequently discarded. These discarded alternatives are discussed in **Section 4.2.1**.

#### 3.1.2.1 THE PROPOSED BMH MBA

The proposed BMH MBA is located on a public access road off Nyali Beach. The subsea cable route from the landing site will run along the beach up a gentle slope to the high tide point, continuing to the public road where the proposed BMH MBA is located. The route above the high tide point is comprised of sandy soils. Along the route between the high tide mark and the proposed BMH MBA, the vegetation cover is sparse, mostly consisting of patches of riparian vegetation along the property boundaries on either side of the public access road. The direct footprint of the route between the high tide mark and proposed BMH MBA is bare, except for two (2) coconut trees present near the proposed BMH MBA location, as shown in **Figure 3-4**. There are two (2) temporary structures established along either side of the proposed subsea cable route towards the proposed BMH MBA, (a restaurant / bar named ‘Costa Rica’ and a structure under construction), as shown in **Figure 3-4**. The Costa Rica restaurant will need to be temporarily dismantled to allow for the subsea cable trench and excavator access to the beach. The hedge along the boundary of the structure will also need to be cut back to ground level (note this vegetation is cut back regularly to increase access to the beach).

Previous turtle nesting surveys indicate that nests have been identified across Nyali Beach near the proposed BMH MBA. There is a safe turtle hatchery established by the Early Birds Banda Project approximately 500 metres (m) from the proposed BMH MBA location and beneath the Nyali Serena and Pride Inn hotels, approximately 9 km North of the proposed BMH MBA location.

FIGURE 3-4 IMAGES OF PROPOSED BMH MBA LOCATION ON NYALI BEACH, MOMBASA, KENYA


Source: ASN, 2024

Source: ASN 2025 (recent photo of the site)

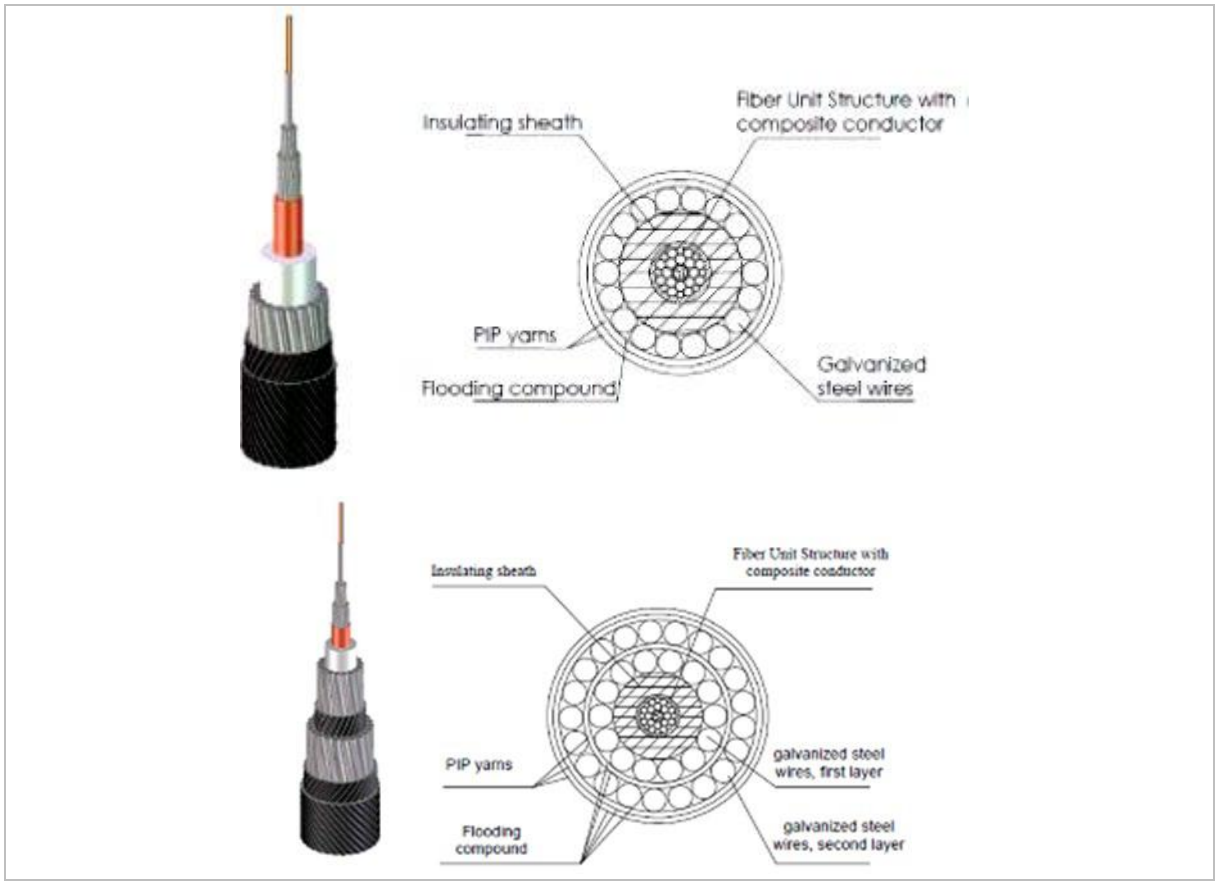
## 3.2 MARINE INFRASTRUCTURE

### 3.2.1 THE SUBSEA FIBRE OPTIC CABLE

The subsea fibre optic cable will be the OALC4 cable, developed and manufactured by ASN. It comprises a core of optical fibres made up of silica, surrounded by copper sheathing, steel wires and plastic. Different levels of protection, comprising steel wires and polypropylene yarns, will be added to the subsea cable on certain sections, depending on the seabed conditions and installation requirements.

The diameter of the subsea cable will vary depending on the level of protection applied, as depicted in **Figure 3-5**, but will have a maximum diameter of 50 millimetres (mm).

FIGURE 3-5 EXAMPLE OF SUBSEA CABLES WITH SINGLE AND DOUBLE LAYERS OF ARMOUR




Source: ASN, 2024

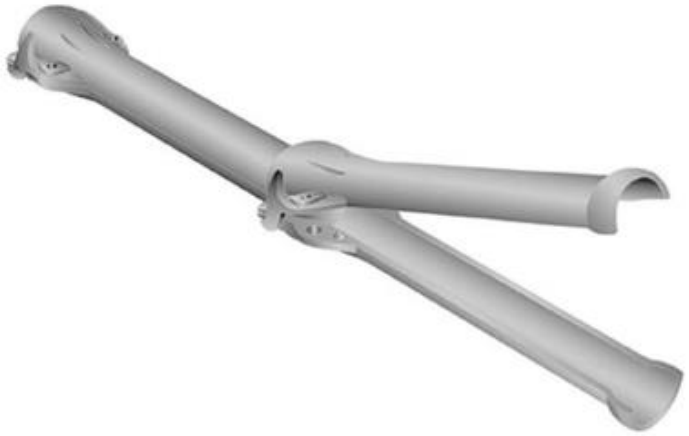
### 3.2.2 ADDITIONAL PROTECTION

Additional protection of the subsea cable will be required in areas where there is a greater risk of damage or abrasion. Approximately 725 m of articulated pipes will be installed over the subsea cable from the proposed BMH MBA / end of seaward duct towards the sea, and within the Mombasa Marine National Reserve (MMNR). The articulated pipes will be coated with a protective electro-coating, protecting them from sulphate-reducing bacteria within the marine environment. The coating does not contain any substances classified as hazardous to health or the environment, nor does it include substances identified as Persistent, Bio-accumulative, and Toxic (PBT), very Persistent and very Bio-accumulative (vPvB), or of equivalent concern. The articulated pipes provide stability and protection from abrasion or external aggression on the subsea cable in the surf zone, in shallow waters, and where environmental conditions limit burial. An example of the articulated pipe typically used is shown in **Figure 3-6**.

To prevent lateral movement of the articulated pipe in high-energy surf zones in the nearshore, articulated pipe can be fixed to the seabed using saddle clamps or subsea cable clamps installed by divers at suitable intervals (approximately 45 clamps are estimated based on substrate and the length of articulated pipe). Clamps will only be considered for articulated pipe on hard ground in high-energy surf zones with a significant risk of subsea cable movements. Typical articulated pipe saddle clamps and cable clamps are shown in **Figure 3-7**.

The decision to incorporate additional protection, the final quantity and location of the articulated pipes, and the maximum number of clamps will be confirmed following installation.

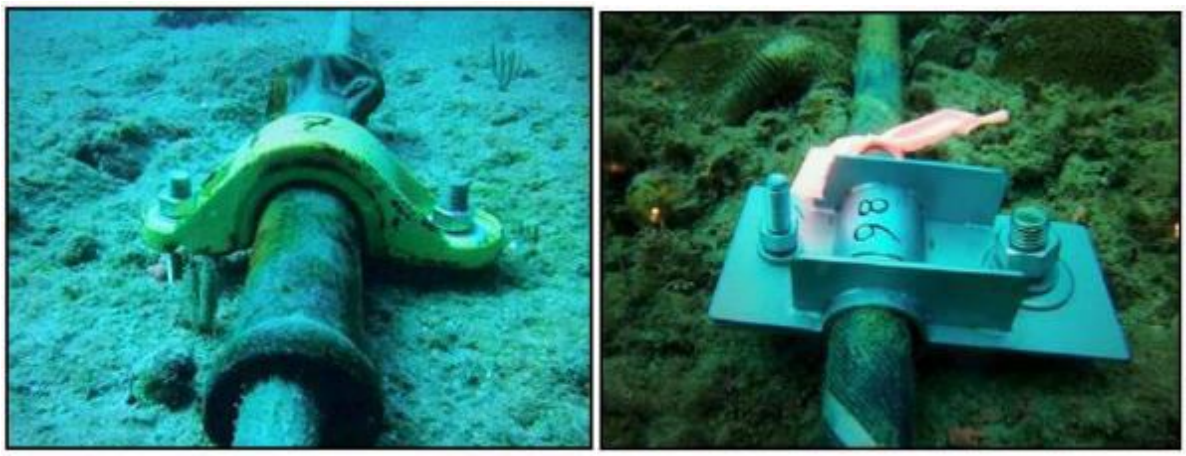
## FIGURE 3-6 ARTICULATED PIPE AND TYPICAL SPECIFICATIONS



| **Specifications (PS055/500/09)** | |
|---|---|
| Segment Length - Overall | 546 mm |
| Effective Installed Length/segment pair | 500 mm |
| Minimum Internal Diameter | 55 mm - for subsea cables up to 47 mm diameter |
| Maximum External Diameter | 130 mm |
| Wall Thickness | 9 mm |
| Material | Ductile Iron to AS1831 / ISO 1083 |
| Tensile Strength / Elongation | 400 MPa / 12% elongation |
| Impact Resistance | ≥7.5 Kilojoules (kJ) |
| Minimum Bend Diameter | 4.0 m |
| Weight per Segment | 8.1 kilograms (kg) |
| Weight per installed metre (air) | 16.4 kg |
| Weight per installed metre (water) | 14.3 kg |
| Fasteners | M12x50 Bolts and M12 Nyloc Nuts<br>Material: Stainless Steel G316/A4<br>Recommended usage: 1 pair per 10 metres of installed pipe |

Source: ASN / Protectorshell.com, 2024

FIGURE 3-7 EXAMPLE OF SUBSEA CABLE CLAMPS AND INSTALLATION



Source: ASN, 2024

Left: Example of an articulated pipe section with saddle clamp, showing typical installation.
Right: Example of a subsea cable and a subsea cable clamp, showing typical installation.

### 3.2.3 REPEATERS

Subsea cables which span large distances require repeaters to amplify the subsea cable signal. Repeaters are optical amplifiers that are installed at points along the length of the subsea cable. They are used to extend the reach of optical communications links by overcoming loss due to attenuation. Repeaters will be installed approximately every 80 km along the length of the subsea cable, so six (6) repeaters are expected to be required within the EEZ. The repeaters are fitted to and form a part of the subsea cable, typically measuring up to approximately 270 mm (diameter) x 980 mm (length) in size. The total length of the repeater section is approximately 3,900 mm to 4,240 mm depending on subsea cable coupling. An example of a repeater is shown in **Figure 3-8**.

FIGURE 3-8 EXAMPLE OF A REPEATER AND FIBRE OPTIC CABLE

Source: ASN, 2024

Note: Repeater and fibre optic cable shown during subsea cable installation from installation vessel.

### 3.2.4 BRANCHING UNIT

A BU allows the subsea cable to be split to serve multiple destinations. For BU MBA, an X-BU **Figure 3-9** will be used within the Kenyan EEZ to connect the subsea cable branch from Oman to the Kenya subsea cable branch, and to the 14 km southern subsea cable branch stub

running from the Kenyan EEZ south towards Tanzanian waters. At a later stage of the Daraja Project (assumed to be 2028/2029), the installation vessel would return to connect this southern subsea cable branch stub (installed in the first phase of the Daraja Project) to a 45 km branch subsea cable running south through the Kenyan EEZ to Tanzanian waters.

FIGURE 3-9 EXAMPLE OF AN X-BRANCHING UNIT

Source: ASN, 2025

The X-BU's design delivers strength consistent with all operations and ensures that a standard vessel can perform lay and recovery operations. The housing and termination are designed to function continuously without maintenance for a minimum system life of 25 years and support the laying, recovery and re-laying of the X-BUs. The housing is qualified for use at depths of up to 8,000 m. However, maximum deployment depth is determined by recovery conditions and cable characteristics. The joint housing can terminate all lightweight and armoured cable designs.

The corrosion protection system used on X-BU housings is an organic electrically insulating barrier coating with additional mechanical reinforcement. This system, selected after extensive trials, prevents seawater from contact with the steel surface of the BU housing, thereby eliminating metal wastage and hydrogen generation through galvanic corrosion and magneto-hydrodynamic effects.

A remote electrode positioned approximately 5 m from the BU on the single cable end (main branch) provides the BU's return current path. The electrode is designed to provide the path of least resistance to the sea.

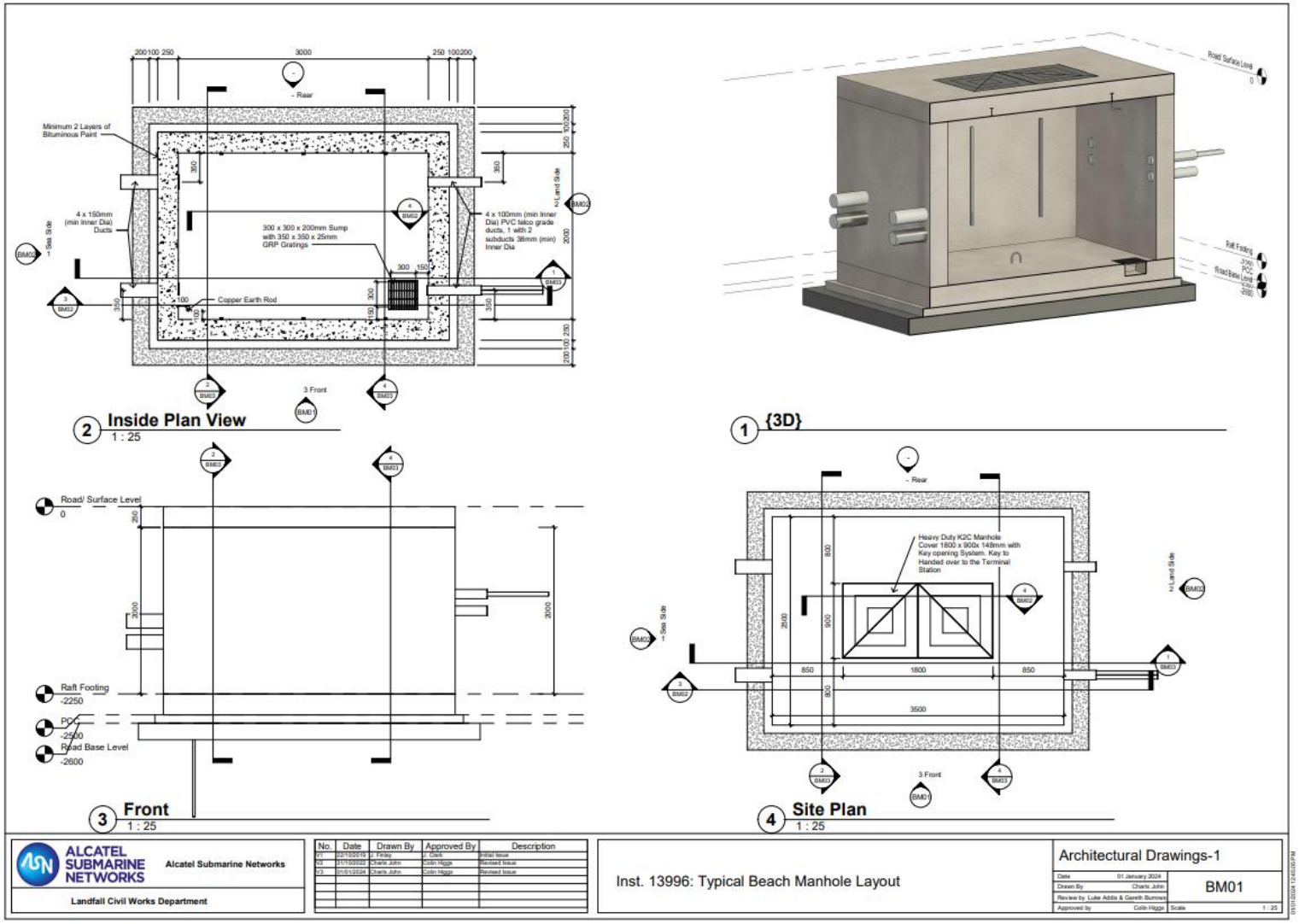
## 3.3 SHORE-END INFRASTRUCTURE

### 3.3.1 BEACH MANHOLE (MOMBASA)

The new BMH MBA is intended to be 2.4 m long, 3.4 m wide and 2.4 m deep as shown in **Figure 3-10**, and will be buried below the ground. The inner chamber will be constructed using reinforced concrete walls, concrete base and concrete cover slab. The sub-surface chamber will be accessed via a 1,000 mm diameter manhole. Once installed, the manhole cover will be the only element of the BMH MBA visible above ground.

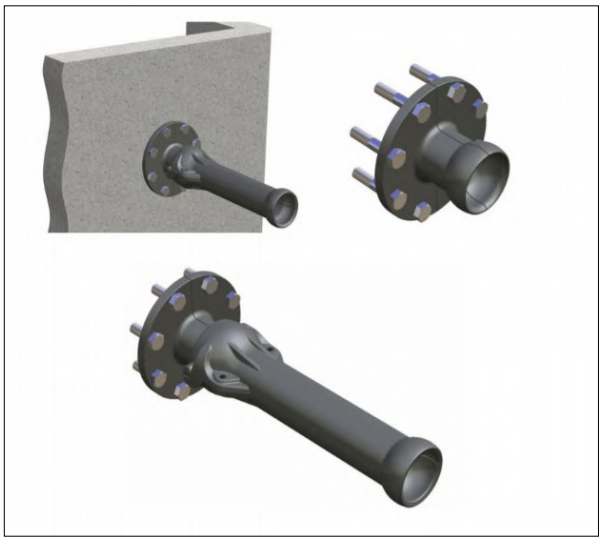
Seaward ducts, equipped with a flange adaptor for connection with the subsea cable (**Figure 3-11**), would extend from the BMH towards the landing point at Nyali Beach, where a concrete headwall will be buried (refer to **Section 3.3.1.1**). The ducts may be encased in concrete and buried up to 2 m deep (unless there is hard ground prior to the 2 m depth). The ducts provide protection and stability to the subsea cable from the seaward headwall of the BMH MBA. The length of seaward ducts on Nyali Beach are planned to be approximately 35 m long (**Figure 3-12**).

## FIGURE 3-10 A TYPICAL BMH DESIGN AND SIZE




Source: ASN, 2025

FIGURE 3-11 BMH SEAWARD FLANGE ADAPTOR



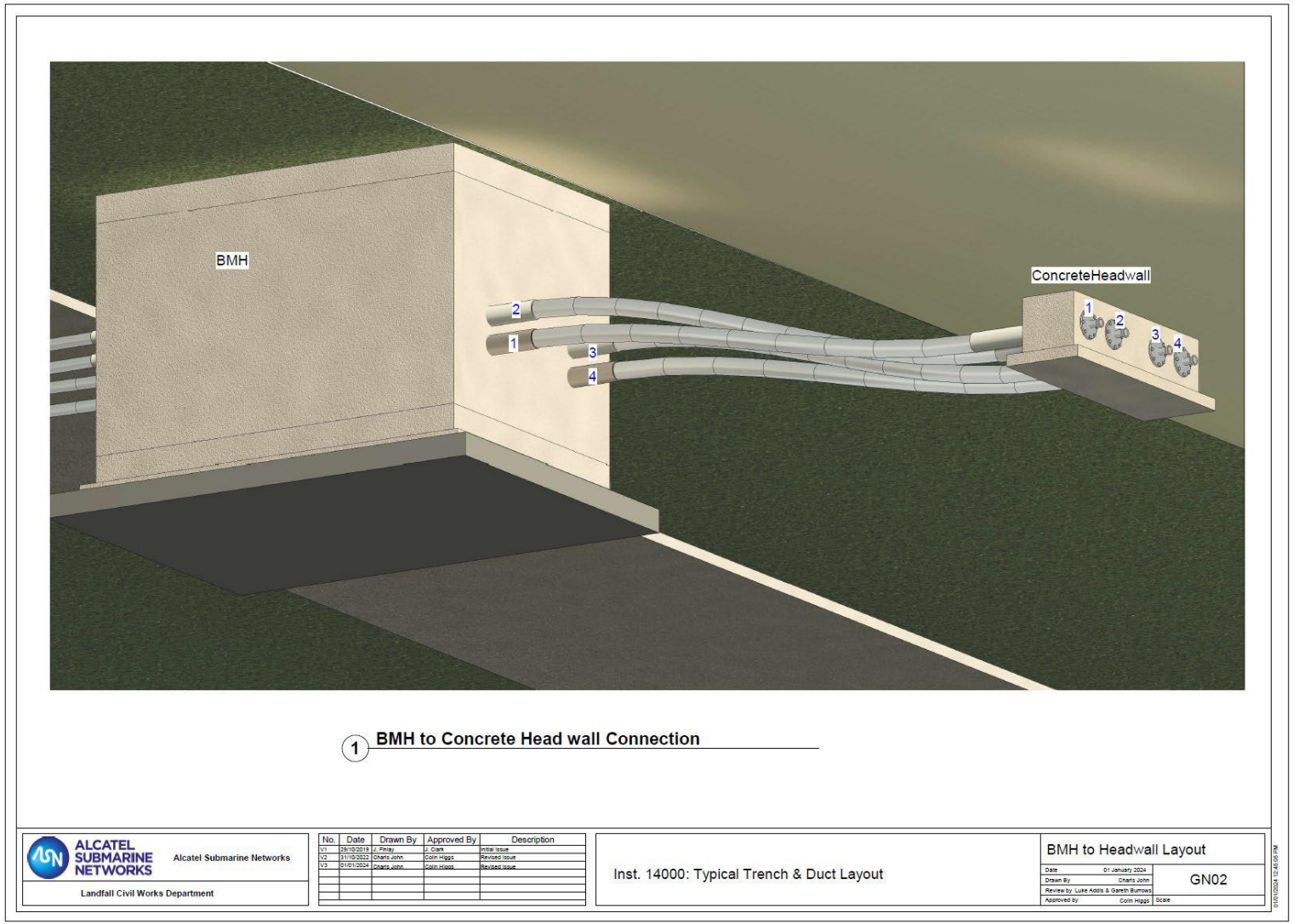
Source: ASN, 2024

#### 3.3.1.1 CONCRETE HEADWALL

The concrete headwall (3 m x 0.5 m x 0.5 m) (**Figure 3-13**) will be positioned at the seaward end of the seaward ducts from the proposed BMH MBA. This block stabilises the ducts at the back of the beach, provides a robust point to which the shore-end subcontractor can excavate to install the subsea cable, and provides a solid fixing point for an articulated pipe flange.

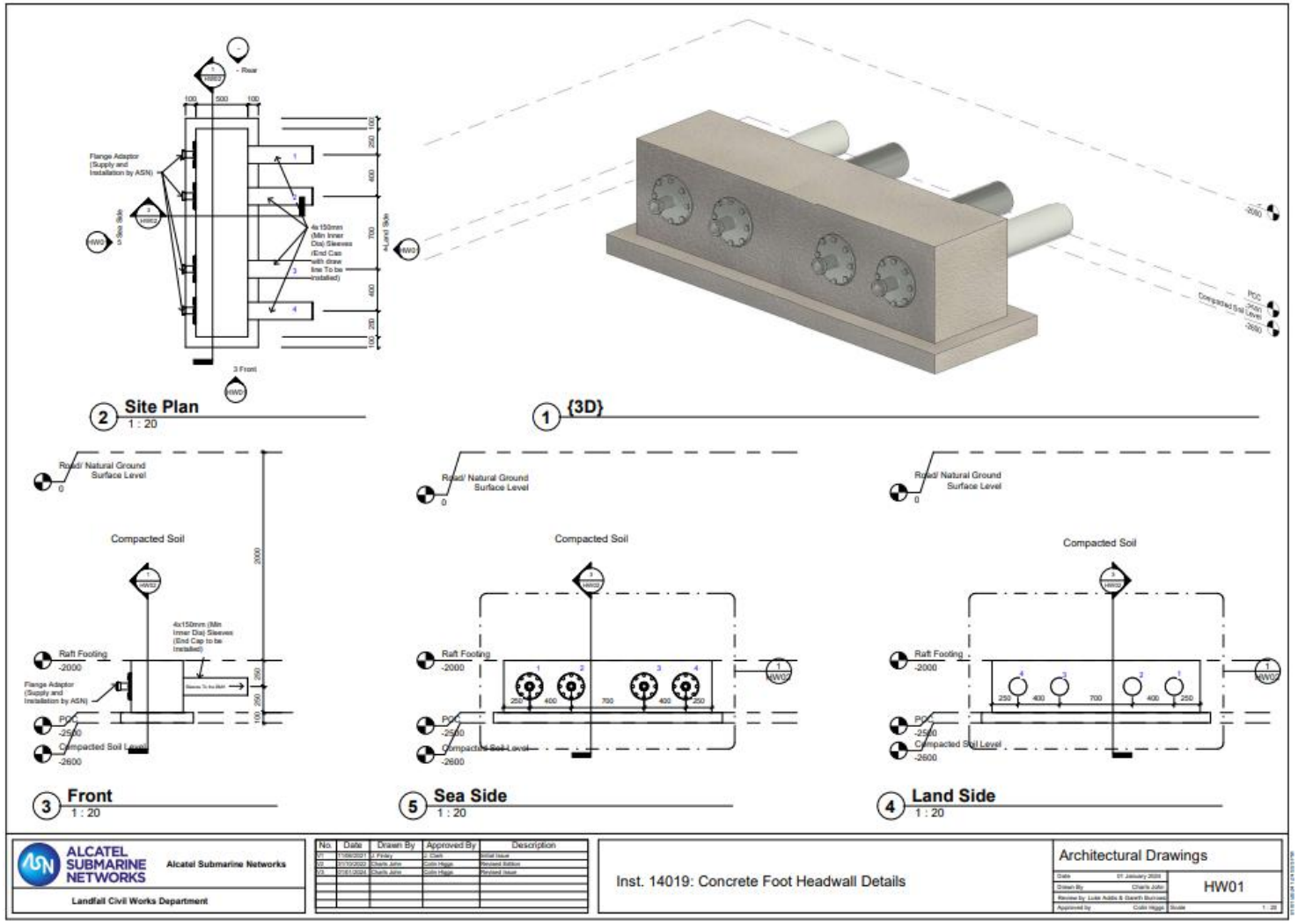
As part of the shore-end works, the concrete headwall will be prefabricated and lowered into position by an excavator. The BMH MBA, seaward facing ducts and headwall are all underground and a representation is shown in **Figure 3-12**. Note the seaward facing ducts would be encased in concrete for protection.

## FIGURE 3-12 UNDERGROUND BEACH MANHOLE TO HEADWALL LAYOUT




Source: ASN, 2024

## FIGURE 3-13 CONCRETE HEADWALL STRUCTURE



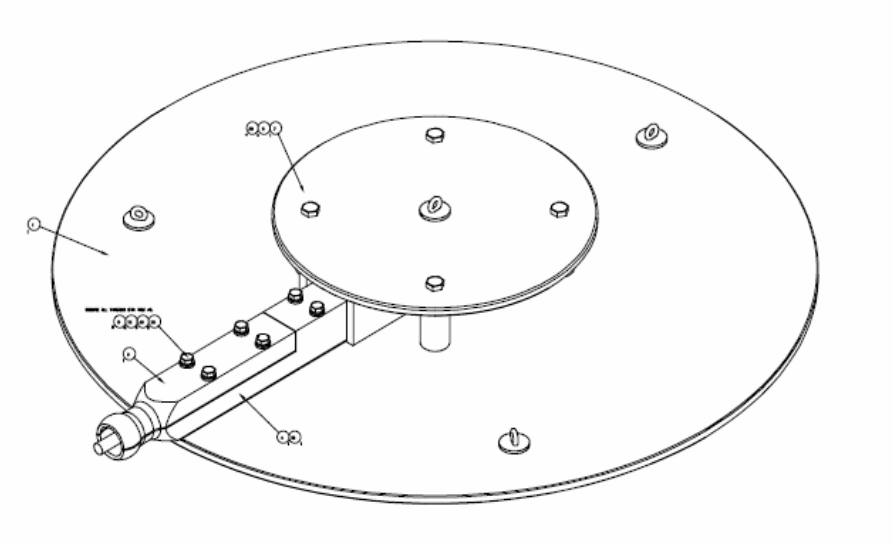

Source: ASN, 2025

### 3.3.2 SYSTEM EARTH

Every optically amplified (repeatered) subsea cable system needs power from the shore to operate the underwater plant. As such the subsea cable requires a system earth to provide a return path for the electrical circuit.

The proposed System Earth will be a beach plate. The beach plate must be installed a minimum of 25 m from the subsea cable and any other steel objects. The plate is 25 mm-thick steel, 2 m in diameter, with a weight of approximately 800 kg (**Figure 3-14**). The beach plate must be submerged in permanently saturated (conductive) wet sand buried near the low water mark (LWM) on the beach to a depth of 2-3 m. The proposed location of the beach plate is shown in **Figure 3-15**.

FIGURE 3-14 SCHEMATIC OF A BEACH PLATE



Source: ASN, 2024

## FIGURE 3-15 PROPOSED BEACH PLATE POSITION IN THE INTER-TIDAL AREA


Source: ASN, 2025

## 3.4 PROJECT ACTIVITIES

The Daraja Project will involve the following activities:

- Pre-installation activities in the marine environment:
  - Route clearance (RC) of one out-of-service (OOS) cable;
  - Pre-lay grapnel run (PLGR) to clear debris from the seabed;
- Shore-End Installation:
- BMH MBA and associated infrastructure;
  - Pre-Laid Shore End (PLSE) at the landing point;
  - System earth installation;
- Main subsea cable lay;
- Post-lay inspection and burial (PLIB);
- Cable crossings;
- Subsea cable operation and repair; and
- Retirement, abandoning or decommissioning.

It is planned for the subsea cable landing at Mombasa, Kenya to have a PLSE. A PLSE is required when the distance out to the 15 m water depth contour is too far to allow safe operation of the main cable installation vessel. The PLSE phase will involve laying the subsea cable in shallow water (out to the 15 m water depth) using a shallow draft vessel (as presented in **Section 3.4.1**) and will be undertaken ahead of the main subsea cable lay.

The installation and burial of the new BMH MBA and earthing system at the landing site are often undertaken as part of the PLSE phase (as presented in **Sections 3.4.2.1** and **3.4.2.2**). The PLSE phase will be undertaken after the pre-installation activities, before the main subsea cable lay. The main installation vessel will install the rest of the subsea cable in Kenyan waters from the EEZ boundary up to the 15 m water depth contour (as presented in **Section 3.4.3.2**).

In order to bring the subsea cable ashore, a floating hauling line or similar will be run from the beach to the PLSE vessel to pull the subsea cable at the landing point to the BMH MBA. Once the subsea cable has been successfully tested, divers will check the subsea cable is lying flat on the seabed in an acceptable position. The subsea cable will be buried, where conditions allow, out to the position where the cable ship plough is to commence.

Following installation, the beach will be entirely reinstated. Then PLIB is undertaken to ensure the cable installation and any cable and pipeline crossings are optimally positioned.

### 3.4.1 PRE-INSTALLATION ACTIVITIES

#### 3.4.1.1 ROUTE CLEARANCE OF OUT-OF-SERVICE CABLES

RC operations will be conducted in accordance with International Cable Protection Committee (ICPC) Recommendation 1 "Management of Redundant and Out of Service Cables" (ICPC, 2011) prior to the laying and burial operations along those sections of the route where burial is to be performed. RC will be performed at the one (1) out of service cable that is known to cross the subsea cable route. Where an OOS subsea cable is present, the vessel will remove a suitable section of the old subsea cable for safe ploughing at all points along the route where

burial is planned (further detail in **Section 3.4.1.2**). More information on cable clearance and crossings is provided in **Table 3-3**.

#### 3.4.1.2 PRE-LAY GRAPNEL RUN

A PLGR of approximately 56 km will be carried out by the main lay installation vessel or by a vessel of opportunity specifically fitted with winches and grapnels in burial areas immediately prior to installation. The vessel will be equipped with navigation and positioning system to the same specification as the main lay installation vessel. The PLGR activity is intended to clear seabed surface debris (e.g. wires, hawsers, discarded fishing gear) which may be in the path of the subsea cable. The specifics of the grapnel configuration will depend on seabed conditions, an example of a typical PLGR rigging is shown in **Figure 3-16**. Divers will remove debris near shore or adjust the subsea cable route if debris cannot be removed. Any material recovered by the PLGR will be handled, stored and disposed of onshore according to International Conventions for the Prevention of Pollution at Sea from Ships (MARPOL 73/78), Kenyan standards and waste disposal best practice.

The grapnel activity will not be conducted in rocky areas where no subsea cable burial is feasible, or where in-service subsea cables are crossed by the Daraja Project.

FIGURE 3-16 TYPICAL PLGR RIGGING


Source: ASN, 2024

### 3.4.2 SHORE-END INSTALLATION

#### 3.4.2.1 CONSTRUCTION AND INSTALLATION OF THE BEACH MANHOLE, SYSTEM EARTH, AND ASSOCIATED INFRASTRUCTURE

**Beach Manhole**

The new proposed BMH MBA will be constructed onsite on Nyali Beach (**Figure 3-17**). The process will be conducted as part of the shore-end installation activities prior to landing of the subsea cable at the Mombasa landing site. The proposed BMH MBA will be located

approximately 110 m from the waterline with a straight line of sight to the landing point at the LWM.

The BMH MBA construction and installation will require an excavation area of 5 m x 4 m. An area will be excavated 1 m along each side of the BMH MBA using an excavator to allow for a concrete truck for concrete pouring on site.

The excavation will likely require a concrete base for the BMH MBA to sit on and a concrete top which would be poured on site. Metal formwork will be installed and concrete poured into the formwork.

The BMH MBA is expected to take approximately 20 days to install. During construction and installation, appropriate fencing and warning signs will be used to surround the works area until it is complete.

FIGURE 3-17 EXAMPLE OF BMH BEING CONSTRUCTED ON SITE WITH RE-INFORCEMENT BARS

Source: ASN, 2024

**Beach Plate**

The beach plate requires an exclusion area for the excavation and installation works 25 m from the subsea cable route on the beach. The beach plate needs to be placed in the intertidal zone more than 2 m below the beach level and in contact with the water table. Due to the weight of the beach plate, an excavator (approximately 3 m wide) will be required to move and lower the beach plate into position (**Figure 3-18**). This will likely take less than one (1) day to complete as part of the existing shore-end works. A separate earth cable will also need to be buried between the BMH MBA and the beach plate, requiring a trench up to 2 m deep and approximately 65 m long.

FIGURE 3-18 EXAMPLE OF BEACH PLATE INSTALLATION ON THE BEACH

Source: ASN, 2024

#### 3.4.2.2 PRE-LAID SHORE END AT LANDING POINT

The PLSE work would start at the BMH MBA with the exposure of the seaward ducts and then with the trenching of the subsea cable length by an excavator down to the landing site. The subsea cable would be installed in the trench inside articulated pipe (for additional protection). The distance between the BMH MBA and the Lowest Astronomical Tide is 113 m and the subsea cable will be buried to 2 m depth on the beach. The total working area for PLSE on the beach will be a corridor approximately 25 m wide to allow for the trench, working areas, access and material stockpiling. The beach burial work is normally completed, and the beach is fully restored within several days.

Depending on the water depth and installation technique selected, the subsea cable installation would be undertaken by a mixture of barges (or small boats), divers, and other local support vessels. In rocky outcrops and / or areas with shallow sand the subsea cable will be surface laid on the seabed.

Typically, a shallow-draft vessel facilitates laying the subsea cable on the seabed. Then, with the assistance of divers, the subsea cable is buried using either water jetting, airlifting, or burial jetting sledge (as described below). Due to the length of PLSE required, this work is expected to take up to 28 days to complete.

Note that the installation of the subsea cable on Nyali Beach would be done at low tide to maximise the depth of burial by excavator. The PLSE work would continue throughout the tidal cycle and take advantage of high tide water depths in the shallowest areas to reduce the risk of the shallow draft PLSE vessel coming into contact with the reef.

### Water Jetting

Handheld water jetting is a system in which the diver uses a small portable water pump and fire hose, often fitted with a special double nozzle, to counterbalance the reaction force. This can be used from the waterline and out. This tool can also be used to fluidize the sand around the subsea cable to allow it to sink deeper into the sediments. The principle here is based on a combination of sediment being blown away and fluidisation.

### Airlifting

Airlifting will require a long air hose and compressor. The airlift can be a 6-10 inch diameter x 2 m long hard polyvinyl chloride (PVC) pipe section fitted with a diver operated valve that will feed compressed air into the pipe. By holding the tube/pipe section near upright and allowing air into the pipe this will generate a flow up and out of the pipe which in turn will start a suction process at the bottom end. The compressor may need to be accommodated on a small boat when working. The airlift system can only be considered at water depths of more than approximately 2 m. The principle is based on suction removal of sediments and will discharge all sediments in the water column.

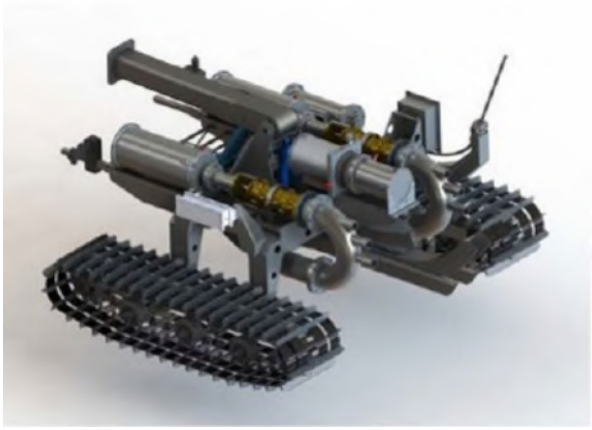
### Burial Jetting Sledge

The jetting sledge is the most powerful inshore burial tool, as it is often supported by a more powerful water pump, which can be 100-400 horsepower (HP). This system needs a small barge/vessel platform to support the diving team and pumping unit. The jetting sledge fluidises the sand around the subsea cable, allowing the cable to be lowered to the required depth (where possible). The jetting sledge may tow the pump barge as burial progresses.

### Mobile Remotely Operated Vehicle (crawler)

The PLSE vessel will be equipped with a remotely operated vehicle (ROV) crawler (**Figure 3-19**) which is a diver-less subsea ROV used to bury the cable after its installation. Its main features are 425 HP jetting power and trench width up to 150 mm. The ROV is approximately 5 m x 3.4 m x 2 m. It fluidises the sand / gravel around the subsea cable, allowing the subsea cable to sink to the required depth (where possible). This ROV is deployed on soft ground from the PLSE vessel where all the pumps and power feeding equipment are installed.

FIGURE 3-19 MOBILE REMOTELY OPERATED VEHICLE CRAWLER



Source: ASN, 2025

In the inshore area, the seabed between Nyali Beach and the lagoon in the MMNR has stretches of coral-hard ground where burial will not be possible. As such, where it is possible, an ROV or burial sled will be used to bury the subsea cable within the lagoon. Around the wave break area, the gap where the reef stops and the water is deeper will be utilised for routing the subsea cable. Within this area, the subsea cable will be buried if possible. Otherwise, the subsea cable will be surface laid. If subsea cable burial is not possible in the inshore areas and the cable is at risk of being moved in the high-energy surf zone, then articulated pipe may be applied to the subsea cable, and it may be pinned to the seabed (as presented in **Section 3.2.2**).

### 3.4.3 MAIN SUBSEA CABLE LAY

#### 3.4.3.1 INSTALLATION VESSEL

For clarity, please note that no dredging is involved in the installation of subsea cables.

The subsea cable will be installed from a purpose-built installation vessel (**Figure 3-20**) equipped with a towed sea plough, along with a mobile ROV and/or diver capability.

The exact installation vessel has not yet been identified; however it will be a C class vessel (as shown in **Figure 3-20**), fully equipped with all the necessary equipment, tools, and facilities to safely handle and install, joint, test, and power the submerged equipment, including simultaneous subsea cable lay and plough burial. The vessel will have sufficient power and dynamic positioning capability to install in the expected weather and current conditions without requiring anchoring. This reduces the impact on the seabed as compared to older models that used anchors to stabilise and position the vessels while burying subsea cables under the seabed.

Subsea cable engineering software is used to install the subsea cable along the route with high positional accuracy and control of the subsea cable tension in combination with the ship's navigational systems. The vessel will be entirely self-sufficient for the duration of the installation operations.

FIGURE 3-20 TYPICAL INSTALLATION VESSEL

Source: ASN, 2024

#### 3.4.3.2 SUBSEA CABLE INSTALLATION

In water depths of less than 1,000 m, the installation vessel, with an average vessel operational speed of 90 km per day, will simultaneously lay and bury the subsea cable to a target burial depth of 2 m, where feasible, using a plough, as described in **Section 3.4.3.3** below. Subsea cable burial on hard, rocky substrates will not be possible.

In water depths of more than 1,000 m the subsea cable will be laid on the seabed surface, with an average vessel operational speed of 170 km per day.

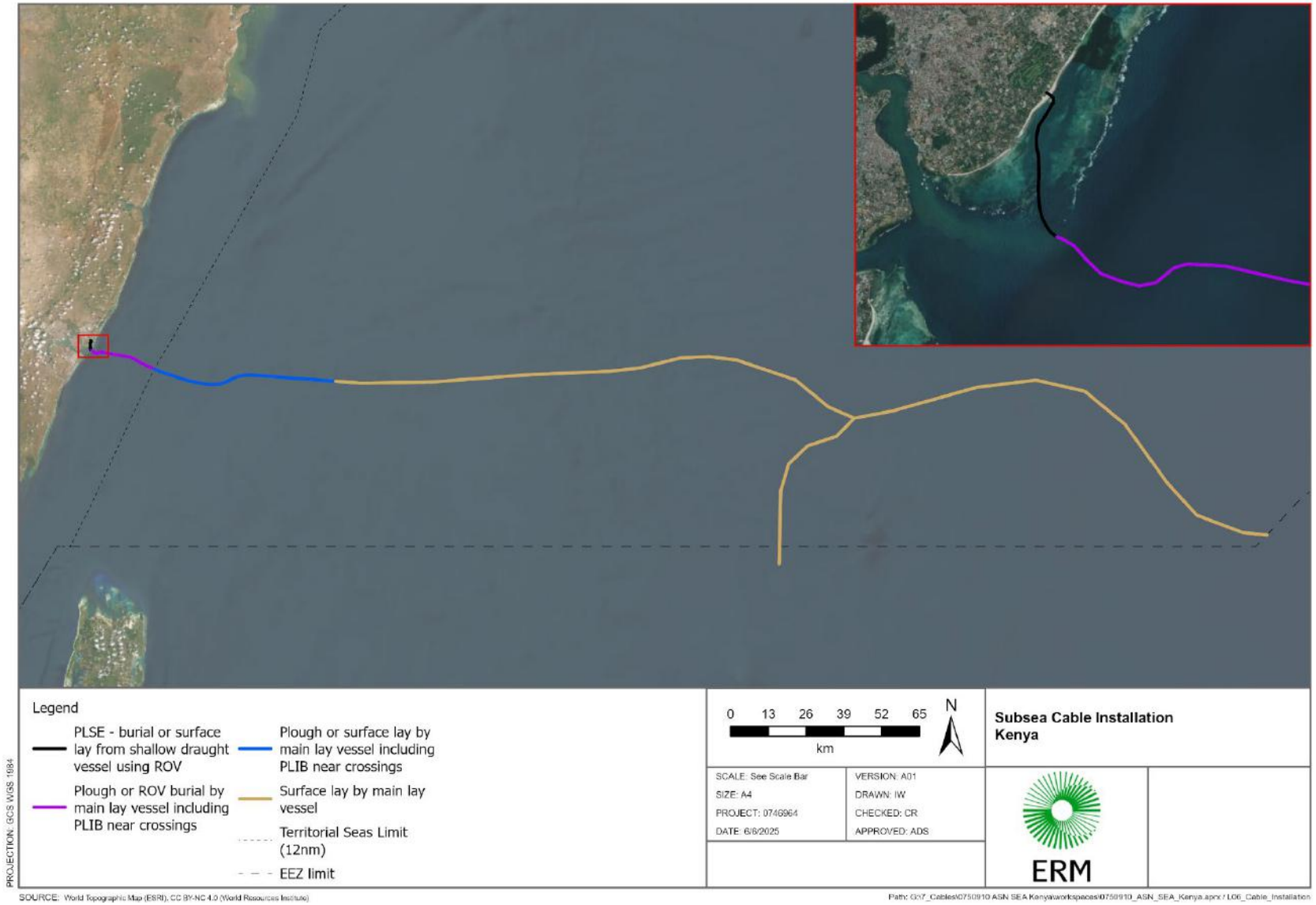
**Table 3-2** and **Figure 3-21** provide a summary of the subsea cable installation process in the Kenyan waters.

TABLE 3-2 SUMMARY OF SUBSEA CABLE INSTALLATION WITHIN KENYAN WATERS

| Subsea Cable Location | Water Depth (m) | Subsea Cable Installation Description |
|---|---|---|
| Landing Point to 3.5 km along the route in the TS | 0 to 15 m | PLSE - burial or surface lay from shallow draught vessel using ROV |
| From 3.5 km to 26.9 km in the TS | 15 m to 508 m | Plough or ROV burial by main lay vessel including PLIB near crossings |
| From 26.9 km to 93.6 km in the EEZ | 508 m to 1,000 m | Plough or surface lay by main lay vessel including PLIB near crossings |
| From 93.6 km to 511 km in the EEZ | 1,000 m to 4,065 m | Surface lay by main lay vessel |

Source: ASN, 2025

## FIGURE 3-21 SUBSEA CABLE INSTALLATION IN KENYAN WATERS



### 3.4.3.3 PLOUGH INSTALLATION

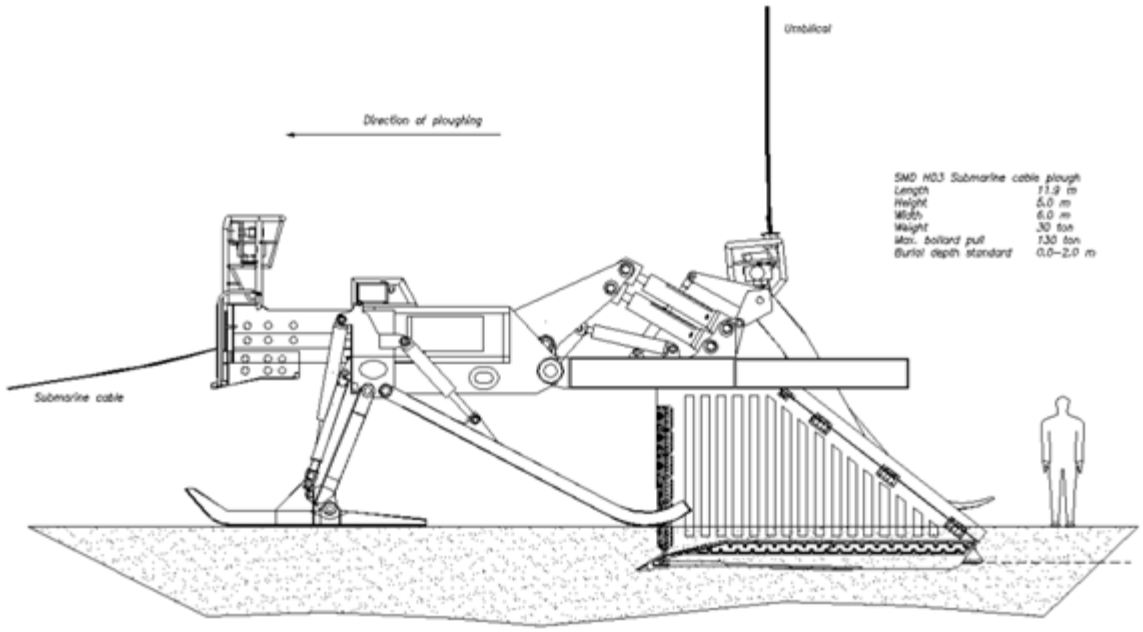
Simultaneous subsea cable installation with plough burial is the planned method of installation where possible in waters less than 1,000 m deep. The plough will be approximately 10.8 m (L) x 4.8 m (H) x 6.0 m (W) in size and can operate at a minimum depth of 15 m. The subsea cable feeds into a bell mouth at the front of the plough and is guided down through the plough share to emerge in the trench. Hydraulically adjustable skids are used to provide steering on the plough and the plough share is used to vary the burial depth (**Figure 3-22**). On-board sensors determine whether the subsea cable passed through the plough in a safe manner before being buried, and record the burial depth achieved.

Typical ploughing configuration is shown in **Figure 3-23**, where the plough will likely be towed two (2) or three (3) times the water depth behind the vessel. The plough dimensions are indicative of the size of the equipment to be used. The footprint of the plough is limited to where the four (4) plough skids are in contact with the seabed surface and the plough share, which is approximately 0.2 m wide (**Figure 3-24**).

There will be no ploughing over sensitive marine fauna such as corals / soft corals / sponges etc. The seabed will be left nearly undisturbed after ploughing and any marks / evidence of the plough trench will be removed naturally at a rate dependent on seabed dynamics. Only temporary track marks from skids and plough share will remain visible just after installation but will start to disappear shortly after installation due to seabed currents and wave action. During the installation phase and once the subsea cable is buried, the operations of the subsea cable will not have any potential impact on the sensitive marine fauna (**Appendix I**).

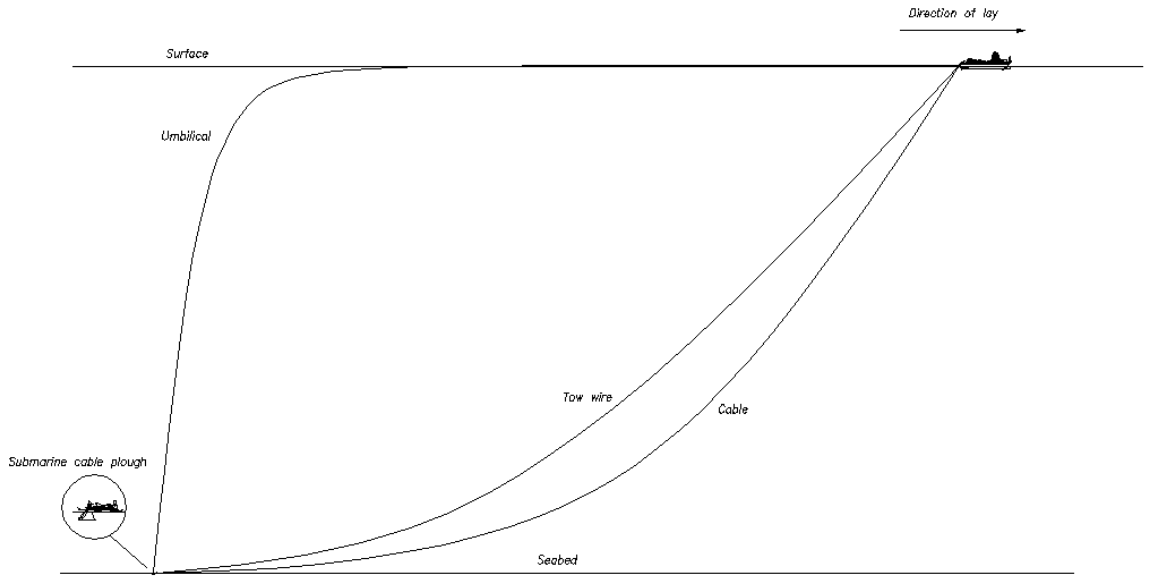
Ploughing is a well proven industry standard cable burial process which will keep the environmental impact to an absolute minimum compared to other burial techniques available for cable protection, like water jetting, airlifting, sediment dredging, rock cutting and rock placement.

FIGURE 3-22 TYPICAL SPECIFICATIONS OF CABLE PLOUGH




Source: ASN, 2024

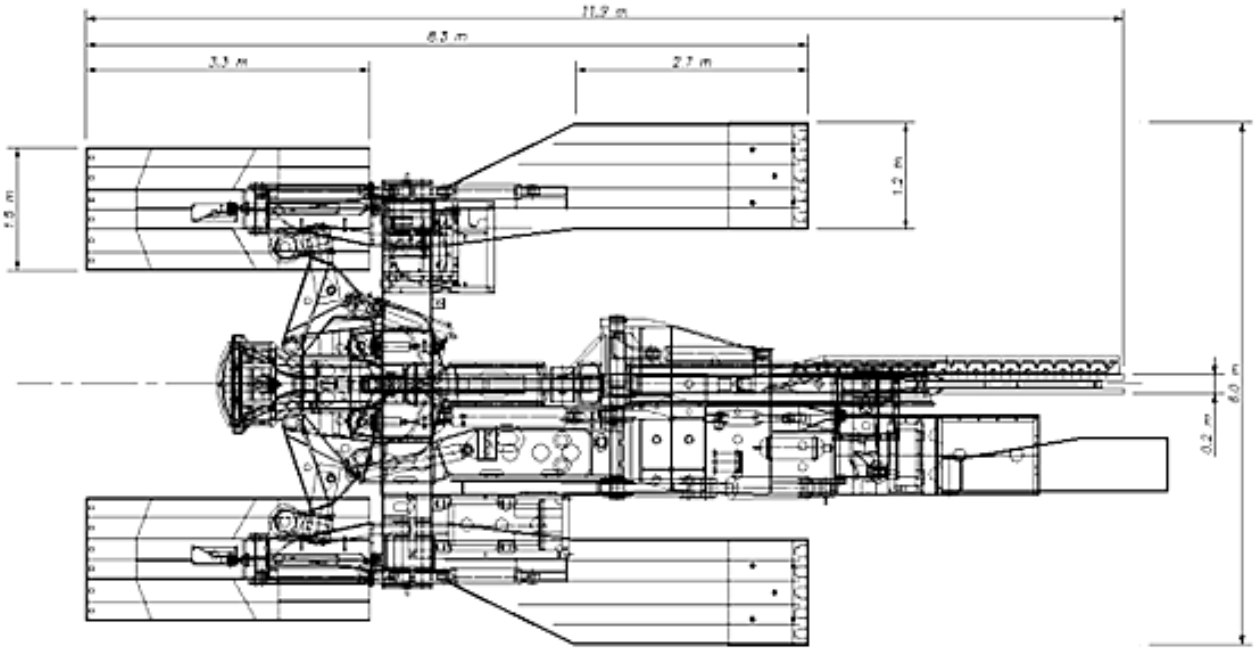
FIGURE 3-23 TYPICAL PLOUGHING CONFIGURATION




Source: ASN, 2024

Diagrammatic representation of the Cable Ship Ploughing set up with Tow Line, Umbilical and subsea cable

FIGURE 3-24 TYPICAL PLOUGH FOOTPRINT




Source: ASN, 2024

## 3.4.4 POST-LAY INSPECTION AND BURIAL

Post-Lay Inspection (PLI) will be carried out following the main ploughing installation to verify the subsea cable burial condition. The subsea cable on the seabed will be inspected using an ROV with on-board cameras and detectors to identify anomalies and areas that may require

further burial and to measure burial depth (**Figure 3-25**). The ROV may also be used to carry out subsea cable burial in places where the plough was not suitable to be used, for example within the MMNR, 500 m either side of a pipeline, or if unplanned plough skips were required during installation.

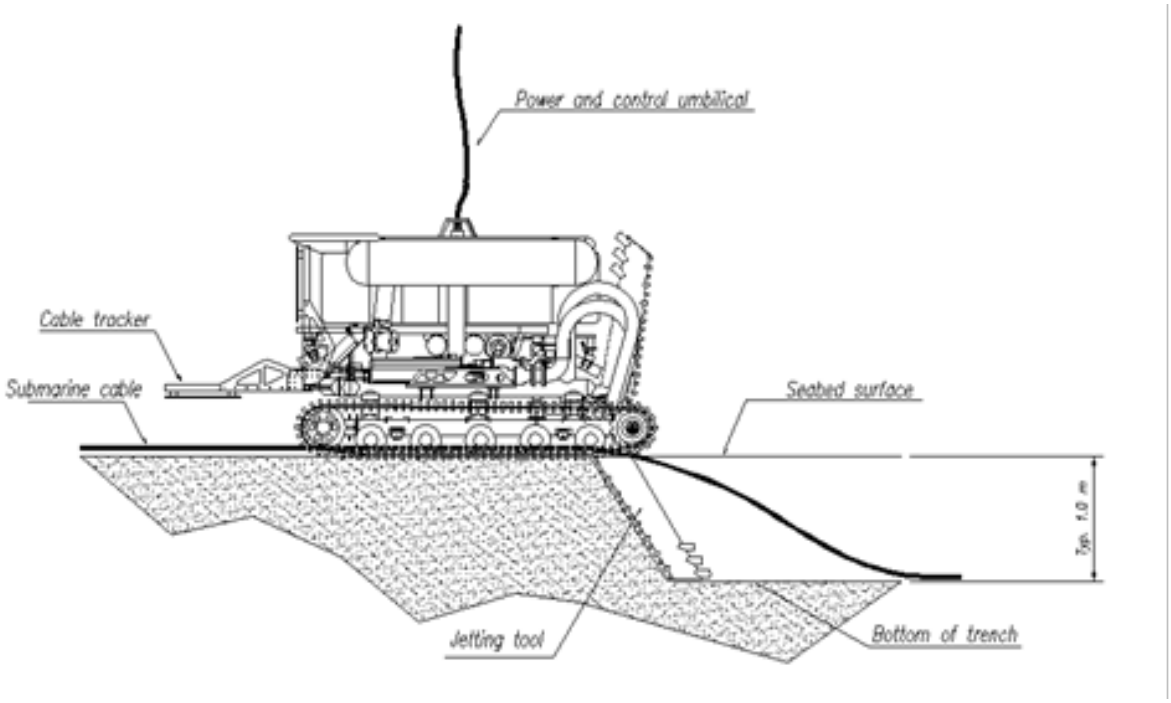
Post-Lay Burial (PLB) will be performed in planned plough buried areas at the following locations:

- Around the point of plough launch/recovery;
- Initial, intermediate and final splices;
- Crossings of in-service power and telecommunications cables and pipelines;
- BUs;
- Unplanned plough skips; and
- Areas where seabed slopes are not suited for ploughing and jetting burial is possible.

During PLB, a tracked ROV will use seawater jetting tools to bury the subsea cable on soft sediments. A narrow trench approximately 0.2 m wide will be created for the subsea cable to lie in, with a target burial depth of 2 m.

Following burial of the subsea cable, the trench then backfills naturally.

FIGURE 3-25 SUBSEA CABLE BURIAL BY REMOTELY OPERATED VEHICLE




Source: ASN, 2024

Diagrammatic representation of subsea cable installation and PLIB by ROV.

## 3.4.5 CABLE AND PIPELINE CROSSINGS

The plough will not be used to install and bury the subsea cable where the route crosses seabed infrastructure and will not be undertaken within a specified distance of in-service cables. Where the Daraja Project crosses other cables, the subsea cable will be surface laid for approximately 500 m in the corridor along the planned / agreed route between the cable

owner(s). Following surface lay, the subsea cable will be buried by an ROV or by divers in shallow water.

All crossings will follow the ICPC guidelines and crossing angle should normally be as perpendicular as possible.

TABLE 3-3 PLANNED NUMBER OF SUBSEA CABLE AND PIPELINE CROSSINGS WITHIN THE KENYAN WATERS

| Location Description | No. of Existing Pipelines | No. of Planned In-Service Cables | No. of Existing In-Service Cable Crossings | No. of Out-of-Service Cable Crossings to be cleared | No. of Out-of-Service Cables that will be crossed |
|---|---|---|---|---|---|
| Kenyan waters | 0 | 0 | 19 | 1 | 0 |

Notes:
Crossings refer to each individual crossing made. There may be instances where a cable is crossed more than once.
The number of cable crossings for In-Service and / or OOS include both power and fibre optic cable crossings.

Source: ASN, 2024

#### 3.4.5.1 CABLE CROSSINGS

When crossing power and / or other fibre optic cables, the crossing corridor distance is generally 500 m. However, this can be reduced to 250 m for level crossings of power and / or fibre optic cables which have been positively identified during the CRS, subject to the agreement of the cable owner(s).

Utilising the OceanIQ Cable Database, the Daraja Project will notify the cable owner of the one (1) OOS cable. Subject to the cable owner's agreement, the section of the OOS cable will be removed for installation of the Daraja Project (refer to **Section 3.4.1.1** for further detail on RC operations).

#### 3.4.5.2 PIPELINE CROSSINGS

No pipeline crossings will be conducted within Kenyan waters.

### 3.4.6 SUBSEA CABLE OPERATION AND REPAIR

The subsea cable is intended to operate with no regular maintenance throughout the projected 25-year lifespan. However, should a problem be detected, analysis may conclude that repair of the subsea cable is required to replace a damaged or faulty portion. A repair vessel would be deployed and an ROV or electrodes used to determine the location of the fault. Once located, the subsea cable would be retrieved to the vessel by grapnels and then cut. The cut section will be recovered on board the repair vessel and retained for disposal when onshore.

Following testing, the faulty portion of the subsea cable would be removed, and a new cable segment joined to one end of the subsea cable. The two ends of the subsea cable would be re-joined and then lowered back into position on the seabed. If necessary, post-repair inspection and burial (PRIB) may be carried out following any subsea cable repairs to bury the repaired

cable. The duration of the subsea cable repair once on station is generally approximately 1 day.

### 3.4.7 RETIREMENT, ABANDONING OR DECOMMISSIONING

The Daraja Project has a life span of about 25 years; however subsea fibre optic cable systems can operate long after this period, and its deactivation can only be performed by the shutdown of the electrical / electronic system and disabling the transmission of information.

At the end of its life span, the subsea cable and the associated terrestrial infrastructure will be dealt with in line with the legislation in force at the time and based on consideration of the Best Practicable Environmental Option (BPEO), taking into account socio-economic and environmental impacts, technical and financial feasibility and local regulations. The subsea cable may be dealt with differently in accordance with the following options:

- The subsea cable itself can either be removed or left in situ. Standard international industry practice is to leave subsea cables in situ where they have been colonised by benthic organisms and the impacts of removal would be greater than the impacts of leaving the subsea cable in place, or where removal of the subsea (and often partially buried) cable is technically or economically impractical. The subsea cable will be inert and there are no significant long-term environmental impacts from leaving subsea cables in situ.
- Should removal of the subsea cable be undertaken, this would involve mobilising a vessel to recover the subsea cable and transport it to a suitable location for reuse, recycling or disposal at an appropriate facility. Impacts of removal would be similar in nature to the impacts of installation, but likely to a lesser degree.

Should a full or partial recovery of the subsea cable be required, a decommissioning plan that aligns with industry standard recommendations (i.e. ICPC document 1-14A 'Recovery of Out of Service Cables') will be developed and adhered to.

It should be noted that UNEP documentation (Carter *et al.,* 2010) points out that the removal of subsea telecommunication cables and associated infrastructure should be evaluated on a case-by-case basis, as the procedures for withdrawal and some local conditions (based on soil / sediment type, crossing other cables, etc.) can often have a greater environmental impact than the procedures related to the installation itself.

## 3.5 PROJECT SCHEDULE

### 3.5.1 CABLE ROUTE SURVEY

The CRS was completed in February 2025. The results of the CRS were used to inform the final subsea cable route, identifying any marine feature restrictions, as well as informing the characterisation of the landing environment.

### 3.5.2 SUBSEA CABLE INSTALLATION

Immediately prior to installation, a PLGR will take place along the subsea cable route. This is anticipated from Q1 2026, and for the PLSE to follow shortly after. Installation of the subsea cable within Kenyan waters is currently anticipated to commence in Q1/Q2 2026, including the first phase of the southern subsea cable branch stub. It should be noted that the second phase of the subsea cable branch extension from the Kenyan EEZ towards Tanzanian waters is

expected to be installed in 2028/9. The estimated installation duration within Kenyan waters is presented in **Table 3-4**, where onshore and PLSE activities will be operating daily, during daylight hours, and offshore activities will be conducted daily for 24 hours.

Following the installation of the subsea cable, PLIB will be conducted to validate burial and bury around crossing points or any areas where burial was planned but not possible with the plough.

TABLE 3-4 PROPOSED INSTALLATION DURATION WITHIN KENYAN WATERS

| Activity | Estimated Duration |
|---|---|
| RC and PLGR (offshore) | 3.5 days |
| PLSE (offshore and onshore) | 28 days |
| BMH MBA construction (onshore) | 20 days |
| System Earth installation (onshore) | 1 day |
| Join main subsea cable to PLSE (offshore) | 1 day |
| Main subsea cable installation (including phase 1 of the southern subsea cable branch stub, excluding phase 2 extension) (offshore) | 9 days |
| Integrate XBU (offshore) | 5 days |
| Phase 2 extension of southern subsea cable branch (offshore) | 1 day |
| PLI and PLIB (offshore) | 15 days |

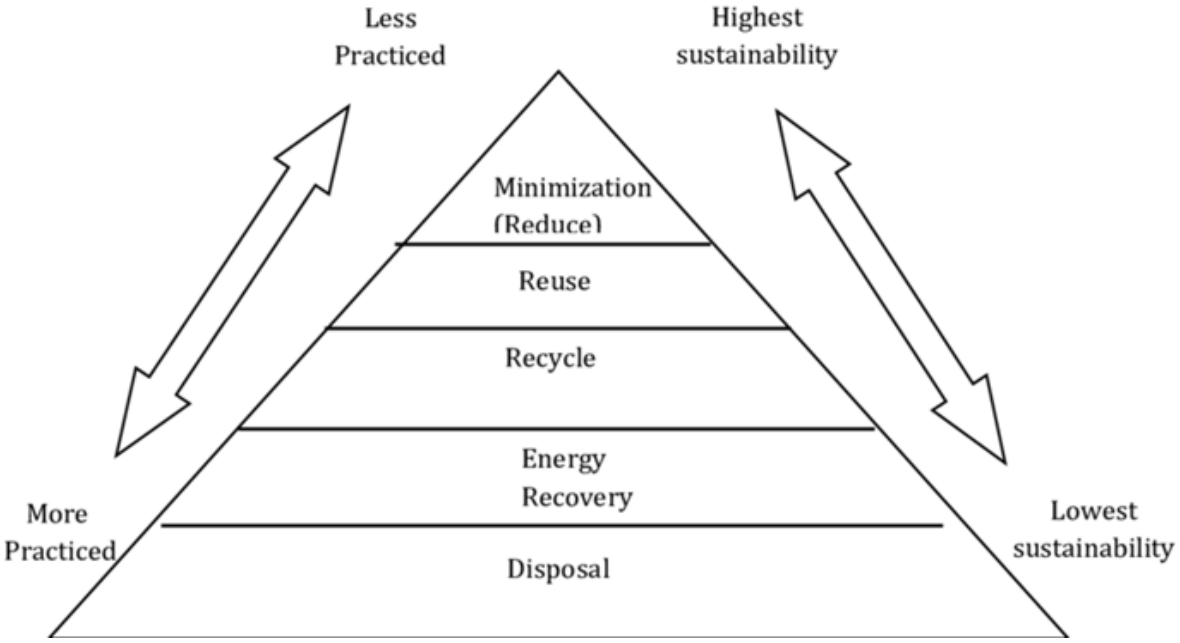
## 3.6 WASTE GENERATION AND MANAGEMENT

The Daraja Project will be designed, installed and operated using best practice approaches. To this end, effective and integrated waste management practices shall be implemented during all phases of the Daraja Project to avoid or minimise potential impacts on the environment and protect public health, safety and welfare.

A Waste Management Procedure (WMP) will be provided to manage the waste streams associated with the Daraja Project. Waste management will comply with applicable Kenyan legislation and the requirements of MARPOL 73/78.

- The onshore contractors and vessel operators will manage the waste in accordance with the waste hierarchy presented in **Figure 3-26** below;
- Suitably approved and fully licensed companies providing waste disposal services will be selected by review and evaluation in line with best practice;
- Waste tracking will be conducted in line with MARPOL 73/78, Kenyan legislation and international best practice; and
- Non-hazardous waste will be segregated and recycled where possible.

FIGURE 3-26 WASTE HIERARCHY




Source: Mallak *et al.,* 2016

## 3.6.1 OFFSHORE WASTE ESTIMATES AND MANAGEMENT

The offshore waste streams associated with the Daraja Project are discussed in the subsections below.

### 3.6.1.1 INSTALLATION PHASE (INCLUDING PRE-INSTALLATION)

It is anticipated that minor quantities of wastes will be produced during the installation phase. A significant portion of the waste streams associated with the installation phase activities will be generated from the main installation vessel.

The general amount of wastes that will be generated during installation from the main installation vessel are summarised in **Table 3-5**. The vessels involved in the pre-installation, installation, repair and decommissioning activities will adhere to MARPOL 73/78 requirements regarding discharges to sea.

TABLE 3-5 SUMMARY OF GENERAL AMOUNTS OF WASTES GENERATED BY MAIN INSTALLATION VESSEL DURING INSTALLATION

| Type Of Waste | Generation Rate | Driver | Onboard Treatment |
|---|---|---|---|
| Oily bilge water | 0.01-13 $m^3$ per day, larger ships generate larger quantities. | Condensation and leakages in the engine room; size of the vessel (approximately 140 m x 23 m). | Use of an oil water separator to reduce waste volume by 65-85%, with the water fraction discharged to sea and the oil portion retained and stored for disposal onshore at an appropriate waste disposal facility. |
| Grey water | 0.22 $m^3$ per person per day. | Number of persons on-board (a maximum of 70 | On-board sewage treatment unit to comply with MARPOL 73/78 Annex IV: no floating |

| Type Of Waste | Generation Rate | Driver | Onboard Treatment |
|---|---|---|---|
| | | people can be on board the vessel) | solids or discolouration of surrounding water. No discharges of treated sewage from vessels within 3 nm of the nearest land. Residual chlorine content <1.0 mg/L. |
| Sewage (Black water) | 0.01 to 0.06 $m^3$ per person per day. Sewage is sometimes mixed with other waste water. The total amount ranges from 0.04 to 0.45 $m^3$ per day per person. | Number of persons on-board; type of toilets; length of voyage. | Effluent from treatment plants may be discharged at sea where permitted under MARPOL 73/78 Annex at a distance of more than 12 nm from the nearest land when the ship is enroute at no less than 4 knots. |
| Plastics | 0.001 to 0.008 $m^3$ of plastics per person per day. | Number of person on-board. | Stored onboard for appropriate disposal onshore |
| Food wastes | 0.001 to 0.003 $m^3$ per person per day | Number of persons on-board; provisions | Where permitted under MARPOL 73/78 Annex V, food waste may be discharged at sea. Ground or crushed food waste is permitted for discharge at more than 3 nm from the nearest land. Non ground or crushed food waste is permitted for discharge at more than 12 nm from the nearest land. |
| Domestic wastes / packaging material | 0.001 to 0.02 $m^3$ per day per person. | Number of persons on-board; type of products used. | Stored onboard for appropriate disposal onshore |
| Ballast Water | To be confirmed | To be confirmed | To be confirmed |

Source: Modified from: MISPINAS, 2016.

#### 3.6.1.2 OPERATION AND REPAIR PHASES

The waste streams associated with the operational phase of the Daraja Project will be generated during repair activities, such as repair of damaged subsea cable (which is very rare). Due to the nature of these repair activities, the wastes will mostly include damaged cables and packaging materials. The waste will be stored onboard the vessel until they can be disposed at a suitably equipped waste disposal facility, which could be taken ashore in Kenya or another country.

#### 3.6.1.3 DECOMMISSIONING PHASE

Based on the current expectation that the buried and underwater components, including the subsea cable and BMH MBA, will be left in situ, no waste is expected to be generated during decommissioning. If any Daraja Project components are to be removed at end of life, this will be undertaken in accordance with legislation in place at that time and a registered waste

management company will handle any waste produced for appropriate recycling, reuse or disposal at a certified facility.

### 3.6.2 ONSHORE WASTE ESTIMATES

During installation onshore up to the proposed BMH MBA, waste is generated from excavated organic materials and installation activities, such as packaging. Excavated material will be used to back-fill the trench following installation, and therefore only a small amount of waste from the excavation is expected. It is currently estimated that approximately 19.5 $m^3$ or 11 tonnes of soil will be created by the excavation works for the proposed BMH MBA. It is also estimated that there may be approximately an additional 120 litres (L) of packaging waste and waste from food and drinks for the site employees. Waste generated onshore will be managed by the implementation of a WMP by shore-end and terrestrial contractors. The waste management of the Daraja Project will be in adherence with international standards and practices. There will be very little waste generated from the ongoing operation and repair of the subsea cable.

## 3.7 PROJECT IMPLEMENTATION COSTS

The envisaged cost of the Kenyan branch of the Daraja Project is around United States Dollars (USD) 23 million (i.e. Kenyan Shilling [KES] 2,973 million[3]). In addition, the Daraja Project has local and national economic values in terms of potential limited employment opportunities for locals (skilled and semi-skilled labour), supply opportunities, and business opportunities.

## 3.8 EMPLOYMENT

There will be opportunities for local subcontractors to be engaged for providing support services and some of the manual excavation and trenching works at the proposed BMH MBA.

There will be approximately 70 people onboard the main installation vessel, plus approximately 20 people supporting the shore-end installation for the subsea cable landing and approximately 10 people for supporting the proposed BMH MBA construction activities. Those crew members onboard the main installation vessel will not come ashore, unless a crew change is being performed.

Where possible, local employees will be recruited from the local and regional areas for security and to perform the installation of the onshore components of the Daraja Project. The specific number of workforce that would be involved in the installation and operation phase of the Daraja Project is yet to be finalised.

[3] Based on the Central Bank of Kenya official exchange rate of KES 129.2 to USD 1.

# 4. PROJECT ALTERNATIVES

The identification and analysis of Daraja Project alternatives is a requirement of the ESIA study, as outlined in Regulation 16 (b) of EIA Regulation 2003 (amended 2022). The exercise aims to improve the Daraja Project's design, construction, installation and operation decisions, based on feasible project alternatives. The alternative should be selected based on which has the fewest negative impacts, and on a cost-benefit analysis.

This Chapter describes the route and location alternatives for specific portions of the Daraja Project. These alternatives include the subsea cable route, landing point and BMH locations.

The preferred route and landing site for the Daraja Project presented in this ESIA Report were selected after an extensive process that included consideration of alternative options in earlier phases of the Daraja Project. For this reason, the alternative options listed in **Sections 4.1** to **4.3** are not presented here as project options, having already been eliminated because they were not feasible or reasonable.

## 4.1 TECHNOLOGY ALTERNATIVES

The following sub-sections describe the technology alternatives for the Daraja Project. These alternatives include data transmission alternatives, subsea cable configuration alternatives, and subsea cable installation shore crossing alternatives.

### 4.1.1 DATA TRANSMISSION ALTERNATIVES

#### 4.1.1.1 SUBSEA CABLE SYSTEM (PREFERRED TECHNOLOGY)

Fibre optic cable systems are currently the only available and viable technology capable of carrying high volumes of voice and data traffic internationally with high security, reliability, and at a lower cost compared to satellite of wireless technologies. Although wireless and satellite technologies continue to be developed and deployed, subsea fibre optic cables are the fastest, most cost-effective, and efficient method to transfer digital information around the world for the foreseeable future (European Union, 2022).

A subsea cable with lower environmental impact and greater reliability offers the best option to achieve the Project's objectives of improving telecommunication services in Kenya. The use of a subsea cable system is therefore the preferred technology for the Daraja Project.

#### 4.1.1.2 SATELLITE TRANSMISSION NETWORK

Satellite links, which had previously been one of the dominant alternate systems for the transmission of international traffic, have been largely replaced by the fibre optic subsea cable transmission networks. Although there are several available telecommunication mechanisms, the scale of customer demand and expectation of communication technology has made many of these inadequate for the provision of international bandwidth. The inherent limitations of satellite transmission include:

- High installation, operation and repair costs as satellite service providers need to have a satellite in orbit. This involves building the various electronic and mechanical components and launching the satellite into space;
- Restricted bandwidth, resulting in unreliable signal depending on the radio frequency band being used;

- Increased risk of interference by weather and sunspots which may cause disruptions to the signals;
- Latency due to huge distances over which the satellites send signals; and
- High installation and operation costs for antennas or ground stations.

For these reasons, the use of a satellite transmission network is not a realistic alternative for the Daraja Project.

### 4.1.2 SUBSEA CABLE CONFIGURATION ALTERNATIVES

#### 4.1.2.1 CABLE REPEATERS AND SYSTEM EARTH TYPES

The need to install repeaters and a system earth on the subsea cable is based on the technical requirements of the subsea cable system. Factors such as the length of the subsea cable, the capacity requirement, and the need for signal amplification using repeaters requires a power source from shore. Due to the proposed length and capacity of the Daraja Project, deploying repeaters and system earth is the preferred cable configuration alternative.

Where powered repeaters are used, a system earth for the return path is necessary. The option of earth system is dependent on site conditions such as work space, depth of sand, soil resistivity etc.

The selection of which system earth to install was chosen on the practicality of installation, minimising resource use, health and safety risk and aiming to reduce disturbance. But the most important consideration is whether the selected earthing system option will work as required.

**Earth Rod Arrays**

Using earth rod arrays requires soil with suitable conductivity and installation is therefore dependent on local geology, as well as identifying a suitable location close to the BMH. This option is a standard earthing system but requires additional trenching and excavation and a greater level of installation activity. It was not selected as there was not sufficient space around the BMH MBA or on the beach.

**Sea Plate**

In some scenarios, a sea plate may be selected as the system earth for projects. If selected, a sea plate would be installed 5 m below the water level by crane from a barge or by floating into position using buoys. Once in position, the buoys are removed and the sea plate is lowered to the seabed with divers monitoring and controlling its progress so that it lands on unobstructed soft ground (i.e. avoiding debris or rocks preventing it from burial). Once on the seabed, where the seabed is a soft sediment, the sea plate should sink into the seabed naturally, but divers may also jet to fluidise the sediment beneath the sea plate to facilitate the sinking process further. The sea plate would be secured where required to ensure stable attitude on the seabed. The installation will occur simultaneously with the existing installation work in shallow water during PLSE.

This option was discarded for the Daraja Project as it would require the sea plate to be installed within the MMNR, which may cause potential environmental impacts in the protected area. Therefore, the Daraja Project is considering other more feasible options for the system earth, as described in **Sections 3.3.2** and **3.4.2.1**.

#### 4.1.2.2 BRANCHING UNIT TYPE AND LOCATION

An ASN standard BU was replaced by an X-BU, which provides functionality and switching capability for the full cable capacity of up to 24 Fibre Pairs in one single node. It has also been designed to be modular to better suit each project's requirements. It can perform "hot switching" meaning it is more resilient as it is not necessary to depower the segment or to modify the system powering conditions in case of cable faults on any leg.

The X-BU's location was also revised from outside Kenyan waters to within the Kenyan EEZ. The original location was over 4,300 m water depth, meaning that only certain vessels could retrieve it for repair. The X-BU is now at 3,400 m water depth and retrievable by all repair vessels.

### 4.1.3 SUBSEA CABLE INSTALLATION SHORE CROSSING METHODS

#### 4.1.3.1 HORIZONTAL DIRECTIONAL DRILLING

The landing site will require beach excavation methods to connect the subsea cable from its nearshore landing point to the BMH MBA. Horizontal Directional Drilling (HDD) is a potential alternative to excavating a trench up the beach. HDD is a process whereby a tunnel is bored underground from the BMH area to a point offshore where the bore exits thereby avoiding trenching across the beach. The subsea cable is then installed through the bored conduit to connect the marine portion of the subsea cable to the terrestrial infrastructure. HDD may be considered where it is necessary to avoid specific coastal features or habitats, but requires the use of specialist drilling equipment, suitable geology and a larger footprint for the drill site, and can be overall more complex than trenching, so is not the preferred option where trenching is a feasible alternative.

#### 4.1.3.2 TRENCHING

Excavating an open cut trench across the beach will result in a greater degree of disturbance to the beach surface but would require a smaller footprint than HDD and is temporary. Due to the smaller footprint and temporary nature of this type of excavation (the trench is filled in and the beach contour is mechanically restored in just a few days), the nearshore area and environment typically returns to its original state within several days after open cut trenching occurs. For these reasons, trenching is the preferred option for the Daraja Project.

## 4.2 ROUTE ALTERNATIVES

The following sub-sections describe the route and location alternatives for specific portions of the Daraja Project. These alternatives include the subsea cable route, landing point and BMH locations.

### 4.2.1 SUBSEA CABLE ALTERNATIVES

In some scenarios, land-based fibre optic cables are an alternative to subsea cables for connecting large distances. Land-based fibre optic cables require extensive trenching and the establishment of appropriate servitudes. The land-based fibre optic cables would also encounter environmentally sensitive features such as surface water bodies (e.g. rivers, streams, and wetlands), conservation areas and endangered ecosystems. In practice, it has been found that installation costs are higher for terrestrial systems due to the increased complexity associated with the installation and repair activities. Cable faults in terrestrial

systems are known to be more frequent, disrupting communication services. For these reasons, terrestrial fibre-optic cable burial for a system of several thousand kilometres, like the Daraja Project, would not be a feasible alternative for Kenya.

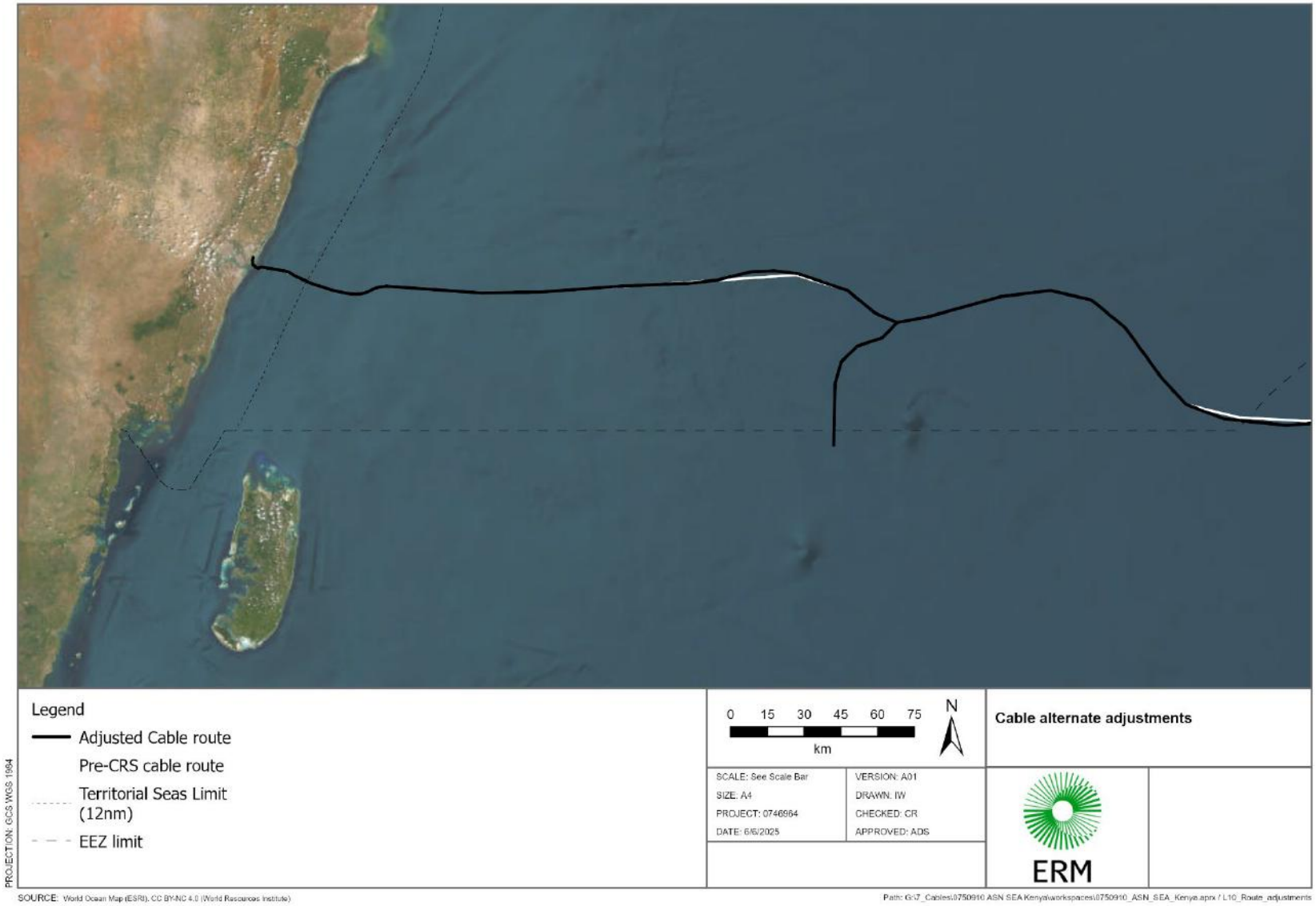
Marine subsea cable routes are developed through an iterative process of reviewing desktop and survey information. As more information becomes available, incremental changes to the preferred subsea cable route are made. A Desktop Study (DTS) was undertaken by ASN to determine the pre-survey cable route for the proposed Daraja Project in October 2024.

The CRS was subsequently completed in February 2025 and has been used to inform the selection of the final, preferred subsea cable route, which avoids sensitive marine environmental and physical features (i.e. seamounts, rocky outcropping) as far as is reasonably practicable. The Daraja Project is located in an area which also includes shipping, fishing, and tourism activities and the route has been engineered to minimise interaction with existing seabed infrastructure and areas of greatest anthropogenic activity, where possible. The Daraja Project aims to utilise areas with relatively few constraints to maximise burial potential and system security and to avoid areas of intense fishing activity and other potentially conflicting seabed uses. To achieve this, the effect of environmental and anthropogenic factors on the subsea cable routing, engineering, installation and repair were considered.

The determination of the subsea cable route for the landing site is based on the DTS and Cable Route Study, including visits to potential landing sites, followed by detailed offshore and nearshore marine geophysical surveys. Subsea cable routing has been designed to avoid locations of known subsea disturbance, all helping to ensure the highest levels of availability. As shown in **Figure 4-1** to **Figure 4-3**, the subsea cable route has been adjusted in Kenyan waters, and in the nearshore of the landing site on Nyali Beach, Mombasa, following the CRS. The route in yellow was designed prior to conducting the CRS. Following its completion in the completion in February 2025, the subsea cable route was updated to avoid rocky outcrops or steep slopes.

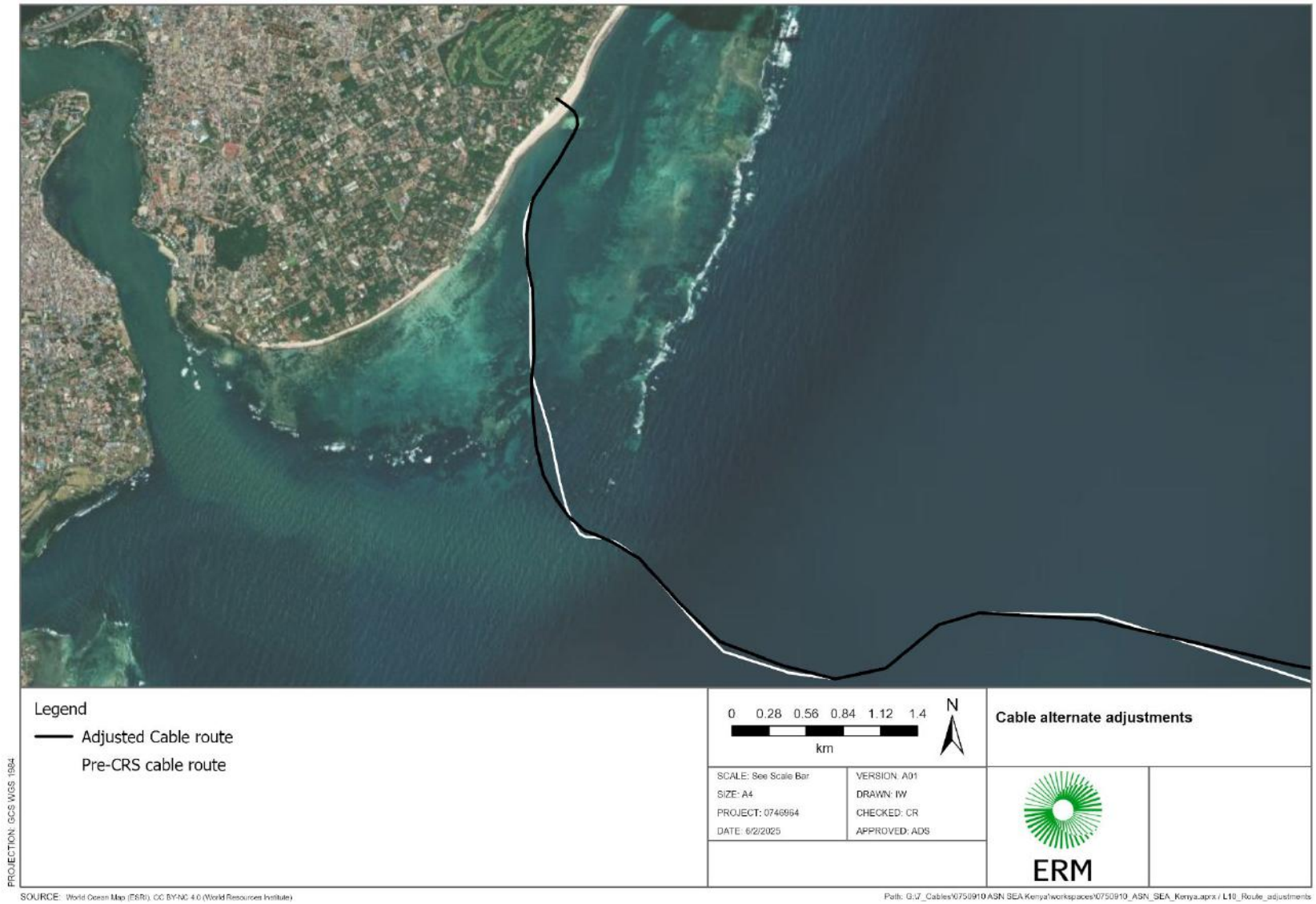
Under the mitigation hierarchy, subsea cable systems are micro-routed during installation to find the optimal route that avoids or minimises interaction with sensitive habitats. The optimal subsea cable route enables the subsea cable connection to be made in the shortest distance whilst avoiding areas that pose a hazard to the subsea cable, such as areas of intensive fishing or shipping activity. Seabed conditions are assessed, and routes are adapted to avoid unstable regions and minimise the likelihood of the subsea cable becoming suspended across irregularities on the seabed. Environmentally sensitive, protected and designated sites are also considered in subsea cable routing and avoided where possible.

## FIGURE 4-1 THE SUBSEA CABLE ALTERNATIVE ADJUSTMENTS IN THE KENYAN EXCLUSIVE ECONOMIC ZONE



## FIGURE 4-2 THE SUBSEA CABLE ALTERNATIVE ADJUSTMENTS IN THE KENYAN TERRITORIAL SEAS

## FIGURE 4-3 THE SUBSEA CABLE ALTERNATIVE ADJUSTMENTS IN THE NEARSHORE OF NYALI BEACH, MOMBASA, KENYA



### 4.2.2 LANDING SITE AND BMH LOCATION ALTERNATIVES

A number of criteria have been used to determine the operational, environmental, and financial feasibility of the selected landing site. The most important of these factors include:

- Physical conditions of the site in terms of geotechnical stability, beach slope, shoreline erosion potential;
- Availability of land that can be acquired or leased for the facilities;
- Availability of public land that can be used for cable routes under government approval;
- Proximity to existing public utility services such as power, sewerage and water;
- Proximity to existing terrestrial telecommunications infrastructure for housing of equipment and provision of backhaul (i.e. linkages to existing terrestrial networks);
- Avoidance of busy shipping areas to avoid locations where anchors may drag on the seabed;
- Avoidance of sensitive or protected areas such as marine reserves, coastal dunes, or sensitive ecosystems;
- Avoidance of sensitive fishing areas to avoid impacting fishing activities; and
- Minimising level of worker H&S risk during installation and operation.

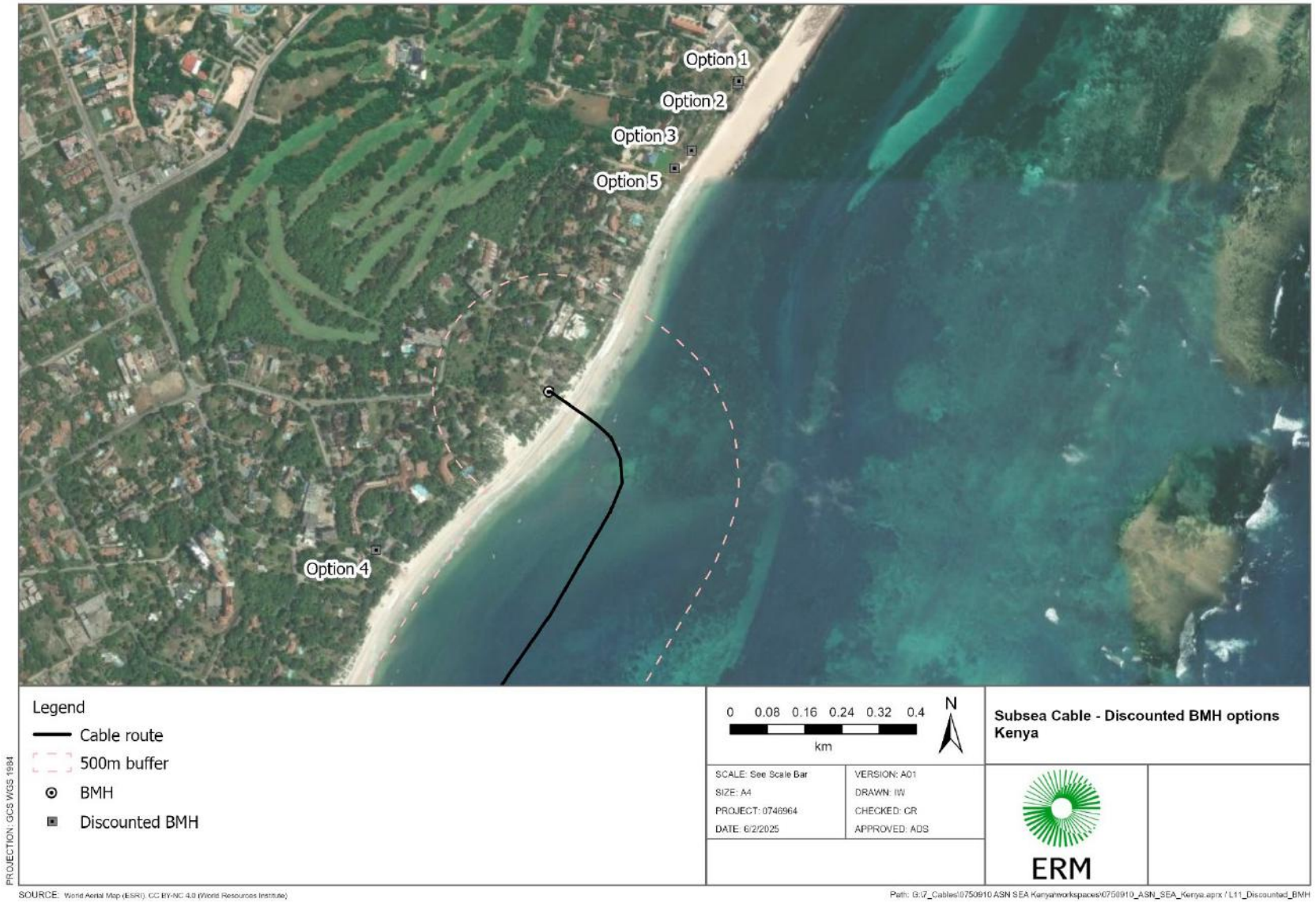
Five (5) sites were considered for the BMH MBA locations, as shown in **Figure 4-4**. The coordinates of the five (5) BMH MBA options are presented in **Table 4-1**. However, they have been discarded as outlined in the subsections below.

TABLE 4-1 LOCATIONS OF THE DISCARDED BMH OPTIONS

| Discarded Location Description | Latitude | Longitude |
|---|---|---|
| Option 1 | 004° 02.453’ S | 039° 42.819’ E |
| Option 2 | 004° 02.453’ S | 039° 42.809’ E |
| Option 3 | 004° 02.458' S | 039° 42.815' E |
| Option 4 | 004° 03.014' S | 039° 42.420' E |
| Option 5 | 004° 02.558' S | 039° 42.748' E |

Note: WGS84 Datum in degrees decimal minutes.

## FIGURE 4-4 LOCATIONS OF DISCARDED BMH OPTIONS



#### 4.2.2.1 OPTION 1 (DISCARDED)

Option 1 BMH is situated on a beach access path next to the military compound, as shown in **Figure 4-5**.

This site has been discarded as an option because:

- The walls on either side of the path make it a secluded spot where security of the BMH may be compromised;
- The narrow path means that during installation beach access for the community would be restricted, in addition to the logistics of access for machinery during installation; and
- The presence of the military barracks also introduces potential regulatory and security considerations.

FIGURE 4-5 LOCATION OF THE DISCARDED OPTION 1 BMH


Source: ASN, 2024

#### 4.2.2.2 OPTION 2 (DISCARDED)

Option 2 BMH is located within the military barracks compound near the north-eastern wall.

This site has been discarded as an option because:

- Although restricted access to the military compound means that the BMH will be highly protected from unauthorised access or vandalism, it also means access for construction and repair may be heavily restricted;

- There is a steep incline to the beach which would require deep trenching or directional drilling and associated disturbance of the area; and
- The beach also shows evidence of soil erosion at the base of this incline, which may pose challenges for future stabilisation of the incline.

FIGURE 4-6 LOCATION OF THE DISCARDED OPTION 2 BMH


Source: ASN, 2024

#### 4.2.2.3 OPTION 3 (DISCARDED)

Option 3 BMH is located just outside the military barracks compound.

- This site has been discarded as an option because:
- Steep, sea-facing incline which combined with erosion, poses stability issues for the BMH and the subsea cable;
- Despite being located outside the military compound, plant and machinery would still need to be transported through the military area or significantly along the beach risking affecting turtle nests and beach users; and
- Would require the military compound fence to be broken (and restored) to allow access to the land duct network on the western edge of the compound.

FIGURE 4-7 LOCATION OF THE DISCARDED OPTION 3 BMH


Source: ASN, 2024

#### 4.2.2.4 OPTION 4 (DISCARDED)

There is an existing BMH located on the Nyali beach access road lying 150 m towards the southwest of Muthu Nyali Beach Resort. The 2Africa, Africa-1 and PEACE cables all land at the existing BMH. This makes the approach to the landing point technically congested as it is difficult to maintain appropriate separation between the subsea cables to allow repair as any new subsea cables would need to cross these existing subsea cables in a restricted area and encroach on a coral area.

FIGURE 4-8 LOCATION OF THE DISCARDED OPTION 4 BMH


Source: ASN, 2024

#### 4.2.2.5 OPTION 5 (DISCARDED)

Option 5 BMH is located approximately 70 m north-east of Nyali Beach Resort along a slightly elevated and undeveloped beach access road.

This site has been discarded as an option because:

- There is evidence of soil erosion at the top of the beach which could extend towards the BMH;
- The point of entry to the beach from this road is also undeveloped;
- There are private properties on either side of the access road which could require negotiations or permissions if the access route affects these properties; and
- The access track would be restricted or blocked for beach access during the subsea cable installation works.

FIGURE 4-9 LOCATION OF THE DISCARDED OPTION 5 BMH


Source: ASN, 2024

### 4.2.3 ORDER OF PROJECT ACTIVTIES ALTERNATIVES

Should the BMH MBA not be constructed on site within the timeframe for the subsea cable landing on Nyali Beach, the Daraja Project may require dry storage of the subsea cable on the beach within the permission of the permits to be obtained for the Daraja Project.

The current shore-end installation methodology is to trench 6 m wide up the beach and connect the subsea cable into the BMH MBA through the concrete headwall and seaward-facing ducts. However, for dry storage, this would entail digging the 6 m wide trench on the beach and burying the subsea cable until the installation shore-end infrastructures are completed (i.e. the BMH MBA, seaward-facing ducts and concrete headwall). Once the installation shore-end infrastructures are completed, the subsea cable would be connected into the BMH MBA.

## 4.3 BEACH MANHOLE CONSTRUCTION ALTERNATIVE

An alternative for the BMH MBA construction could be for it to be constructed offsite, such that the prefabricated BMH will be transported and installed at Nyali Beach (**Figure 4-10**). This process would be conducted as part of the shore-end installation activities prior to landing of the subsea cable at the Mombasa landing site.

For a prefabricated BMH, the works area will be used by the excavator 1 m along each side of the BMH, and also to lower the new prefabricated BMH into position. The excavation will likely require a concrete base for the BMH to sit on and a concrete top which would be poured on site. Whether the BMH MBA is constructed offsite and transported to Nyali Beach for

installation, or else constructed in-situ, the impacts associated with construction / installation of the BMH MBA are not anticipated to change significantly.

FIGURE 4-10 EXAMPLE OF A PREFABRICATED BEACH MANHOLE

Source: ASN, 2024

## 4.4 PROJECT DEVELOPMENT OPTIONS

Project development occurs over four (4) stages:

- ESIA scoping;
- ESIA study;
- ESIA disclosure; and
- Project execution.

### 4.4.1 NO PROJECT OPTION (NO ACTION)

The option to not proceed with the Daraja Project will leave the areas along the subsea cable route in their current environmental state. The no-action alternative entails no change, i.e. the subsea cable installation activities will not be conducted.

Assuming that the Daraja Project is not installed, Kenya would continue to be constrained by the need for additional telecommunications capacity, especially in international data transfer. This could hinder economic growth and risk Kenya becoming isolated from the global community, as sophisticated data transfer mechanisms are employed elsewhere that Kenya would need help accessing.

Given the demand for high-speed telecommunications links, capacity, reliability and diversity, another cable system will likely be proposed soon to address this demand. The details of such a project are hypothetical but can be assumed to be similar in scope and, therefore, involve similar impacts as those addressed in this document.

Should the no-action alternative be selected, the Daraja Project would not be able to facilitate improved communication capacity and internet service to Kenya. Therefore, this is not a suitable alternative and has not been considered further.

### 4.4.2 DELAYED OPTION

The delayed alternative would result in the project being installed at a later date. Reasons for pursuing a delayed alternative can vary, but this approach is typically taken when economic or political conditions are unfavourable for implementing the Daraja Project such as decrease in demand, in-war situations or where there is significant opposition from stakeholders and host communities. None of these conditions are applicable to this Project and its anticipated timeline.

If the Daraja Project is delayed, most preliminary work and associated efforts may need to be repeated or changed. A Project delay may also result in higher Project costs due to inflation, which could affect the Project's overall profitability. On this basis, there are no reasons to delay the installation to a later date, and the delayed option is not the preferred alternative for the Daraja Project.

### 4.4.3 GO-AHEAD OPTION

The "Go-Ahead" option, or pursuing the Daraja Project outlined in this ESIA Report, will have numerous benefits for both the Project Proponent and the people of Kenya. The Daraja Project will enhance telecommunications capacity for Kenyan users as well as provide high-speed connectivity to the global network. Given these benefits, the 'go-ahead' alternative, or installation of the Daraja Project, is preferred.

## 4.5 SILT CURTAINS AS MITIGATION MEASURE

Typically, 95% of the silt from a construction project or pipeline disposal will drop to the bottom, while only about 5% of the sediment remains suspended in the water column to cause turbidity. A silt curtain is suspended within 1 to 2 m of the surface, not to dam the turbid water, but instead to provide control for the dispersion of sediment-laden water and allow it to settle. Also note that silt curtains are typically used for static sources of sediment.

There are several factors that affect the effectiveness of the silt curtain, making it unsuitable for subsea cable installation:

- Source - Silt curtains are typically used for static sources of sediment. The Daraja Project site of activity is constantly changing as installation progresses.
- Area of deployment – open sea areas are severely affected by wave height, tidal flow and wind conditions, reducing their effectiveness.
- Period of deployment - The industry considers short-term deployments of silt curtains to be those less than 12 months. The Daraja Project is considering a deployment that will be moved every few days as cable installation progresses.

- Level of vessel traffic – silt curtains require night-time visibility aids, navigation markers and exclusion zones restricting vessel movement within the lagoon.
- Water depth – silt curtains need to remain clear of the seabed at low tide to avoid damaging sensitive coral, restricting the depth of the curtain that can be used within the Nyali Beach lagoon.
- Mooring technique – the stronger the current the greater the level of mooring required. As the silt curtain would need to be moved regularly it would length the period of deployment and increase the number of areas disturbed by mooring the silt curtain.
- Silt curtain concentrates the silt in an area rather than allow a lower turbidity level over a wider area, which benthic species maybe able to cope with easier.

Due to the short-term nature of the subsea cable installation works within the Nyali Beach lagoon and the fact that the area of work and source of turbidity move every day, silt curtains are not recommended as a mitigation measure.

# 5. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORKS

This Chapter of the report provides a detailed overview of the mandatory ESIA study for the application of an EL. It also describes the pertinent local and national regulations, standards and policies governing environmental quality, health and safety, and protection of sensitive ecosystems that may be applicable to the Daraja Project, and that may require additional permitting processes. Good international industry practices relevant to the Daraja Project, including international conventions, protocols and agreements are also summarised in this Chapter.

## 5.1 NATIONAL INSTITUTIONS, LAWS AND REGULATIONS

### 5.1.1 ADMINISTRATIVE STRUCTURE

#### 5.1.1.1 NATIONAL ENVIRONMENTAL MANAGEMENT AUTHORITY

NEMA was established under the EMCA as the principal instrument of the GoK for the implementation of all policies relating to the management of the environment. The main objective of the Authority is to ensure a clean, healthy, and sustainable environment in Kenya through supervision and coordination of all matters relating to the environment. NEMA is the principal instrument in Government in the implementation of all policies relating to the environment. NEMA is also responsible for monitoring compliance with all the environmental regulations. The most relevant of the Authority's list of mandates is its role to advise the Government on legislative and other measures for the management of the environment or the implementation of relevant international conventions, treaties, and agreements.

#### 5.1.1.2 MINISTRY OF INFORMATION, COMMUNICATIONS AND THE DIGITAL ECONOMY

The Ministry of Information, Communications and The Digital Economy (MICDE) is responsible for formulating, administering, managing and developing the Information, Broadcasting and Communication policy. In October 2022, through an Executive Order No. 1/2022, the Ministry was split into two (2) state Departments. The State Department of Broadcasting and Telecommunications and The State Department of ICT and Digital Economy.

#### 5.1.1.3 COMMUNICATION AUTHORITY OF KENYA

The Communication Authority of Kenya (CAK) is the regulatory authority for the communications sector in Kenya. Established in 1999 by the Kenya Information and Communications Act, 1998, the Authority is responsible for facilitating the development of the information and communications sectors including; broadcasting, cybersecurity, multimedia, telecommunications, electronic commerce, postal and courier services.

The CAK is relevant to the Daraja Project given that the Authority is responsible for licensing all systems and services in the communications industry, including telecommunications.

#### 5.1.1.4 KENYA WILDLIFE SERVICE (INCLUDING THE WILDLIFE AND RESEARCH TRAINING INSTITUTE)

The KWS is a state corporation that was established by an Act of Parliament (Cap 376), now repealed by the Wildlife Conservation and Management Act (2013), with the mandate to conserve and manage wildlife in Kenya, and to enforce related laws and regulations. KWS, together with the WRTI, undertakes conservation and management of wildlife resources across all protected areas in collaboration with stakeholders.

#### 5.1.1.5 DEPARTMENT OF LANDS AND PHYSICAL PLANNING, MOMBASA COUNTY

The Department of Lands and Physical Planning, Mombasa County is charged with the mandate of overseeing land administration through policies that guide land usage in Mombasa.

#### 5.1.1.6 DEPARTMENT OF TRANSPORT, INFRASTRUCTURE AND PUBLIC WORKS, MOMBASA COUNTY

The Department of Transport, Infrastructure, and Public Works in Mombasa County is responsible for maintaining and developing the county's infrastructure. This includes the construction and repair of roads, drainage systems, footpaths, street lighting, and traffic lights. The department reviews permits for construction works, including excavations.

#### 5.1.1.7 KENYA MARITIME AUTHORITY

The Kenya Maritime Authority (KMA) is a statutory authority, established under the Kenya Maritime Act of 2006, with a mandate to regulate, coordinate, and oversee Maritime affairs in the Republic of Kenya (GoK, 2012).

#### 5.1.1.8 THE DIRECTORATE OF OCCUPATIONAL HEALTH AND SAFETY SERVICES

The Directorate of Occupational Health and Safety Services (DOSHS) is one of the departments within the Ministry of Labour and Social Protection, whose primary objective is to ensure the safety, health, and welfare of all workers in all workplaces. The Directorate seeks to prevent unsafe and unhealthy work environments that often cause accidents, diseases, disasters and environmental pollution and occasion huge economic and social burdens to individuals and enterprises, thereby stifling economic and social growth. The Directorate enforces the Occupational Safety and Health Act, 2007 (OSHA, 2007) with its subsidiary legislation which aims at the prevention of accidents and diseases at work. It also administers the Work Injury Benefits Act, 2007 (WIBA, 2007) which provides for compensation of workers who have been injured or have suffered a disease out of and in the course of employment.

#### 5.1.1.9 COASTAL DEVELOPMENT AUTHORITY

The Coast Development Authority (CDA) is a State Corporation established by an Act of Parliament No. 20 of 1990 (Cap 449), revised in 1992. CDA's mandate is to plan and co-ordinate the implementation of development projects in the entire Coast Region, as well as the EEZ. The CDA area of jurisdiction covers 103,326 $km^2$ and the EEZ (out to 200 nm). CDA promotes sustainable development in the Coast Region by coordinating projects, conserving the environment, enhancing food security, and fostering economic opportunities.

#### 5.1.1.10 KENYA MARINE AND FISHERIES RESEARCH INSTITUTE

The Kenya Marine and Fisheries Research Institute (KMFRI) is responsible for conducting research in marine and freshwater fisheries, aquaculture, environmental and ecological studies. Their work provides scientific data and information crucial for the sustainable development of Kenya's Blue Economy.

#### 5.1.1.11 KENYA COAST GUARD SERVICE

The Kenya Coast Guard Service (KCGS) is a national security Service established under the Kenya Coast Guard Service Act No. 11 of 2018. The Service is responsible for enforcement of laws and regulations in Kenya's territorial and inland waters. The functions of KCGS include: enforcement of maritime security and safety; pollution control; prevention of trafficking of the

narcotic drugs, prohibited plants and psychotropic substances; prevention of trafficking of illegal goods; prevention of trafficking of illegal firearms and ammunitions; enforcement of sanitation measures; securing ports, harbours, coastal and inland waters; protection of maritime resources including fisheries; and protection of archaeological or historical objects or sites.

In addition, KCGS responds to maritime emergencies such as search and rescue and marine spill response. KCGS is empowered to prosecute maritime offenders.

#### 5.1.1.12 MINISTRY OF LANDS, PUBLIC WORKS, HOUSING AND URBAN DEVELOPMENT (NAIROBI) - STATE DEPARTMENT FOR LANDS AND PHYSICAL PLANNING

The State Department for Lands and Physical Planning (Nairobi) has a broad range of responsibilities aimed at ensuring efficient land administration, equitable access, secure tenure, and sustainable management of land resources. The following are some of their key responsibilities:

- Policy and Coordination: Formulating national land policies and coordinating land planning by counties, including providing technical assistance and capacity building.
- Physical Planning: Offering advisory services on national physical planning, setting general principles on land planning, and ensuring coordination of planning standards across the country.
- Land Adjudication and Settlement: Managing land rights and interests, land consolidation, and adjudication. They also handle the acquisition of agriculturally viable land for settling poor, landless Kenyans.
- Surveys and Mapping: Conducting land surveys and producing accurate geographical data in various formats.
- Land Administration: Administering and managing private land, regulating land use, and maintaining land records.
- Land Valuation: Valuing land and assets for purposes such as stamp duty, government leasing, and developing a National Land Value Index.
- Land Registration: Registering land transactions and other legal documents, and resolving land and boundary disputes in collaboration with the Surveys Department.

#### 5.1.1.13 NATIONAL LANDS COMMISSION

The National Lands Commission (NLC) is a constitutional commission established under Article 67 (1) of the Constitution of Kenya 2010. The Commission is mandated to perform the following functions relevant to the Daraja Project:

- To manage public land on behalf of the national and county governments;
- To assess tax on land and premiums on immovable property in any area designated by law; and
- To monitor and have oversight responsibilities over land use planning throughout the country.

## 5.1.2 APPLICABLE NATIONAL POLICY PROVISIONS

### 5.1.2.1 THE CONSTITUTION OF KENYA 2010

Article 42 of the Constitution provides that every citizen has a right to a clean and healthy environment. The legal rationale of public participation in an ESIA comes from the Constitution, where it states that every Kenyan citizen has the right to have the environment protected for the benefit of the present and future generations. Articles 10 and 69, respectively, recognise public participation as a principle of governance and give the state a responsibility to encourage public participation in the management, protection and conservation of the environment (GoK, 2010). The ESIA process was undertaken so that the constitutional right to a clean and healthy environment is upheld. Additionally, the public participation undertaken was done so that inclusive public participation as required under Articles 10, 42, and 69, thereby safeguarding environmental rights for both current and future generations.

### 5.1.2.2 KENYA VISION 2030

Kenya Vision 2030 is the country's development blueprint covering the period 2008-2030. It aims to transform Kenya into a newly industrialised, "middle income country providing a high-quality life to all its citizens by the year 2030". Vision 2030 is based on three (3) key pillars, namely: Economic, Social, and Political. These pillars are anchored on the foundations of infrastructure, and public sector reforms, among others. ICT, and therefore the development of telecommunication infrastructure, is identified as an enabler or foundation for socio-economic transformation. The Vision recognises the role of science, technology, and innovation in the modern economy in which new knowledge plays a central role in boosting wealth creation, social welfare, and international competitiveness. In alignment with Kenya Vision 2030, the Daraja Project supports national development by enhancing ICT infrastructure, which is a key enabler of economic and social transformation. By expanding digital connectivity, the Daraja Project contributes to the country's goal of becoming a middle-income, knowledge-based economy.

### 5.1.2.3 NATIONAL ENVIRONMENT POLICY, 2013

The National Environment Policy aims to ensure a high quality of life for present and future generations through sustainable management of the environment and natural resources. Key objectives include providing a framework for integrated planning and sustainable management, strengthening legal and institutional frameworks for good governance, and promoting research and capacity development. The policy emphasises the sustainable use of unique terrestrial and aquatic ecosystems, promoting innovative environmental management tools, and enhancing cooperation and partnerships. It also addresses cross-cutting issues such as poverty reduction, gender, and health, and promotes the domestication of multilateral environmental agreements. In the context of subsea cable and ICT infrastructure development, this policy underscores the importance of conducting thorough EIAs/ESIAs and Strategic Environmental Assessments (SEAs) to ensure that such projects are sustainable and do not harm marine ecosystems. In compliance to this policy, the Daraja Project has developed an ESIA that integrates environmental sustainability into all phases of planning and implementation.

#### 5.1.2.4 THE NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN (2019-2030)

The National Biodiversity Strategy and Action Plan (NBSAP) aims to conserve biodiversity, promote sustainable use, and ensure equitable benefit sharing. Key objectives include protecting and restoring ecosystems, species, and genetic diversity, with a focus on endangered species and degraded habitats. The plan emphasises sustainable practices in agriculture, forestry, and fisheries to meet current and future needs. It also aims to ensure fair distribution of benefits, particularly for local and indigenous communities. Enhancing knowledge and capacity through research, education, and public awareness, along with developing supportive policies and legislation, are crucial. Addressing threats like habitat loss, climate change, pollution, and invasive species is also a priority. To comply with the NBSAP, the Daraja Project will avoid and mitigate potential impacts on marine biodiversity, particularly in sensitive habitats. It will promote sustainable resource use, support biodiversity monitoring, and raise awareness through stakeholder engagement and education undertaken as part of the ESIA process.

#### 5.1.2.5 NATIONAL POLICY ON WATER RESOURCES MANAGEMENT AND DEVELOPMENT, 1999

The National Policy on Water Resources Management and Development promotes the systematic development of water facilities in all sectors while recognising wastewater as a by-product of this process. The Policy therefore calls for development of appropriate sanitation systems to protect people's health and water resources from institutional pollution. This implies that industrial and business development activities should be accompanied by corresponding waste management systems to handle the wastewater and other waste emanating from there. The Daraja Project must manage waste properly, including stormwater and effluent, to prevent water pollution. The Daraja Project will comply with MARPOL 73/78 regulations, that all sanitation and effluent discharge practices meet national standards, protecting both human health and aquatic ecosystems.

#### 5.1.2.6 NATIONAL OCEANS AND FISHERIES POLICY, 2008

The policy aims to ensure sustainable management and utilisation of marine resources. Its main objectives include promoting conservation and sustainable management of fisheries, maximising employment and revenue from fisheries, enhancing food security through increased fish production, and promoting safety at sea. Additionally, it seeks to foster an integrated economy by encouraging investment in recreational and ornamental fisheries, balancing economic growth with the conservation of marine ecosystems and the well-being of coastal communities. The Daraja Project will traverse areas where artisanal fishing occurs. It is important to mitigate against impacts on the fisheries in the area as a result of ship movements and laying of the subsea cable. This ESIA study has generated an ESMP that aims to minimise disruption to artisanal and commercial fisheries by carefully scheduling marine operations and allowing continued engagement. Mitigation measures will be implemented to reduce the potential impact of subsea cable laying and ship movements on marine livelihoods.

#### 5.1.2.7 NATIONAL ICT POLICY, 2019

This Policy aims to position ICT at the core of the national economic agenda. Its main objectives include enhancing access to high-speed internet across the country, fostering the growth of data centres and local manufacturing, and promoting a secure innovation ecosystem. The policy also seeks to increase ICT's contribution to the economy to 10% by 2030, leverage global opportunities, and enhance education and skills to support emerging

trends like the gig economy. Additionally, it aims to achieve global recognition for innovation and efficiency in public service delivery. By expanding high-speed internet infrastructure, the Daraja Project supports the objectives of the National ICT Policy. It will contribute to economic growth, foster innovation, and enhance Kenya's global competitiveness in the digital economy, while supporting data security and resilience.

#### 5.1.2.8 NATIONAL LAND POLICY, 2009

The overall objective of the National Land Policy is to secure rights over land and provide for sustainable growth, investment, and the reduction of poverty in line with the Government's overall development objectives. Specifically, the policy shall offer a framework of policies and laws designed to ensure the repair of a system of land administration and management that will provide:

- All citizens with the opportunity to access and beneficially occupy and use land.
- Economically viable, socially equitable and environmentally sustainable allocation and use of land.
- Efficient, effective, and economical operation of land markets.
- Efficient and effective utilisation of land and land-based resources.
- Efficient and transparent land dispute resolution mechanisms.

The Daraja Project will provide equitable and sustainable land use for terrestrial infrastructure components by acquiring all requisite permits from respective agencies for rights to use land and in Kenyan waters. It will comply with land acquisition laws, respect community land rights, and promote transparent and efficient land management practices throughout the Daraja Project lifecycle.

### 5.1.3 APPLICABLE LAWS AND REGULATIONS

#### 5.1.3.1 KENYA INFORMATION AND COMMUNICATION ACT, 1998

The Kenya Information and Communication Act establishes the Communications Authority to regulate the communications sector in Kenya, including telecommunications, broadcasting and postal services. The act includes in Part 3, Section 24, Subsection 1 that no person shall operate a telecommunication system or provide telecommunication services except in accordance with a valid licence, as stated in the act. The Daraja Project will comply with the Kenya Information and Communication Act by securing all necessary licences from the CAK before operating any telecommunication systems. This includes obtaining authorisation for the installation and operation of the subsea cable, as required under Section 24(1) of the Act.

#### 5.1.3.2 ACCESS TO INFORMATION ACT, 2016

The Act aims to actualise the constitutional right to access information. It mandates public entities and relevant private bodies to proactively disclose information and respond to public requests. The Act promotes transparency, accountability, and public participation by ensuring routine and systematic information disclosure. It also provides protections for individuals who release information in the public interest and outlines the roles and powers of the Commission on Administrative Justice in overseeing and enforcing these provisions. In line with the Access to Information Act, the Daraja Project will provide transparency and accountability by proactively disclosing relevant Daraja Project information to the public through the ESIA study disclosure process. The ESIA study process will include mechanisms for timely responses to

information requests and will facilitate public access to environmental and social data, thereby promoting informed participation and oversight.

#### 5.1.3.3 THE COUNTY GOVERNMENTS (AMENDMENT) ACT 2020 (AMENDMENT OF THE COUNTY GOVERNMENTS ACT NO. 17 OF 2012)

Part VII of the Act provides principles of citizen participation in counties including timely access to information, access to the process of formulating and implementing policies, laws and regulations, promotion of interest and rights of minorities, grievance redress and regional balance in decision making process.

Part XI of the Act empowers County Governments to oversee planning of development projects by coordinating and ensuring integrated planning including coordinating the public participation and environmental protection. The formed Counties technical planning units define: the County Integrated Development Plan (CIDP), sectoral plans, county spatial plan, and cities and urban areas plans. The act also provides for the a) constitution to confer powers on the County Assemblies to receive and approve plans and policies, and b) Ensuring and coordinating the participation of communities in governance at the local level. Through the ESIA study process for Daraja Project, the Daraja Project will uphold principles of citizen participation, including timely access to information, grievance redress mechanisms, and inclusion of minority and vulnerable groups in decision-making. Further, the Daraja Project has engaged Mombasa County to ensure alignment with CIDPs and spatial plans.

#### 5.1.3.4 THE LANDS ACT, 2012

The Kenyan constitution gives the NLC the responsibility of managing public lands on behalf of the National and County governments. In this Act, 'land' refers to seabed and subsoil of the TS and EEZ. Section 10 of this Act states, 'no person shall carry out development in an interim planning area except with the consent of the authority under these regulations…'. Consent from the physical planning office is to be obtained by the Project Proponent prior to landing the subsea cable. To facilitate preparation of leases on public land, the commission is to request three (3) copies of seabed cadastral maps in form LA 12, set out in the NLC Regulations scheme. The lease documents and cadastral maps then will be forwarded to the Chief Land Registrar for registration and issuance of certificate of lease. Articles 5 and 7 of United Nations Convention on the Law of the Sea (UNCLOS) give the coastal nations exploitation rights over their EEZs (Refer to **Section 5.2.1.1** for further detail). Such rights include the right of installations and structures, such as submarine cables and pipelines (UNCLOS, 1982). A seabed lease, in line with the Lands Act and the provisions of UNCLOS, is to be obtained. The Land Act, however, defers powers for allocation of private land that is in a sensitive environment to other Ministries that have justification over the proposed land use activities. In this case, because the seabed and beach are considered sensitive, the CAK is the key ministry / authority to approve the use of the seabed. Based on this approval, the Lands Commission would then be able to add its consent for the use/occupation of the seabed and beach. The Daraja Project will obtain all necessary consents and leases for the use of seabed and beach land, as required under the Lands Act. This includes submitting seabed cadastral maps and lease documentation to the NLC and Chief Land Registrar. The Daraja project will also comply with the provisions of UNCLOS regarding the installation of submarine cables within Kenya's EEZ.

#### 5.1.3.5 THE NATIONAL LAND COMMISSIONS ACT, 2012

This is an Act of Parliament to make further provision as to the functions and powers of NLC, qualifications, and procedures for appointments to the commission, to give effect to the objects and principles of devolved government in land management and administration, and for connected purposes. In particular, this Act mandates the NLC to manage public land on behalf of the national and county governments. The Daraja Project will work closely with the NLC to ensure lawful access and use of public land. This includes adhering to NLC procedures for land allocation, lease issuance, and environmental safeguards.

#### 5.1.3.6 THE PHYSICAL AND LAND USE PLANNING ACT (NO. 13 OF 2019)

This is an Act of Parliament that makes provision for the planning, use, regulation, and development of land and for connected purposes. The Physical and Land Use Planning Act was enacted in 2019 to repeal the Cap 286 of 1996 which has been operational since 1998. The Act provides for the preparation and implementation of physical development plans and other related purposes. Its provisions apply to all parts of the country except such areas as the Minister may specify. Thus, the Act directs, regulates, and harmonises development and use of land all over the country. In addition, the Act provides a vital link with the Environmental Management and Co-ordination Act.

The following sections are relevant to the Daraja Project:

**Section 57** (development permission)

(1) A person shall not carry out development within a county without a development permission granted by the respective county executive committee member.

(2) A person who commences any development without obtaining development permission commits an offence and is liable on conviction to a fine not exceeding five (5) hundred thousand shillings or to imprisonment for a term not exceeding two (2) months or to both.

(3) A county executive committee member shall require a person who has commenced a development without obtaining development permission to restore the land on which the development is taking place to its original condition or as near to its original condition as is possible and that such restoration shall take place within ninety days

**Section 58** (Application for development approval)

(1) A person shall obtain development permission from the respective county executive committee member by applying for development permission from that county executive committee member in the prescribed form and after paying the prescribed fees.

(2) An applicant for development permission shall provide documents, plans and particulars as may be required by the respective county executive committee member to indicate the purposes of the proposed development.

(3) An applicant for development permission shall indicate the proposed uses to which the land shall be put, the population density to which that land shall be subjected and the portion of the land the applicant shall provide for easements as a consequence of the applicant's proposed development.

(4) Where an applicant is not the registered owner of the land for which development permission is being sought, that applicant shall obtain the written consent of the registered

owner of that land and the applicant shall provide that written consent to the respective county executive committee member at the time of applying for development permission.

(5) The development permission granted by a county executive committee member shall be subject to compliance with the provisions of any other written law.

(6) Where an applicant does not receive written response for development permission within 60 days, such permission shall be assumed to have been given in terms of this Act.

(7) A person applying for development permission shall also notify the public of the development project being proposed to be undertaken in a certain area in such a manner as the Cabinet Secretary shall prescribe.

(8) The notification referred to under sub-section (7), shall invite the members of the public to submit any objections on the proposed development project to the relevant county executive committee member for consideration.

**Section 59** (Plans and documents to be prepared by qualified person)

(1) A person applying for development permission shall ensure that any documents, plans and particulars that are provided to the respective county executive committee member while applying for development permission have been prepared by the relevant qualified, registered, and licensed professionals.

**Section 65**

A county executive committee member may impose conditions or impose a fine to be prescribed in regulations on an applicant for development permission for building works where that applicant fails to complete the building works within five years.

According to the **Third Schedule Development Control, Section 4***,* planning authorities shall require applications for major developments to be subjected to E&S impact assessment.

The Daraja Project will obtain development permission from the respective County Executive Committee Member in accordance with Sections 57 and 58 of the Act. All development plans and documents will be prepared by qualified professionals as required under Section 59. The Daraja Project will also provide public notification and participation in line with Section 58 (7–8), and has undergone the ESIA study process as mandated for major developments under the Third Schedule.

#### 5.1.3.7 SURVEY ACT (CAP. 299)

This is an act of parliament that makes provisions in relation to surveys and geographical names and the licensing of land surveyors. Surveyors shall carry out surveying in a manner as to ensure that surveys accord in all respect with the provisions of this Act and regulations made thereunder and shall be responsible for correctness and completeness of every survey carried out by them or under their supervision. Boundaries and benchmarks for any land or holding should be shown on the map. All land and seabed surveys for the Daraja Project will be conducted by licensed surveyors in compliance with the Survey Act. The Daraja Project will review all survey data, including boundaries and benchmarks, so that they are accurate, complete, and conform to the standards set by the Director of Surveys.

#### 5.1.3.8 KENYA MARITIME ACT, 2006 (AS AMENDED 2012)

This Act establishes the KMA to regulate, coordinate, and oversee maritime affairs. Its objectives include administering and enforcing maritime laws, ensuring safety and security in maritime transport, and promoting the development of maritime infrastructure. The Act also aims to enhance maritime training and research, manage marine resources sustainably, and ensure compliance with international maritime conventions. Additionally, it seeks to facilitate maritime trade and protect the marine environment. Under this Act, KMA may require the developer to attain a Vessel Registration Permit from them, to allow the Daraja Project vessel to sail in Kenyan waters. This requirement will have to be confirmed by the KMA. The Daraja Project will comply with maritime safety and environmental protection requirements as stipulated by the KMA. If required, the Daraja Project will obtain a Vessel Registration Permit to operate within Kenyan waters and ensure adherence to international maritime conventions.

#### 5.1.3.9 ENVIRONMENT MANAGEMENT AND COORDINATION ACT, 1999 (AMENDMENT 2015)

The EMCA 1999 (amended 2015), is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the high court if this right has been, is likely to be or is being contravened. Section 58 of the Act makes it a mandatory requirement for an ESIA to be carried out by proponents intending to implement projects specified in the second schedule of the Act (9). Such projects have a potential of causing significant impacts on the environment. Similarly, section 68 of the same Act requires operators of existing projects or undertakings to carry out environmental audits to determine the level of conformance with statements made during the ESIA study. This ESIA study has been undertaken as required under Section 58, given its potential for significant environmental impact. Post-implementation, environmental audits will be conducted in accordance with Section 68 for ongoing compliance with environmental commitments.

#### 5.1.3.10 THE ENVIRONMENTAL (IMPACT ASSESSMENT AND AUDIT) REGULATIONS, 2003 (AMENDMENT 2022)

These Regulations have been developed to regulate the environmental permitting process and provides requisite conditions for conducting impact assessments, project environmental licencing, environmental audit requirements and related technical and compliance requirements. The Regulations state in Regulation 3 that "the Regulations should apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Act". Part II of the Regulations indicates the procedures to be taken during preparation, submission and approval of the ESIA Report. Specifically, the amendment in 2019 (through Legal Notice No. 31) contains an updated version of the Second Schedule in which the Daraja Project (Telecommunication Infrastructure) falls in the category of Medium risk projects for which an ESIA Report is required. Through the issuance of legal notice 32 of 2019, regulation 7 of EMCA, 1999 (amended 2015), has been replaced, and provides updated requirements for the preparation and submission of a Summary Project Report for Low or Medium risk projects. Should the Authority consider that any proposed projects may have a significant adverse environmental impact, it shall recommend that the Project Proponent should submit a Comprehensive Project Report.

Through engagement with NEMA HQ in Nairobi on 1 October 2024, Mr. Geoffrey Wafula from NEMA's Environmental Compliance, HQ, it was stated that the proposed Daraja Project is a High-risk Project, therefore requiring a full ESIA study. The ESIA study process follows the

procedures outlined in Part II of the Regulations, including public participation, submission of a comprehensive report to NEMA, and engagement of licensed ESIA experts.

#### 5.1.3.11 EMCA (WETLANDS, RIVERBANKS, LAKES AND SEA SHORE MANAGEMENT) REGULATIONS, 2009

These Regulations aim to conserve and sustainably use wetland, riverbank, lakes and seashore ecosystems. Regarding seashores, the regulations focus on preventing soil erosion, siltation, and water pollution. They mandate the identification and restoration of degraded seashores, requiring environmental impact assessments for activities likely to affect these areas. The regulations also emphasise the sustainable use of seashore resources through permits and the involvement of local communities in conservation efforts. The Daraja Project ESMP provides mitigation measures for implementing erosion and pollution control to protect the seashore environment. The ESIA study includes mitigation strategies to prevent degradation of coastal ecosystems.

#### 5.1.3.12 EMCA (NOISE AND EXCESSIVE VIBRATION POLLUTION) REGULATIONS, 2009

These regulations provide for the control of noise and excessive vibrations in Kenya. They set out permitting and limit guidelines to ensure that no person makes or causes to be made any loud, unreasonable, unnecessary, or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. The Daraja Project will operate within acceptable noise and vibration levels. The Daraja Project will operate within permissible noise and vibration levels, especially during construction of the BMH MBA on the beach, and subsea cable laying where noise may be generated by construction / installation equipment.

#### 5.1.3.13 EMCA (WASTE MANAGEMENT) REGULATIONS, 2024

The Environmental Management and Coordination (Waste Management) Regulations, 2024 provide a legal framework for managing waste in Kenya to ensure a clean, healthy, and sustainable environment. These regulations categorise different types of waste, including solid, industrial, hazardous, biomedical, and radioactive waste, and set standards for their treatment and disposal. They also outline the requirements for developing waste management plans, which include segregation, recycling, and disposal methods. Licensing requirements for waste transporters and disposal facility operators are specified to ensure compliance with environmental standards. Additionally, the regulations establish monitoring and reporting obligations to ensure ongoing compliance and facilitate enforcement. Overall, these regulations aim to protect public health and the environment by promoting sustainable waste management practices. A summary of the Schedules include:

- First Schedule: Categories of Waste. This Schedule classifies different types of waste, including solid, industrial, hazardous, biomedical, and radioactive waste.
- Second Schedule: Standards for Waste Treatment and Disposal, which outlines the standards and procedures for the treatment and disposal of various waste types to ensure environmental protection.
- Third Schedule: Requirements for Waste Management Plans. This Schedule specifies the requirements for developing and implementing waste management plans, including segregation, recycling, and disposal methods.

- Fourth Schedule: Licensing Requirements, which details the licensing requirements for waste transporters and disposal facility operators, ensuring that all activities comply with environmental standards.
- Fifth Schedule: Monitoring and Reporting. This schedule sets out the monitoring and reporting obligations for waste management activities to ensure compliance and facilitate enforcement.

Specifically, the EMCA Waste Management Regulations of 2024 requires the following:

**Waste Classification and Handling**

The regulations classify waste into categories, including domestic, industrial, hazardous, and biomedical waste. Waste generators must segregate waste at the source to facilitate proper disposal or recycling, as outlined in Schedule 1. About the waste management hierarchy, the regulations emphasise the hierarchy of waste management, prioritizing waste minimisation, reuse, recycling, and recovery before disposal.

**Licensing Requirements**

Entities involved in waste management activities, including waste generators, transportation, treatment, or disposal must obtain licenses from the NEMA. Facilities must adhere to operational standards set out in Schedule 2.

**Extended Producer Responsibility (EPR)**

Producers are required to manage the lifecycle of their products, including end-of-life waste. This provision promotes recycling and reduces environmental impact, essential for projects involving manufacturing or packaging.

**Waste Management Plans**

Projects generating significant waste must prepare and implement waste management plans, detailing methods for waste reduction, segregation, storage, collection, transportation, and disposal.

**Transportation and Disposal Standards**

Waste must be transported in compliance with safety and environmental standards, including proper packaging and labelling, as specified in Schedule 3. Disposal must occur only in NEMA-licensed facilities.

**Hazardous Waste Management**

The regulations emphasize stringent controls for hazardous waste, including tracking, treatment, and disposal, as outlined in Schedule 4.

**Monitoring and Reporting**

Waste generators and handlers must maintain records of waste management activities and submit periodic reports to NEMA to ensure compliance.

**Penalties for Non-Compliance**

Non-compliance with the regulations attracts penalties, including fines and potential revocation of licenses, reinforcing adherence to waste management standards.

The ESIA must address potential waste impacts, propose mitigation measures, and provide detailed waste management plans. Adherence to these regulations is critical for obtaining project approvals and maintaining environmental sustainability.

As part of the ESMP, the Daraja Project includes mitigation measures for management of wastewater and generated waste in line with the 2024 regulations. This includes waste segregation, recycling, safe transportation, and disposal at licensed facilities. The Daraja Project will also comply with licensing, monitoring, and reporting obligations, and will provide proper handling of any hazardous waste generated.

#### 5.1.3.14 EMCA (E-WASTE MANAGEMENT) REGULATIONS, 2013

The Environmental Management and Co-ordination (E-Waste Management) Regulations 2013 provide a legal and institutional framework and mechanisms for the management of E-waste handling, collection, transportation, recycling, and safe disposal. It also provides for improved legal and administrative co-ordination of the diverse sectoral initiatives in management of E-waste as a waste stream to improve the national capacity for the management of the E-waste. Any E-waste generated by the Daraja Project will need to be disposed of in compliance with this regulation. Any electronic waste generated during construction / installation, operation, or decommissioning will be handled, transported, and disposed of in accordance with the E-Waste Management Regulations. Licensed e-waste handlers will be engaged, and all disposal activities will be documented and reported to NEMA for safe and compliant e-waste management.

#### 5.1.3.15 EMCA (AIR QUALITY) REGULATIONS, 2024

These Regulations aim to prevent, control, and reduce air pollution to ensure clean and healthy ambient air. These regulations establish emission standards for various sources, including mobile sources like motor vehicles and stationary sources such as industries. They also outline procedures for designating controlled areas and developing air quality management plans for these areas. The regulations are designed to protect public health and the environment by setting limits on emissions and ensuring compliance through monitoring, enforcement and other technical specifications.

The First Schedule outlines the Ambient Air Quality Tolerance Limits, the Second Schedule outlines the Priority Air Pollutants and the Third Schedule outlines Emission Limits for Controlled and Non-Controlled Areas. The Daraja Project will comply with air quality standards by minimising emissions from construction / installation equipment and support vehicles.

#### 5.1.3.16 EMCA (FOSSIL FUEL EMISSION CONTROL) REGULATIONS 2006

These Regulations aim at eliminating or reducing emissions generated by internal combustion engines to acceptable standards. The regulations provide guidelines on use of clean fuels, use of catalysts and inspection procedures for engines and generators.

#### 5.1.3.17 THE ENVIRONMENTAL MANAGEMENT AND COORDINATION (WATER QUALITY) REGULATIONS, 2024.

The Regulations provide for sustainable management of water resources including prevention of water pollution and protection of water sources. The regulations require that any activity near or within water bodies (e.g. cable landfalls, trenching, or laying cables across rivers or coastal zones) must not pollute or degrade water quality. Activities must maintain a buffer zone of 6 to 30 m from the highest flood level of rivers and streams unless otherwise approved. The regulations require that if the project involves any discharge into water bodies

(e.g. during construction or repair), an effluent discharge license is mandatory. Discharges into the marine environment must comply with strict pollutant thresholds (e.g. pH 5.0–9.0 for marine water, nil for oil and grease, and specific limits for heavy metals and toxic substances). Discharges must comply with strict standards for parameters such as pH, heavy metals, suspended solids, and biological oxygen demand. Continuous monitoring of water quality is required, with biannual reporting to NEMA.

Where a project involves coastal trenching, cable landings, or marine construction, these regulations necessitate: A comprehensive EIA, strict effluent control and monitoring, and adherence to buffer and setback requirements to protect marine ecosystems. The Daraja Project ESIA study has been undertaken to fulfill the requirements of these regulations.

#### 5.1.3.18 EXTENDED PRODUCER RESPONSIBILITY REGULATIONS, 2024

The EPR Regulations, 2024, enacted under the Sustainable Waste Management Act, establish a mandatory framework for managing the potential environmental impacts of products throughout their lifecycle. For a submarine cable project, these regulations are particularly pertinent due to the significant volume of materials (such as cable sheathing, insulation, metallic components, and packaging) introduced into the Kenyan market. The project proponent is required to register with the NEMA and either establish or join a Producer Responsibility Organisation (PRO). As part of compliance, the project proponent must develop and submit an EPR plan outlining strategies for the collection, recycling, and environmentally sound disposal of cable components, particularly at the decommissioning phase.

In the context of an ESIA, the EPR framework necessitates that the project integrate waste minimisation and circular economy principles into its design and implementation. This includes selecting cable materials that are durable, non-toxic, and recyclable, so that packaging is minimised and environmentally friendly. The project proponent must also implement a take-back scheme for end-of-life materials and submit annual reports to NEMA detailing quantities of materials introduced, recovered, and treated. Additionally, EPR fees (calculated based on material type, recyclability, and environmental impact) must be paid, and relevant licences obtained. These obligations ensure that the submarine cable project aligns with Kenya's national waste management goals and contributes to sustainable infrastructure development.

#### 5.1.3.19 EMCA (CONSERVATION OF BIOLOGICAL DIVERSITY AND RESOURCES, AND ACCESS TO GENETIC RESOURCES AND BENEFITS SHARING) REGULATIONS, 2016

These Regulations apply to the conservation of all biological resources in Kenya, whether or not they are found in their natural environment, access to genetic resources and sharing of benefits that derive from those resources. In Section 4, the Regulations provide that no person shall engage in any activity that may have an adverse impact on any ecosystem or lead to the unsustainable use of natural resources. The conservation of biological diversity applies to any area of land, lake, or river which the government has declared to be a protected natural environment system for purposes of promoting and preserving biological diversity in accordance with section 54 of the EMCA 1999 (amended 2015). The Daraja Project will avoid potential adverse impacts on ecosystems and ensure sustainable use of natural resources in compliance with Section 4 of the Regulations. The ESIA study includes biodiversity assessments and mitigation measures to protect sensitive habitats, particularly in marine and coastal zones.

#### 5.1.3.20 THE WATER ACT, 2016

This Act provides for the regulation, management and development of water resources, water and sewerage services, and for other connected purposes. As stated in Section 63, every person in Kenya has the right to clean and safe water in adequate quantities and to reasonable standards of sanitation as stipulated in Article 43 of the Constitution. Section 21(2) mandates the Water Resources Authority to demand from any person, within a reasonable time or on a regular basis, to provide it with specified information, documents, samples, or materials in relation to the system referred to in Section 21(1). Under these rules, specific records may require to be kept by a site operator and the information thereof furnished to the authority. Section 36 makes it a requirement to obtain a permit for any of the following purposes:

Any use of water from a water resource, except as provided by Section 37 (3).

- The drainage of any swamp or other land.
- The discharge of a pollutant into any water resource.
- Any other purpose, to be carried out in or in relation to a water resource, which is prescribed by Regulations made under this Act to be a purpose for which a permit is required.

In line with Section 5(1) of the Second Schedule of this Act, the permit holder shall submit a completion certificate in the prescribed form upon the expiration of the time limited by a permit for construction of works authorised by the permit, or where the construction is completed before the expiration of that time. The Daraja Project will comply with the Water Act by obtaining necessary permits for any water abstraction, discharge, or construction / installation near water resources.

#### 5.1.3.21 THE WATER RESOURCES MANAGEMENT RULES, 2007

These Rules implement provisions of the Water Act, 2016. They apply to all policies, plans, programmes, and activities to which the Act applies. Matters covered by these Rules include public notification and consultation; the protection of the water resources monitoring network; Water Resource Users Associations; the register of water bodies; approvals, authorisations and permits; declaration of a watercourse or a wetland for water resources management by the Water Resources Authority.

The Rules prohibit anyone from discharging any toxic or obstructing matter, radioactive waste, or other pollutants into any water resource unless the discharge has been treated to permissible levels. Discharge of effluent into a water resource also requires a valid discharge permit. The Daraja Project will adhere to these rules and MARPOL 73/78 by avoiding pollution of water bodies, and engaging with Water Resource Users Associations, where applicable.

#### 5.1.3.22 THE WILDLIFE CONSERVATION AND MANAGEMENT ACT, 2013

This is the main law that governs the management of wildlife including their habitats such as national parks, national reserves, and local sanctuaries. Part XI of this Act lists the offenses in national parks which includes among others pollution of wildlife habitats and ecosystems; and damage of any object of geological, prehistoric, archaeological, historic, and marine or other scientific interest within a National Park. The Daraja Project will avoid pollution and disturbance of wildlife habitats, particularly in marine and coastal ecosystems. The ESIA study includes measures to prevent harm to protected species and habitats, in compliance with Part XI of the Act.

#### 5.1.3.23 WILDLIFE CONSERVATION AND MANAGEMENT (MARINE PROTECTED AND MARINE CONSERVATION AREAS) REGULATIONS, 2016

Section 11 states that "any person who intends to undertake any activity in a marine protected or conservation area must submit to the Service for approval, not less than 90 days before the start of the proposed activity, a plan that indicates the specific areas in which the activity is proposed to be carried out" (KWS, 2016). The Daraja Project's landing site is in the MMNR, which is a Protected Area. Guidelines from KWS will also need to be followed. A Marine Wayleave Permit is therefore required from KWS. Section 8, Subsection 3 states that no vessel propelled by means of propeller is allowed above the waters of any Marine Protected Area (MPA) (KWS, 2016). As the Daraja Project's landing site is within a MMNR, a Marine Wayleave Permit will be obtained from KWS. The Daraja Project will submit a detailed activity plan at least 90 days in advance and comply with restrictions on vessel operations within the MPA.

#### 5.1.3.24 PREVENTION OF POLLUTION IN COASTAL ZONE AND OTHER SEGMENTS OF THE ENVIRONMENT) REGULATION, 2003

This Regulation aims to prevent pollution in coastal zones, particularly from ships. It enforces the MARPOL 73/78 (refer to **Section 5.2.1.2** for further detail). The regulations prohibit the discharge of hazardous substances, chemicals, oil, or oily mixtures into Kenyan TS. Ships must offload waste at certified Port Waste Reception Facilities, primarily at Mombasa port. Additionally, ships are required to maintain an Oil Record Book and obtain discharge certificates before leaving port. The Daraja Project will prevent marine pollution by ensuring that all vessels comply with MARPOL 73/78 standards. Waste will be offloaded at certified port reception facilities, and oil discharge records will be maintained as required.

#### 5.1.3.25 NATIONAL MUSEUMS AND CULTURAL HERITAGE ACT (CAP. 216) 2006

The Act gives due consideration for national museums and heritage; to provide for the establishment, control, management and development of national museums and the identification, protection, conservation, and transmission of the cultural and natural heritage of Kenya. Provisions are given on heritage declarations, where protected areas are on trust land, monuments, antiques and protected objects, powers of enforcement and export. Section 30 of the Act requires all discoveries of objects of archaeological interest to be reported to the National Museums of Kenya (NMK) / GoK. Any archaeological or cultural discoveries during the project will be reported to the NMK per the Archaeological Chance Find Procedure (**Appendix E**), to comply with Section 30 of the Act.

#### 5.1.3.26 FISHERIES MANAGEMENT AND DEVELOPMENT ACT (NO. 35 OF 2016)

This is an Act of Parliament that provides for the conservation, management and development of fisheries and other aquatic resources to enhance the livelihood of communities dependent on fishing, and to establish the Kenya Fisheries Services; and for connected purposes. The Daraja Project will mitigate potential impacts on fisheries and aquatic resources, particularly artisanal fishing activities. Engagement with local fishing communities and implementation of sustainable marine practices are included in the ESIA study.

#### 5.1.3.27 PROTECTED AREAS ACT (CAP 204)

This is an Act of Parliament to prevent the entry of unauthorised persons into areas which have been declared to be protected areas. This Act grants powers upon the Minister to declare, in the interest of public safety or public order, protected areas in which access is limited to

authorised persons. The Act also provides for measures of enforcement and protection of areas declared to be protected areas. The Daraja Project will obtain necessary authorisations for access to any declared protected areas. Activities will be planned to avoid disruption to public safety and environmental integrity within these zones.

#### 5.1.3.28 OCCUPATIONAL SAFETY AND HEALTH ACT, 2007

This is an Act that regulates H&S at the workplace (workplace defined as any land, vessel or thing at, in, on or near where a worker will be in the course of employment). The Act was developed to secure the safety, health, and welfare of persons at work and protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work.

This Act applies to all workplaces, and every occupier must ensure the health, safety, and welfare at work of all the people working in his workplace as well as protect other people from risks to safety and health occasioned by the activities of his workers. The occupier's duty to ensure the safety, health, and welfare of all persons at work in his premises includes providing a working environment and work procedures that are safe.

The Act prohibits the emission of poisonous, harmful, or offensive substances into the atmosphere, and where such incidents occur, they must be rendered harmless and inoffensive. Machinery, protective gear, and tools used in all workplaces must comply with the prescribed safety and health standards. Dust, fumes, or impurity must not be allowed to enter the atmosphere without appropriate treatment to prevent air pollution or harm of any kind to life and property. Highly inflammable substances must be kept in a safe place outside any occupied building. Where dangerous fumes are liable to be present, there must be a means of exit and suitable breathing apparatus made available. Means for extinguishing fire must be available and easily accessible, and evacuation procedures tested regularly (Sections 6, 21, 47, 55, 64, 78, 79, 81, 82). The Daraja Project will provide a safe working environment by implementing occupational H&S measures for all personnel. The ESMP for the Daraja Project provides measures to mitigate risks of injury during construction / installation and operation.

#### 5.1.3.29 THE PUBLIC HEALTH ACT (CAP.242)

This is an Act of Parliament to make provision for securing and maintaining health. Section 115 of this act prohibits causing nuisance or other condition liable to be injurious or dangerous to health. Section 118 provides a list of nuisances which includes any noxious matter, or wastewater, flowing or discharged from any premises, wherever situated, into any public street, or into the gutter or side channel of any watercourse, irrigation channel or bed thereof not approved for the reception of such discharge.

#### 5.1.3.30 CLIMATE CHANGE ACT, 2016

The Climate Change Act, 2016, as amended, establishes a comprehensive legal framework for Kenya's response to climate change, with a strong emphasis on promoting low-carbon, climate-resilient development. The Act mandates the integration of climate change considerations into all levels of governance and across sectors, including infrastructure development. It requires both public and private entities to fulfill statutory climate change duties, which include monitoring and reporting greenhouse gas (GHG) emissions in accordance with national regulations. The Act also empowers the NEMA to require project proponents to

submit periodic reports on their climate performance and compliance with emission thresholds, as may be prescribed in the Gazette.

In the context of a submarine cable project, this legislation is relevant due to the potential GHG emissions associated with construction, logistics, and operational activities throughout the project lifecycle. The project proponent is obligated to assess and mitigate these emissions, and to implement measures that align with Kenya's nationally determined contributions (NDCs) under the Paris Agreement. Furthermore, the project may be subject to carbon reporting obligations and performance audits, especially if it involves energy-intensive processes or intersects with marine ecosystems vulnerable to climate impacts. Compliance with the Act ensures that the project contributes to Kenya's broader climate goals while minimizing its environmental footprint.

#### 5.1.3.31 MERCHANT SHIPPING ACT (CAP. 389)

The Merchant Shipping Act (Cap. 389) provides the overarching legal framework for the regulation of maritime activities in Kenya, including the registration, licensing, and operation of vessels, as well as the safety of navigation and marine environmental protection. For a submarine cable project, this Act is particularly relevant during the marine installation phase, which involves the use of specialised cable-laying vessels operating within Kenya's territorial waters. The Act mandates compliance with international maritime safety standards, including those related to the prevention of marine pollution, collision avoidance, and the safe carriage of equipment and materials. It also empowers the KMA to oversee vessel operations and enforce compliance with maritime safety and environmental obligations.

For the Daraja Project, the Act necessitates that all marine operations associated with the Daraja Project (including CRS, installation, and operation and repair) be conducted using vessels that are duly registered and compliant with Kenyan maritime laws. The Project Proponent must coordinate all maritime activities with the KMA and that appropriate navigational safety measures are in place to prevent interference with other marine users and to protect sensitive marine ecosystems.

#### 5.1.3.32 MERCHANT SHIPPING (LICENSING OF VESSELS) REGULATIONS, 2012

These regulations operationalize Section 57 of the Merchant Shipping Act by setting out the procedures and requirements for licensing vessels operating in Kenyan waters. For a submarine cable project, any vessel engaged in cable laying, support, or repair must obtain a valid licence from the KMA. The licensing process includes verification of vessel ownership, safety certification, and compliance with operational standards. The regulations also require vessels to be properly marked and to notify the Authority of any changes in ownership or operational status.

For the Daraja Project, this regulation underscores the need for the Project Proponent to use licensed marine vessels during the Daraja Project lifecycle that meet the safety and operational standards prescribed by the KMA. This is critical for legal compliance, minimising operational risks, and safeguarding marine safety during offshore installation activities.

#### 5.1.3.33 MERCHANT SHIPPING (SMALL VESSEL SAFETY) REGULATIONS, 2012

These regulations apply to small commercial vessels operating within Kenyan waters, including those used for nearshore support, environmental monitoring, or crew transport during submarine cable installation. The regulations categorise vessels based on their operational

range from shore and prescribe safety requirements such as crew certification, vessel fitness, life-saving equipment, and operational limits. They also require vessels to obtain a local certificate of fitness and to be operated by personnel holding valid certificates of competence.

For the Daraja Project, these regulations are relevant where small vessels are deployed for nearshore works, such as the BMH MBA construction / installation, subsea cable pull-in operations, and / or environmental surveys. The Daraja Project's vessels will be operated in accordance with the safety standards set out in these regulations, thereby minimizing the risk of the safety of personnel, marine accidents or environmental harm.

## 5.2 GOOD INTERNATIONAL INDUSTRY PRACTICE

### 5.2.1 INTERNATIONAL CONVENTIONS, PROTOCOLS AND AGREEMENTS

Kenya has signed and ratified several key international conventions and directives, including the UNCLOS. The below sub-sections provide a non-exhaustive list of Kenya's ratified conventions.

#### 5.2.1.1 UNITED NATIONS CONVENTION ON THE LAW OF THE SEA

UNCLOS is the current prevailing international law of the sea covering the rights and responsibilities of nations for use, management and protection of the world's oceans. UNCLOS was signed by Kenya on 10 December 1982 and was ratified on 2 March 1989. UNCLOS delimits the various maritime zones bordering coastal states, islands and archipelagic states. These boundaries structure and rationalise the marine space. Each section of sea obeys a specific legal regime where the coastal State has specific rights and obligations.

In respect to underwater subsea cables, UNCLOS states the following:

- Article 113 - The breaking or injury of a submarine cable shall be a punishable offence unless the breakage or injury was caused while saving lives.
- Article 114 - The owners of a cable that is being laid or repaired shall bear the cost of any damage to another cable or pipeline.
- Article 115 – The owner of the cable shall compensate for the loss of an anchor, net or fishing gear if they have proof that they sacrifice the loss of the mentioned items in order to avoid damage to the cable.

UNCLOS also provides guidance on the protection and preservation of the marine environment as summarised below:

- Section 4 (Monitoring and Environmental Assessment) – Article 204 mentions that States shall observe, measure and evaluate the risks or effects of pollution in the marine environment and Article 205 mentions that reports shall be published and should be made available to member States.
- Article 123 - Member states shall endeavour to undertake the necessary means to ensure protection and preservation of the marine environment.
- Article 235 – The fulfilment of international obligations regarding protection and preservation of the marine environment is the responsibility of the State.

#### 5.2.1.2 INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS

MARPOL 73/78 was established in 1973 and was modified by the Protocol of 1978. MARPOL 73/78 aims to prevent pollution from ships transporting oil, harmful liquid substances in bulk. It was ratified in Kenya on 15 December 1992.

There are six (6) annexes in the regulations:

- Annex 1 provides the regulations for the prevention of pollution by oil.
- Annex 2 regulates pollution by noxious liquid substances.
- Annex 3 prevents pollution by harmful substances carried by sea in packaged form.
- Annex 4 prevents pollution by sewage from ships.
- Annex 5 prevents pollution by garbage by ships.
- Annex 6 prevents air pollution from ships.

#### 5.2.1.3 CONVENTION ON THE INTERNATIONAL REGULATIONS FOR PREVENTING COLLISIONS AT SEA

The Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) regulations are published by the International Maritime Organisation (IMO) and set out, among other things, the "rules of the road" or navigation rules to be followed by ships and other vessels at sea to prevent collisions between two or more vessels. COLREGs can also refer to the specific political line that divides inland waterways, which are subject to their own navigation rules, and coastal waterways which are subject to international navigation rules.

#### 5.2.1.4 NAIROBI CONVENTION FOR THE PROTECTION, MANAGEMENT AND DEVELOPMENT OF THE MARINE AND COASTAL ENVIRONMENT OF THE WESTERN INDIAN OCEAN

The Convention provides a legal framework through which contracting parties address critical national and trans-boundary issues, share experiences, and create opportunities for sustained socioeconomic growth. The convention aims to tackle the accelerating degradation of the world’s oceans and coastal areas through the sustainable management and use of the marine and coastal environment. It does this by engaging countries that share the western Indian Ocean in actions to protect their shared marine environment.

#### 5.2.1.5 CONVENTION ON BIOLOGICAL DIVERSITY

The Convention has three (3) main objectives: the conservation of biological diversity; the sustainable use of the components of biological diversity; and the fair and equitable sharing of the benefits arising out of the use of genetic resources. Kenya’s national goals under the convention are to:

- Ensure and maintain a high-quality environment that permits a life of dignity and well-being for all;
- Achieve sustainable use of resource ecosystem for the benefit of the present generations, while ensuring their potential to meet the demands of future generations;
- Maintain ecosystems and ecological processes essential for the functioning of the biosphere; and
- Preserve genetic resources and biological diversity in the nation’s ecosystems and preserve their cultural value.

#### 5.2.1.6 INDIAN OCEAN MEMORANDUM OF UNDERSTANDING

The Indian Ocean Memorandum of Understanding (IOMOU) on Port State Control recognises the need for increased maritime safety and the protections of marine environment, and the importance of improving living conditions on board. The Port State Control aims to verify whether foreign flag vessels calling at a port in a state comply with maritime conventions. When vessels are found to be not in substantial compliance, the Port State Control system imposes actions to ensure that the vessels comply. Ships to be inspected are selected according to the criteria outlined in the MOU (IOMOU, 2021).

#### 5.2.1.7 OTHER RELEVANT CONVENTIONS

Other relevant international conventions include:

- International Convention Pertaining to the Control of Invasive Alien Species (IAS);
- UNEP Regional Seas Programme;
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), 1979;
- Convention for the Protection of the World Cultural and Natural Heritage, Paris 1972;
- The Ballast Water and Sediments (BWM) Convention, 2004; and
- The Aarhus Convention on access to information, public participation in decision-making and access to justice in environmental matters, 1998.

# 6. PUBLIC CONSULTATION

This Chapter provides a summary of actions undertaken during the stakeholder engagements. The engagements have been undertaken in line with the national legal requirements, the Constitution of Kenya (2010) and EMCA 1999 (amended 2015). The Constitution recognises public participation as an integral requirement in all policy and statutory functions of the executive and legislature, and as an inherent requirement in the planning and execution of projects that have an impact on the social or economic life of communities. The EMCA calls for effective stakeholder participation and public consultation in the ESIA study. The full summary of output from the public stakeholder engagements is included in **Appendix H**.

## 6.1 OBJECTIVES OF PUBLIC CONSULTATION AND PARTICIPATION

Stakeholder consultations were carried out pursuant to compliance with the legal and regulatory requirements cited above. The specific objectives of the consultations were to:

- Inform the public and the key informants regarding the Daraja Project, and its anticipated benefits and effects;
- Provide an opportunity for interested parties to share their views, concerns and recommendations for incorporation into the Daraja Project implementation designs (i.e. the subsea cable route and installation process);
- Identify potential socio-economic and environmental impacts for the various phases of the Daraja Project and to capture mitigation measures from stakeholders;
- Build relationships with the local communities and authorities;
- Manage expectations;
- Comply with both local regulatory requirements and international best practice; and
- Acquire local knowledge on sensitive areas in the proposed BMH MBA area.

The Constitution of Kenya outlines the national values and principles of governance, which include patriotism; democracy and participation of the people; human dignity; equity; social justice; inclusiveness; equality; human rights; non-discrimination and protection of the marginalised; good governance; integrity, transparency and accountability; among others. The following values and principles guided the stakeholder engagement for the Daraja Project:

- Transparency and honesty in engaging with stakeholders;
- Timely access to information and documents relevant to decision making;
- Clear communication and adequate time investment to ensure that all affected stakeholder groups understood the issues at hand prior to decision making;
- Respect of local culture and related values, with full cognisance of human rights as protected by the Constitution;
- Observance of human rights;
- Promotion of inclusiveness, including clear mechanisms to empower vulnerable and marginalised groups to promote their active participation, with reasonable measures undertaken to reduce the barriers to participation as experienced by these groups; and
- Proactiveness in consulting stakeholders and seeking feedback on issues.

## 6.2 STAKEHOLDER IDENTIFICATION AND ANALYSIS

Stakeholders are people who may be impacted by, or who have an influence on or an interest in the Daraja Project. This includes those who would be impacted either positively or negatively by the Daraja Project. Different issues and concerns were raised by different stakeholders; for this reason, stakeholders have been grouped in accordance with their connections to the Daraja Project.

Stakeholder identification and analysis entails determining who the Daraja Project stakeholders are; the key groupings and subgroupings of stakeholders; and a more in-depth look at the group's interests, how they will be affected by the Daraja Project, and to what degree they are likely to influence the Daraja Project. It is important to understand that not all stakeholders will have the same influence or effect on the Daraja Project, nor will they all be affected in the same manner.

Overall, the stakeholders were grouped either as:

1. Primary stakeholders: These are the people who will be affected directly by the Daraja Project activities during installation and operation. They include fishermen; tourists; Nyali area residents; and local business owners such as hotels along the beach where the Daraja Project activities will take place.
2. Secondary stakeholders: These are the people who will be indirectly affected by the Daraja Project but influence the Daraja Project's implementation. They include the national government authorities who provide permits, the County Government of Mombasa, and local administration and parastatals.

For the Daraja Project, stakeholder identification and analysis were carried out to identify the various groups and stakeholders to be engaged for the Daraja Project. A working list of stakeholders is provided in **Table 6-1**.

### TABLE 6-1 LIST OF STAKEHOLDERS IDENTIFIED TO BE PART OF THE CONSULTATION PROCESS

| Stakeholder Category / Group | Stakeholders | Scope of Agency with Reference to the Daraja Project |
|---|---|---|
| Permitting/Regulatory Authorities | | |
| CAK | Head of permitting and compliance department | Telecommunication Licensing: Submarine Cable Landing Rights Licence, International Gateway Licence |
| KWS | Head of permitting and compliance department | Permit to work on a MPA (due to proximity of Mombasa Marine National Park (MMNP). Issue a Marine Wayleave Permit to begin work. |
| NEMA (Mombasa) | NEMA Director General in Mombasa | Environmental management, policy and licensing. Issue an Environmental Licence to begin work. |
| KMA | Head of permitting and compliance department | Vessel registration permit to sail in Kenyan waters. |
| Kenya Ports Authority (KPA) | Head of permitting and compliance department | Permit to operate in the vicinity of the port entrance. |

| Stakeholder Category / Group | Stakeholders | Scope of Agency with Reference to the Daraja Project |
|---|---|---|
| CDA | Head of permitting and compliance department | Checking on permitting requirements. |
| Ministry of Defence (MoD) | Head of permitting and compliance department | Defense – approval by MoD to enter Kenyan waters. |
| KCGS | KCGS Officials | Enforcement of maritime security and safety. |
| NEMA HQ | NEMA officials in Nairobi | ESIA licensing |
| NLC HQ | Head of permitting and compliance department | Consent to develop on public land. |
| NLC Mombasa | Head of permitting and compliance department | Consent to develop on public land. |
| NMK | NMK officials, Nairobi | Responsible for the management of cultural heritage within Kenya. |
| Ministry of Lands, Public Works, Housing and Urban Development - State Department for Lands and Physical Planning (Nairobi) | Director | Grants a Notification of Approval of Development Permission of a Strategic National Project to lay cables in the Kenyan TS. |
| MICDE | MICDE Officials | Approve and accept all telecommunications equipment intended to be used within the public telecommunications networks in the country. All entities that wish to market / sell or use communication equipment in Kenya must seek for type approval/acceptance of this equipment. |
| Implementing Authorities | | |
| Kenya Forest Service (KFS) | Head of Conservancy | In charge of protection of mangroves in the area. |
| KMFRI | KMFRI Officials in Mombasa | To gain input around potential environmental sensitivities and potential impacts associated with the Daraja Project. |
| WRTI | WRTI Officials, Mombasa | To conduct and coordinate wildlife research and training through innovation, knowledge and technology transfer for sustainable wildlife conservation and management. |
| Coastal Oceans Research and Development in the Indian Ocean (CORDIO) | Director | Provide inputs to marine ecosystems baseline studies. |

| Stakeholder Category / Group | Stakeholders | Scope of Agency with Reference to the Daraja Project |
|---|---|---|
| County Government Mombasa | | |
| Department of Lands, and Physical Planning, Mombasa County | County Executive Commissioner (CEC) Land, Housing and Physical Planning | Local administration – approval to construct a beach manhole. Issuance of a Temporary Occupation Licence (TOL) for the subsea cable and earth system. |
| County Fisheries Department, Mombasa | Director, Fisheries Department | They facilitate consultations with local fishing communities; provide inputs to potential impacts of subsea cable installations on local fisheries and marine resources, data about fish populations, marine ecosystems, and fishing activities. |
| Department of Transport, Infrastructure and Public Works, Mombasa County | Head of permitting and compliance department | Issues an Excavation Permit for the beach trench. |
| National Government | | |
| Administration | • Sub-County administrators<br>• County/Deputy/Assistant Commissioners<br>• Ward administrators<br>• Chiefs and sub-chiefs | Entry point for engaging with communities |
| DOSHS | Director, DOSHS Mombasa County | A Workplace Registration Certificate is required to be obtained from DOSHS prior to subsea cable installation. |
| Mombasa County Department of the Ministry of Blue Economy | Director, Blue Economy | Responsible for safeguarding the marine and aquatic resources for the county and for the artisanal fishers. |
| BMU / Community | | |
| BMU Nyali Community | • BMU members<br>• Village heads and elders | BMU - Derive their various sources of livelihood from the beach and surrounding environment.<br>Village heads - Speaks on behalf of communities and have an influence on community development. |
| Non-Governmental Organisations (NGOs) | | |
| Early Birds Banda | Community conservation volunteer organisation members | Turtle conservation volunteers, who have partnered with KWS where turtles nest along the Nyali Beach. |
| Community Based Organisations (CBOs), Faith Based Organisations (FBOs), NGOs | Sample of key CBOs and FBOs identified within the Daraja Project's AOI | Some NGOs, CBOs and FBOs may have a direct interest in the Daraja Project and may be able to draw on its benefits for economic or community development purposes. |

| Stakeholder Category / Group | Stakeholders | Scope of Agency with Reference to the Daraja Project |
|---|---|---|
| | | Such organisations may also have useful data and insight and may be able to become partners with the Daraja Project in areas of common interest. |
| Private Sector | | |
| Hotels, businesses on the beach etc. | Prime hotels operating in the proposed BMH location. | Engaged as part of communities. |

## 6.3 APPROACH TO CONSULTATIONS

This section describes the approach used to mobilise and conduct the consultations for the stakeholders identified in **Section 6.2** above.

For this ESIA study, engagement consisted of two (2) main stages: a first round of stakeholder engagement (informative), and a second round of engagements (consultative).

These activities were carried out by the consultants for the period between October 2024 and February 2025; further information on each stage is outlined below. All meetings undertaken as part of this ESIA study have been documented in the form of meeting minutes and registers (where possible). These documents are summarised in **Appendix H**.

## 6.4 METHODS OF COMMUNICATION AND ENGAGEMENT

Different platforms were used to engage stakeholders for the Daraja Project. As outlined above, the consultant team applied the following methods to communicate and engage stakeholders:

- Emails. The team arranged the meetings and shared meeting invites and details of the Project with stakeholders via e-mail.
- Telephone calls. Where no email address was available, the team used telephone calls to engage stakeholders. One-on-one telephone calls were used to set up meeting appointments.
- Letters. In the absence of email addresses and telephone contacts, the team sent letters to stakeholders to seek their views on the Project. Where possible, the letters were stamped by the stakeholder's office to confirm proof of receipt. Additionally, formal letters were used to officially notify some government agencies of the Daraja Project.
- Virtual meetings. Virtual meetings were set up to present information to stakeholders and to seek their feedback. The virtual platform used was dependent on the stakeholder's preference.
- In-person meetings. In person meetings were arranged and held with the BMU representatives, as well as primary and secondary stakeholders in Nyali through a public baraza, Focused Group Discussions (FGDs) and in the official offices in Mombasa and Nairobi.

## 6.5 PUBLIC NOTIFICATION

In accordance with the EIA Regulation 2003 (amended 2022), Part III, section 17, the actions indicated in **Table 6-2** were undertaken to inform the public about the Daraja Project.

TABLE 6-2 ACTIONS TAKEN FOR THE PUBLIC CONSULTATION PROCESS

| Regulation 17 (2) | Actions |
|---|---|
| 17(2)(a)(i) Posting posters in strategic public places in the vicinity of the site of the proposed project informing the affected parties and communities of the proposed project | Daraja Project public baraza posters were prepared and issued to the County Government of Mombasa Secretary's office, the Nyali area Chief's office, and at the proposed BMH MBA site (i.e. at the Costa Rica restaurant and its surroundings) between 3-7 February 2025. The public posters were displayed in public areas 14 days prior to the meeting dates. See **Appendix H** for a sample poster used. |
| 17(2)(a)(ii): Publishing a notice on the proposed project for two successive weeks in a newspaper that has a nation-wide circulation | This notice is to be published in a newspaper (the Standard, or the Daily Nation), informing the stakeholders that they have a 30-day period within which NEMA will receive their feedback. The notice shall be gazetted upon NEMA's request once the ESIA Report is submitted for review. |
| 17(2)(a)(iii): Making an announcement of the notice in both official and local languages in a radio with a nation-wide coverage for at least once a week for two (2) consecutive weeks | Local radio stations that broadcast within the Daraja Project zone of influence include:<br>• Radio Rahma (91.5 FM): is a broadcast radio station from Mombasa, Kenya; and<br>• Bahari FM (90.4) is part of the Royal Media Services and transmits in Swahili. |
| 17(2)(b): Hold at least three (3) public meetings with the affected parties and communities to explain the project and its effects and to receive their oral or written comments | Public meetings were held between 19-21 February 2025. Records of these meetings are appended to this report (refer to **Appendix H**). Additional public meetings will be held as ESIA disclosure. |

## 6.6 ROUNDS OF PUBLIC CONSULTATION

Two (2) rounds of stakeholder engagement took place. The first round was primarily conducted during the reconnaissance visit to Mombasa from 1-4 October 2024. The stakeholders were identified during preliminary stakeholder mapping and analysis. The team sought the guidance of these stakeholders on the Daraja Project's environmental and social sensitivities and permitting requirements, to inform the Daraja Project's design and to guide subsequent engagements during the actual ESIA study.

The second round introduced the Daraja Project to primary and secondary stakeholders. The engagement was accomplished through a combination of in-person meetings in 17-22 February 2025. Prior to the consultations, the Project team engaged the County Commissioner, Deputy Commissioner and chiefs in Nyali sub-county. The aim of these meetings was to introduce the ESIA study of the Daraja Project, and to discuss the logistics of the public consultation meetings.

In these two (2) rounds of consultation, the objective was to engage the stakeholders listed in **Table 6-1**. However, some of the stakeholders who were invited to participate in consultations did not respond to the invitation.

## 6.7 STAKEHOLDER ENGAGEMENT SUMMARY

This Section summarises the meetings that were held as part of the stakeholder engagement process from the scoping phase to the ESIA study. The meetings adhered to the EIA Regulation 2003 (amended 2022) for stakeholder engagement. The public consultation exercise was interactive and yielded positive outcomes. ERM adopted a balanced approach by ensuring that those who supported the Daraja Project and those who sought more clarification got a chance to participate. Meeting minutes to these engagements are in **Appendix H**.

### 6.7.1 FIRST ROUND OF STAKEHOLDER ENGAGEMENT – INFORMATIVE

During the first round of stakeholder engagement, ERM's approach was to engage the National Government, the County Government authorities as well as primary stakeholders in the Nyali Beach area. Additionally, ERM aimed to gather more information as to who else should be engaged that the consultant might have missed out in stakeholder mapping and identification process, as well as obtain valuable contacts of some of these stakeholders. In total, 18 meetings were successfully conducted in this round of engagements. These meetings were held between 1 October 2024 and 3 December 2024. The list of stakeholders, dates of engagements and mode of engagement are highlighted in **Table 6-3** below.

The main issues discussed during the first round of consultations were related to the impact on marine habitats and ecosystems as well as the impacts on the local Nyali fishermen and Nyali Beach traders. Most of the highlighted recommendations were around ensuring that the Daraja Project does not negatively impact on the marine ecosystem as well as to avoid interference with the shipping navigation routes.

TABLE 6-3 FIRST ROUND OF STAKEHOLDER ENGAGEMENT - INFORMATIVE

| Date of engagement | Name of stakeholder | Mode of engagement |
|---|---|---|
| 1 October 2024 | NEMA HQ, Nairobi | In person meeting |
| 1 October 2024 | Ministry of Lands, Public Works, Housing and Urban Development (Nairobi) - State Department for Lands and Physical Planning, HQ, Nairobi | In person meeting |
| 2 October 2024 | Mombasa County Commissioner | In person meeting |
| 2 October 2024 | NEMA, Mombasa County | In person meeting |
| 2 October 2024 | Department of Lands and Physical Planning, Mombasa County | In person meeting |
| 2 October 2024 | Mombasa Sub-County Administration | In person meeting |
| 2 October 2024 | KWS, Mombasa | In person meeting |
| 3 October 2024 | Kenya Fisheries Department, Mombasa County | In person meeting |
| 3 October 2024 | WRTI, Mombasa | In person meeting |
| 4 October 2024 | KMA, Mombasa | In person meeting |

| Date of engagement | Name of stakeholder | Mode of engagement |
|---|---|---|
| 4 October 2024 | CDA, Mombasa | In person meeting |
| 4 October 2024 | KCGS, Mombasa | In person meeting |
| 4 October 2024 | BMU member, Nyali beach, Mombasa | In person meeting |
| 25 October 2024 | KWS, HQ Nairobi | In person meeting |
| 20 November 2024 | NLC HQ, Nairobi | Phone call |
| 26 November 2024 | NMK, Nairobi | Virtual meeting |
| 3 December 2024 | MICDE, Nairobi | In person meeting |

### 6.7.2 SECOND ROUND OF STAKEHOLDER ENGAGEMENT – CONSULTATIVE

The second round of stakeholder engagement included the primary and secondary stakeholders that had not been engaged during the first round of engagements, as well as a public baraza and FGDs with communities in the Nyali Beach area. In total, 14 meetings were successfully conducted in this round of engagement. These meetings were held between 18-21 February 2025. The list of stakeholders, dates of engagements and mode of engagement are highlighted in **Table 6-4** below. Images of public consultations conducted on 20-21 February are shown in **Figure 6-1**.

The main issues discussed during the second round of consultations are listed in **Section 6.7.3**.

#### TABLE 6-4 SECOND ROUND OF STAKEHOLDER ENGAGEMENT - CONSULTATIVE

| Date of engagement | Name of stakeholder | Mode of engagement |
|---|---|---|
| 17 February 2025 | District County Commissioner | In person meeting |
| 17 February 2025 | Nyali Area Chief and Sub-Chief; village elders | In person meeting |
| 18 February 2025 | CAK, Mombasa County | In person meeting |
| 18 February 2025 | KPA | In person meeting |
| 18 February 2025 | Department of Transport, Infrastructure and Public Works, Mombasa County | In person meeting |
| 19 February 2025 | KWS HQ | In person meeting |
| 19 February 2025 | KMFRI | Provided the BID in person at the office department, for the Director's attention |
| 20 February 2025 | Public Baraza | In person at the Costa Rica restaurant |
| 20 February 2025 | Nyali BMU | In person meeting |
| 21 February 2025 | CBOs, FBOs, and NGOs<br>Early Bird Banda<br>Business owners along Nyali beach | In person meeting |
| 21 February 2025 | DOSHS | In person meeting |
| 21 February 2025 | Mombasa County, Environment Department | In person meeting |

| Date of engagement | Name of stakeholder | Mode of engagement |
|---|---|---|
| 16 February 2025 | CORDIO | Email correspondence |
| 27 March 2025 | Mombasa County Department of the Ministry of Blue Economy | Virtual meeting |

FIGURE 6-1 PUBLIC CONSULTATIONS (20-21 FEBRUARY 2025)


Source: ERM, 2025

### 6.7.3 SUMMARY OF PUBLIC MEETING STAKEHOLDER FEEDBACK

The main comments and feedback that were raised during the stakeholder engagement sessions are highlighted below:

TABLE 6-5 MAIN COMMENTS AND FEEDBACK FROM STAKEHOLDERS

| Main Comments and Feedback | Responses |
|---|---|
| The public enquired what the role of Safaricom Plc in landing the subsea cable is. | Safaricom Plc is the Project Proponent of the Daraja Project. They will be responsible for the overall implementation, execution, and regulatory compliance of the Daraja Project. |
| The public enquired why there is need for more subsea cables landing in Kenya. | The Daraja Project supports the significantly increasing capacity, quality and availability of internet connectivity within Kenya, and that should a subsea cable be damaged, internet connectivity can easily be re-routed via another cable. |
| The public enquired how the Daraja Project will be beneficial to the local communities and Kenyans at large. | It is expected that temporary employment opportunities will be available through local contractors for site preparation and during BMH MBA construction on Nyali Beach for the Daraja Project.<br>Additionally, once the Daraja Project is operational, it will indirectly promote national job growth and support digital enhancements for the GoK to deliver its objectives under Kenya's Vision 2030, including telecommunications improvement. |
| The public enquired about emissions and electric shocks, which may cause potential injuries. | The Daraja Project does not emit any chemical, heat or noise emissions. The subsea cable will only be emitting a level of electromagnetic radiation that is half the natural background level in the marine environment, and that the values are lower than the background magnetic field produced by the Earth. |

| Main Comments and Feedback | Responses |
|---|---|
| | Additionally, the subsea cable is fully insulated through the protection layers of a double-armed cable. It should be noted that if the subsea cable is damaged significantly, the 1.5 amp current may be reached at the fibre optic core of the subsea cable where an electric shock may occur. However, should the subsea cable be so damaged, the electrical circuit would be cut off immediately as any break in the fibre optic strands would be instantly identified. |
| The public enquired about security of the subsea cable in case it becomes exposed due to strong weather (e.g. storms / cyclones), and potential damage caused by navigational channels and commercial ships to the port. | Natural hazards (e.g. storms / cyclones) may cause wave conditions to damage the subsea cable where it is surface-laid. However, the subsea cable is normally clamped to the seabed if it is on the surface within the surf zone. If the subsea cable is damaged, the damaged location will instantly be identified, and the nearest repair vessel around the globe will sail to repair the subsea cable.<br>The Daraja Project is aware of the location of the Kenyan navigational channel and will be liaising with the KPA to confirm that the subsea cable is not within the dredging area. Additionally, vessels sailing over the subsea cable will not damage it. However, the Daraja Project will issue Notice to Mariners (NtMs) to ask that vessels not drop their anchor near the subsea cable. All cables' locations are recorded on navigational charts that all marine vessels use. |
| Issue of loss of business during the Daraja Project timeframe (i.e. from the people hiring floaters, camel operators, parking attendants, tourists from the villas / accommodations within the Daraja Project location) and enquired whether the Project Proponent has a compensation plan for the affected traders. | The installation / construction of the Daraja Project components on Nyali Beach will only be for a short duration. Access to the beach will still be kept open for beach-goers during the activities. Any individual or group that can demonstrate with evidence they have been directly affected by the Daraja Project's activities can raise a grievance, and this will be reviewed on a case-by-case basis for those who qualify through proof of evidence. |
| Restrictions caused by the complete blocking of beach access: There were issues from a previous submarine cable project regarding KWS / police around the site. Thus, the business operators enquired about the Project Proponent's reassurance that the Daraja Project will not result in the situation. The beach operators requested the Project Proponent to maintain their access to the beach even if it's an access path. | The installation / construction of the Daraja Project components on Nyali Beach will only be for a short duration. Access to the beach will still be kept open for beach-goers during the activities. The works area will be appropriately fenced and there will be signage to identify the works area. |
| The stakeholders requested that the Daraja Project maintain continuous engagement throughout the Daraja Project for inclusion of the stakeholders throughout the Daraja Project phases. | The Daraja Project have conducted two (2) site visits in October 2024 and February 2025, and undertaken two (2) public consultation to provide information on the Daraja Project. The Daraja Project will also publicise the final ESIA study through newspaper publication and radio broadcast, in accordance with EMCA 1999 (amended 2015).<br>NtMs will be issued to sea users to advise the installation vessel's location and activities programme. Relevant stakeholders in Nyali will be notified prior to installation activities, and a grievance mechanism will be established for any comments and feedback from the local community during installation / construction of the Daraja Project. |

| Main Comments and Feedback | Responses |
|---|---|
| Manpower / Labour: the public baraza requested the Project Proponent to create employment opportunities for the youths during the landing phases i.e. digging trenches, or any labour around the site (partly to compensate loss of income during this time). | It is expected that temporary employment opportunities through local contractors for site preparation and during BMH MBA construction on Nyali Beach for the Daraja Project. |
| Impact of existing submarine cables on fish: Previous submarine cables in a 'vuma' aka vibrates, which drives away the fish, etc. The community of fishermen enquired about what impact study can be done to prevent this in future submarine cable landing projects. | ASN have been liaising with KWS from a previous subsea cable project to assess fish population changes that have occurred and whether these can be attributed to existing subsea cables. In addition, WRTI has been conducting its own marine studies (as well as a marine ecological impact assessment for the Daraja Project) to provide information that will determine whether there is a correlation between the subsea cables and fish migration or population. |
| Concern was raised that the populations of Octopus and lobsters were decreasing because of the cables. | Not answered at the event but subsequent research has highlighted that there is global evidence of Octopi moving to deeper water due to climate change. (ref: Shahar Chaikin *et al.,* 2002) |
| Stakeholders emphasised the need for the protection of marine life and reefs during implementation of the Daraja Project. | A CRS have been completed in February 2025 to support the design of the Daraja Project route, minimising disturbances to sensitive habitats and marine life. The Daraja Project have also liaised with KWS and commissioned WRTI to produce a marine ecological impact assessment of the MMNR based on their monitoring results of the area. The Daraja Project will also target the areas with low coral presence within the lagoon and micro-route around sensitive areas of the seabed during installation of the Daraja Project. |
| Communities enquired about any planned Corporate Social Responsibility (CSR) activities that the Daraja Project has for the local community. Locals suggested construction of toilet facilities for themselves and those who access the beach area. | The Project Proponent recognises the need for CSR as part of the Daraja Project for the local community potentially affected by the installation / construction activities. The Project Proponent is currently reviewing the CSR commitments and discussing appropriate measures with the local community at the time of reporting. The commitment will be agreed in time for the final ESIA study public consultation with the local communities. |

## 6.8 CORPORATE SOCIAL RESPONSIBILITY COMMITMENTS

The CSR will be prioritised for fishermen who will be most affected during the Daraja Project's construction / installation phases on Nyali Beach and the Kenyan TS. Safaricom Plc operates a charity CSR initiative, and will also aim to improve on the quality of life within those associated communities through health, education, youth development and / or national priority initiatives on a sustainable basis.

## 6.9 GRIEVANCE REDRESS MECHANISM FOR THE DARAJA PROJECT

The ESIA project-specific Grievance Redress Mechanism (GRM) will be developed to address concerns arising from the implementation of the Daraja project at Nyali Beach, Mombasa. The GRM will be accessible to all affected stakeholders, including members of the BMU at Nyali Beach, Nyali beach operators, informal traders, fishermen, and local communities who access the beach and adjacent marine areas for livelihood and recreational purposes. The GRM aligns with the community norms and culture, and is aligned with existing grievance structures

commonly used in Mombasa, such as engagement through the BMU leadership (Chairman), local Nyumba Kumi representatives (village elders / heads), and the Mombasa area Chief.

### 6.9.1 PRINCIPLES OF GRIEVANCE REDRESS MECHANISM

A grievance mechanism should be based on the following principles:

- Transparency and fairness: The process for grievance resolution should be transparent, in harmony with the local culture and in the appropriate language. It should explicitly assure potential users that the mechanism will not impede their access to other judicial or administrative remedies.
- Accessibility and cultural appropriateness: All stakeholders including every member of a community or group should have access to the grievance procedure. Any individual or group that can demonstrate with evidence they have been directly affected by the Daraja Project's activities, can raise a grievance.
- Openness and communication regularity: There should be multiple channels available for individuals and groups to choose their preferred method for lodging grievances.
- Channels of communication should be kept open throughout the process of addressing each grievance and up to three months after the situation has been resolved.
- Written records: All grievances should be registered on a Complaints Registration Form and tracked through to Complaints Resolution Form. This should include documentation of how the grievance has been resolved.
- Dialogue and site visits: All grievances should warrant discussions with the complainant and a site visit to gain a first-hand understanding of the nature of the concern. The purpose of the visit is to verify the validity and severity of the grievance.
- Timely resolution: The Project should aim to resolve 90% of grievances within 30 working days, where feasible, as per best practice. Grievances that have not been resolved in this period should at a minimum have been acknowledge and investigated.

### 6.9.2 GRIEVANCE REDRESS MECHANISM PROCESS

Complaints can be submitted verbally or in writing through multiple channels, including at the activity works area, mobile phone communication (calls or SMS to designated mobile number), in writing at Safaricom shop in Mombasa and through a designated email address. All grievances will be logged and acknowledged within three (3) – five (5) working days. Routine or minor complaints will be addressed promptly by the site manager / client representative. However, individuals who believe they have been materially affected must submit formal written grievances, through an email or letter, along with any supporting evidence. The Project will aim to resolve most concerns raised within 30 working days of receiving the information, depending on the urgency and / or volume of issues raised.

The GRM will operate in three (3) tiers:

a. Local resolution through community engagement and the BMU;

b. Project-level resolution through the Grievance Committee; and

c. Escalation to the County Government of Mombasa or the National Environment Complaints Committee for complex or unresolved matters.

The following are the general steps in a grievance redress mechanism process:

- Step 1: Establishing the Grievance Management Procedures
- Step 2: Receiving and Registering a Grievance
- Step 3: Documenting the Grievance
- Step 4: Action, Reviewing and Investigating Grievances
- Step 5: Feedback – Developing Resolution Options and Preparing a Response
- Step 6: Closure
- Step 7: Monitoring, Reporting and Evaluating

All resolutions will be documented, and feedback will be provided to complainants in a timely manner. The mechanism will be monitored regularly to ensure effectiveness, transparency, and responsiveness to community concerns, in line with national legal requirements and international best practices for stakeholder engagement.

# 7. SPECIALIST STUDIES

To understand the environment in which the Daraja Project will be laid, specialist studies were considered to inform the subsea cable route, to avoid any obstacles that might be of importance and to ensure that appropriate mitigation measures are in place where needed. **Table 7-1** indicates which specialist fields were considered and explains why this specialist field was or was not pursued.

TABLE 7-1 SPECIALIST FIELDS CONSIDERED FOR THE DARAJA PROJECT

| Item | Specialist Field | Justification |
|---|---|---|
| 1 | Cable Route Study | ASN and EGS undertook a desktop study and site visit in October 2024 to determine the optimal cable landing point and any features to avoid. This is incorporated into the Cable Route Survey (**Section 7.1**) |
| 2 | Cable Route Survey | A Cable Route Survey was undertaken and completed by EGS in February 2025 (**Section 7.1**). |
| 3 | Marine and Coastal Ecological Study | The Marine Impact Assessment was undertaken by WRTI in February-May 2025 (**Section 7.2**). |
| 4 | Heritage Resources | The DTS identified two (2) shipwrecks in the shallow waters of the subsea cable route. As such, the route has been designed to avoid these. Additionally, NMK also identified two (2) additional shipwrecks near the route. A suitable subsea cable route design buffer was imposed around the shipwrecks to ensure that they would remain unaffected by the Daraja Project activities. No other heritage resources were identified during the CRS; therefore, no further heritage assessments were deemed necessary (**Section 7.3**). |
| 5 | Terrestrial Ecology | Terrestrial coastal ecology within the AOI of the Daraja Project was assessed in the Marine and Coastal Ecological Study. |

## 7.1 EGS CABLE ROUTE SURVEY

As part of the cable route planning, ASN commissioned a specialist marine survey company, EGS, to perform a CRS. The survey was conducted to provide geophysical and geotechnical information on the nature of the seabed within a defined corridor of the proposed subsea cable route. EGS was contracted to survey a safe and economical route for the proposed subsea cable by determining water depth, seabed hazards, geomorphology and other oceanographic and anthropogenic data. Special attention was given to the recording and charting of rock outcrops and other hard substrates, as well as areas of coral, seagrass and other sensitive organisms.

EGS undertook the bathymetric survey and prepared a CRS report. North up charts from the CRS report are included in **Appendix D**.

EGS performed the Daraja Project's survey operations in the Indian Ocean using the Research Vessel Bold Explorer for deep water surveys between 24 January 2025 and 11 February 2025, and the Survey launch Ming Jai for shallow water surveys between 25 January 2025 and 1 February 2025.

The following surveys were also undertaken for the Daraja Project:

1. Onshore Survey (topographic) – ±250 m inland up to the LWM;
2. Inshore Survey – between water depths of 3 m to 15 m (500 m corridor width);

3. Offshore Survey – (Shallow Water Survey) between water depths of 15 m and 1,000 m (500 m corridor width); and
4. Offshore Survey (Deep Water Survey) – in water more than 1,000 m in depth (=/>1,000 m corridor width).

The objective of the CRS was to better understand the geophysical and geotechnical nature of the seabed. This would help inform the subsea cable route to avoid obstacles that might be of importance, and that could also damage the subsea cable in the longer term. The CRS was also used to assess the characteristics of the seabed sediments and to determine appropriate installation methods.

The findings from the CRS have been used to refine the proposed subsea cable route in Kenyan waters. The 'North-Up' charts showing the data collected for subsea cable route are included in **Appendix D** of this report. Key findings relevant to this ESIA are outlined in the following section.

### 7.1.1 FINDINGS OF ENVIRONMENTAL RELEVANCE

The key environmental findings relevant to this ESIA are provided in **Table 7-2**.

TABLE 7-2 KEY ENVIRONMENTAL FINDINGS OF THE EGS CABLE ROUTE SURVEYS FOR THE DARAJA PROJECT

| Topic | Finding |
|---|---|
| Existing Cables | 19 existing in-service cables, and one (1) OOS cable to be cleared. No pipelines were identified. |
| Coral Areas | The inshore survey area is located through Nyali Reef, which is formally protected. The reef is documented to comprise 25% coral, 38% rock, and 37% loose sediments. |
| Seagrass Areas | Seagrass areas (Thalassodendron sp.) were identified during the Inshore Survey – the Nyali Reef provides protection to seagrass habitat. |
| Shipwrecks | A total of four (4) shipwrecks were found in the corridor during the reviews of the DTS, Shallow Water Survey, and the letter received from NMK on 17 January 2025. (**Section 7.3**) |
| Wildlife | No marine mammal observations were made during the survey. |

## 7.2 WILDLIFE RESEARCH AND TRAINING INSTITUTE MARINE AND COASTAL ECOLOGICAL STUDY

The proposed installation of the Daraja Project will traverse the MMNPR, which is within the mandate of KWS for the conservation of marine biodiversity. Through KWS, WRTI was subcontracted by ERM for a marine specialist Ecological Impact Assessment of the Daraja

Project in the MMNPR. The assessment aimed to document the MMNPR's existing marine biological environment, which represents an important area for biodiversity.

The overall goal of this assessment was to determine whether the potential impacts of the Daraja Project's interaction with the sensitive marine ecosystem are significant, and to recommend avoidance or mitigation measures to prevent a net loss in biodiversity when the Daraja Project is implemented. The specific objectives are to:

1. Document the marine flora, fauna, and habitats in the MMNPR;
2. Assess potential impacts on flora, fauna, and natural habitats;
3. Identify potential impacts of the Daraja Project and propose solutions; and
4. Prepare a report to feed into this ESIA Report for the Daraja Project, which traverses through the MMNPR (**Appendix I**).

### 7.2.1 METHODOLOGY

The assessment methodologies take into account the requirements of EMCA 1999 (amended 2015), as well as relevant best international practice, including the following:

- The United Kingdom (UK) Institute of Environmental Management and Assessment (IEMA) – Suite of General and Topic Specific Guidelines for Environmental Impact Assessment (various dates); and
- The UK Chartered Institute of Ecology and Environmental Management (CIEEM) – Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal (2010).

#### 7.2.1.1 DESKTOP RESEARCH AND EXPERT INTERVIEWS

Data and information from recent rapid surveys of the intertidal and subtidal areas were gathered through detailed desktop research of the status of coral reef colonies and seagrasses in the Daraja Project's AOI. A review was conducted of any existing marine life inventories completed for the area in the last five (5) years.

Local experts and scientists with knowledge of the area were also consulted to provide additional insight on the marine biodiversity and habitats in the Daraja Project's AOI.

#### 7.2.1.2 SITE SURVEY

Walking transects were undertaken along the subsea cable landing site on Nyali Beach; biodiversity data and other relevant information were recorded and mapped. Data obtained from routine boat transects undertaken by KWS/WRTI were used to assess the status of fish species in the MMNPR and the immediate environment.

### 7.2.2 FINDINGS

Approximately 17.8 km of the subsea cable route crosses the MMNR in the approach to the landing site on Nyali Beach. This designated area falls under category II of the International Union for Conservation of Nature (IUCN) protected area classification. The MMNR is set aside to protect ecological processes, along with the complement of species and ecosystems characteristic of the area, while allowing for environmentally and culturally compatible public use. Some of the activities taking place in the reserve include fishing, glass-bottom boating, snorkelling and swimming. **Table 7-3** outlines the subsea cable installation activity relative to the environmental setting for the subsea cable route.

Detailed information on the environmental setting and consideration of the Daraja Project's potential impacts within the MMNR have been incorporated in **Appendix I.** Further details on the baseline and impact assessment of the Daraja Project route have been incorporated into **Chapter 8** and **Chapter 10** of this ESIA Report.

### 7.2.3 CONCLUSION

Potential impacts to marine biodiversity associated with the installation and operation of the Daraja Project relate to potential damage to sensitive habitats, sediment plumes, pollution, shipping incidents, disruptions to tourism and fishing activities during installation, and waste generation during subsea cable installation.

Based on the findings from WRTI's report, the majority of these potential impacts can be avoided through appropriate operational procedures or through the use of in-built mitigation measures (**Table 11-1**). Most of the other identified potential impacts related to marine habitats are highly localised, are short-lived and will be minimal after the subsea cable is laid and operational. The study concluded that soft substrate communities are expected to recover naturally, while highly degraded reef areas show low coral cover and fish diversity. As well as that the disturbance is within the ecosystem's resilience. Therefore, the habitat disturbance caused during the installation and operation of the subsea cable is unlikely to have a net loss effect on biodiversity.

## TABLE 7-3 ENVIRONMENTAL SETTING OF THE DARAJA PROJECT

| Section of the Subsea Cable | Substrate Characteristics | Environmental Setting | Project Installation Methods |
|---|---|---|---|
| From the BMH MBA to the High-Water Mark (HWM) | The terrestrial section extends approximately 225 m from the intertidal zone to the BMH MBA. | The subsea cable route does not directly impact sensitive environments, although they are within the Daraja Project's AOI. The subsea cable landing site is far from the turtle nesting sites on Nyali beach. | The subsea cable will be buried to a depth of 2 m beneath the sand (or to hard ground whichever is encountered first). |
| From HWM to 2.9 km offshore (15 m deep) (in the MMNR) | Soft-bottom, sandy substrate that transitions to hard bottom. | Sea grass and corals are present. | The subsea cable will be diver-laid and buried in this section where feasible, and routed around corals and boulders whenever possible. Where this is not possible, the subsea cable will be surface laid without burial or trenching, clamped and secured where necessary to prevent movement.<br>Articulated pipe will be applied for 725 m of the route, adding additional weight that will further prevent subsea cable movement once installed. |
| From 2.9 km (15 m deep) to 10.5 km (292 m deep) (within the MMNR) | The seabed is steep, with boulders, debris, rocks, and depressions. | Corals and seagrass appear before the deep-sea habitat. | The subsea cable will be surface-laid, meaning that no plough burial or trenching will be undertaken for the first 120 m (from 15 m to 18 m deep). |
| From 10.5 km (292 m deep) to 234.6 km (1,000 m deep) (outside the MMNR) | In this section, the seabed substrate consists of soft, thick sediments with occasional boulders, rocks, debris, and depressions. | This section transits into deep sea, where the seabed becomes flat and the marine habitat changes, becoming less sensitive ecologically. | Plough burial is planned for this section of the route. |

## 7.3 HERITAGE RESOURCES: SHIPWRECKS

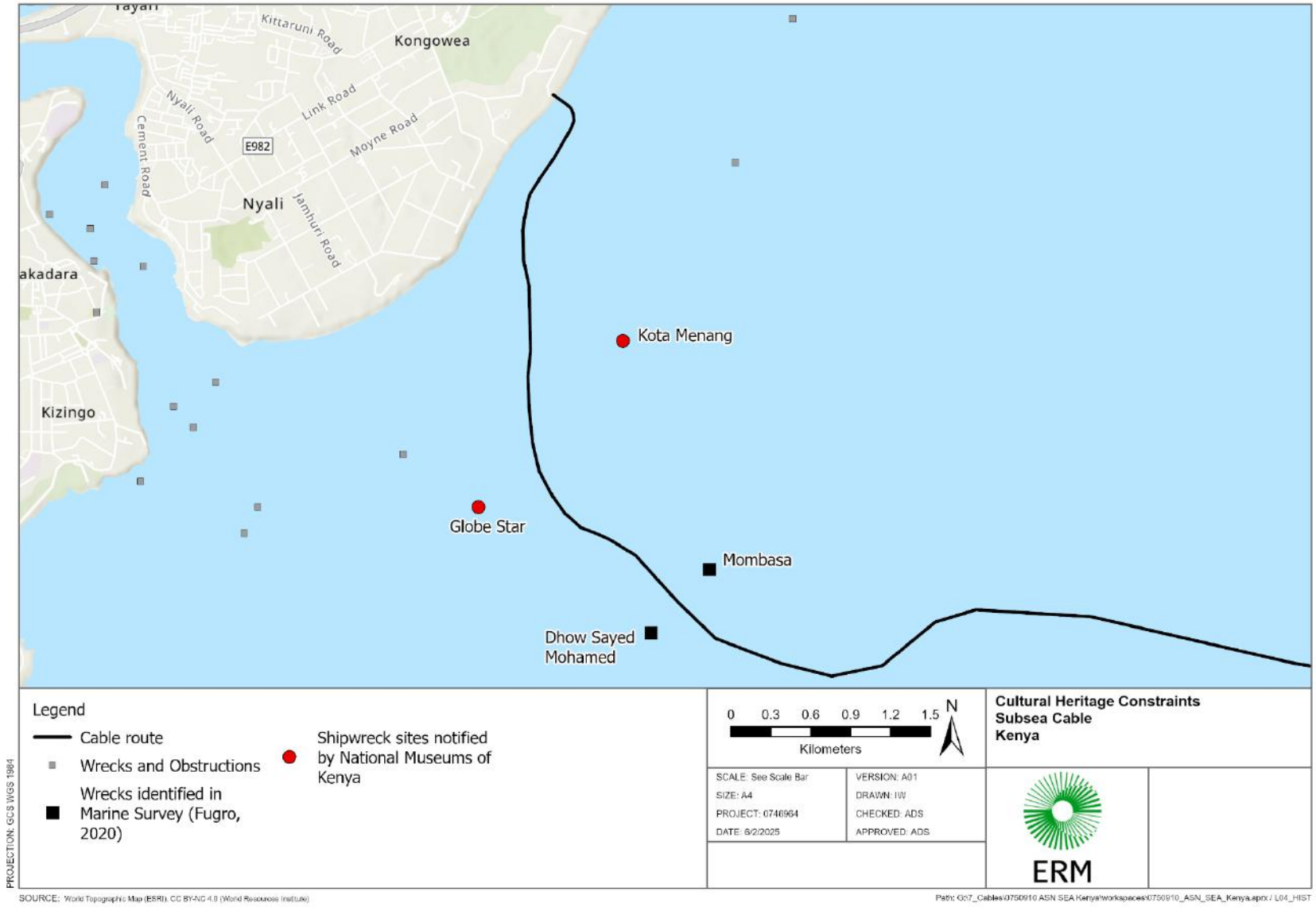
During the initial review stage of the Daraja Project, the NMK in Mombasa was identified as a key stakeholder for consultation. On 26 November 2024, a brief meeting was also held with them to introduce the Daraja Project. On 17 January 2025, the NMK requested for a heritage assessment along the proposed subsea cable route, specifically with regard to shipwrecks.

**Figure 7-1** shows the subsea cable route in proximity to a number of shipwrecks, including the Kota Menang (approximately 660 m from the subsea cable route) and Globe Star (approximately 300 m from the subsea cable route), as well as those identified in the DTS and CRS. These include one (1) located 347.4 m within the shallow waters of Mombasa at latitude 004° 04.742’ S, longitude 039° 43.237’ E, and the Dhow Sayed Mohamed located 294.8 m from the proposed subsea cable route at latitude 004° 05.000’ S, longitude 039° 43.000’ E. The subsea cable route has been designed to avoid these shipwrecks altogether, and a buffer of 100 m was imposed to protect the shipwrecks from the Daraja Project activities. As such, installation of the subsea cable is not anticipated to have the potential for impacts to these identified heritage resources.

Other than shipwrecks, there were no other objects / obstacles identified along the subsea cable route that may have been considered potential heritage resources. It was therefore concluded that an additional heritage and archaeological survey would not be necessary as part of the ESIA study. On 8 February 2025, an email response was sent to NMK describing these findings and the conclusion that no further heritage studies are required in the ESIA study.

Detailed charts (called ‘North-Up’ charts) were developed to guide the proposed subsea cable routing and installation methods (see **Appendix D**). Should any archaeological material be found during the installation phase of the Daraja Project, the Daraja Project will implement the processes highlighted in the Archaeological Chance Find Procedure (see **Appendix E**).

## FIGURE 7-1 SHIPWRECK LOCATION IN RELATION TO THE PROPOSED SUBSEA CABLE ROUTE



# 8. BASELINE INFORMATION OF THE PROPOSED PROJECT SITE

This Chapter provides information on all receptors and resources that were identified during the ESIA study as having the potential to be significantly affected by the Project.

Baseline conditions are defined using publicly available data and information, as well as the information from the CRS, marine ecological study conducted by WRTI, and stakeholder engagement.

The Daraja Project's AOI is used to describe the boundaries of the extent to which the direct or indirect impacts may be felt during the installation and operation phases of the Daraja Project. The AOI to be assessed can vary depending upon the type of impact being considered and the attributes of the potentially affected receptors and resources.

In each case, the AOI includes all areas within which significant impacts are likely to occur, taking into account the:

- Physical extent of the proposed works, defined by the limits of land to be acquired or used (temporarily or permanently) by the Daraja Project.
- Nature of the baseline environment and manner in which impacts will likely be propagated beyond the Daraja Project boundary.

## 8.1 PHYSICAL ENVIRONMENT

### 8.1.1 METEOROLOGY

#### 8.1.1.1 RAINFALL/PRECIPITATION

Kenya's coastal climate is influenced by the southeast monsoon (SEM) from late April to October, which brings rough winds and rain, and the northeast monsoon (NEM) from December to late March, which brings calm winds. The transition period between these seasons lasts about four weeks. The heaviest rainfall occurs from late April to August. Mombasa experiences warmer, calmer conditions during the NEM (December to April) and cooler, rougher conditions during the SEM (May to October). Rainfall in Nyali varies significantly throughout the year, with May being the wettest month, receiving approximately 232 mm of rainfall over 19 rainy days. In contrast, February is the driest month, with only about 20 mm of rainfall over three (3) rainy days. Marine activities are safer during the NEM. According to global climate change projections, rainfall projections indicate that the October-December short rains will increase in many coastal counties, while the March-May long rains will be extremely low under Representative Concentration Pathway (RCP) 2.6 and 8.5 scenarios. With climate change, the frequency and intensity of rainfall are expected to increase, leading to more frequent and severe river floods.

#### 8.1.1.2 TEMPERATURE

Kenya's mean surface temperature is projected to increase by 1°C to 1.5°C by 2030. Coastal regions, particularly the southern coast, may experience a lower rate of warming (0.5°C) compared to other areas. The warmest month is March, with average highs reaching 31.6°C (88.9°F) and lows of 25.3°C (77.5°F). Conversely, July is the coolest month, with average highs of 27.3°C (81.1°F) and lows of 22.2°C (72°F). Generally, temperatures range from highs of 27.3°C (81.1°F) to 31.6°C (88.9°F) and lows of 22°C (71.6°F) to 25.3°C (77.5°F). Rising

temperatures and changing rainfall patterns increase extreme weather events like flooding and coral bleaching, affecting ecosystems, ocean resources, food, health, coastal zones, industry, and human settlements.

#### 8.1.1.3 WIND

The trade winds in the Western Indian Ocean (WIO) play a significant role in shaping the region's climate. These winds are part of the larger atmospheric circulation system known as the Hadley Cell, where warm air rises near the equator and flows toward the poles before descending and returning as surface winds (McGregor and Nieuwolt, 1998). In the WIO, the northeast trade winds dominate during the boreal winter (December to March), while the southwest monsoon winds prevail in the boreal summer (June to September), driven by the land-sea temperature contrast between the Indian subcontinent and the ocean (Schott and McCreary, 2001).

These seasonal shifts create distinct weather patterns, such as the Southwest Monsoon, which brings heavy rainfall to coastal regions like Somalia, Kenya, and Tanzania. Conversely, the northeast monsoon brings dry conditions, contributing to arid climates in parts of East Africa (Nicholson, 2017). The interaction between these winds and ocean currents also influences sea surface temperatures and local marine ecosystems, contributing to upwelling systems like the Somali Current.

Overall, the trade winds and monsoons are critical to the Western Indian Ocean's climate, affecting agriculture, fishing, and regional weather variability.

#### 8.1.1.4 WAVES

Wave patterns in the Western Indian Ocean are influenced by a combination of seasonal winds, ocean currents, and regional topography. The northeast trade winds generate swells during the boreal winter, while the southwest monsoon produces significant wave activity in the summer (Feng *et al.,* 2011).

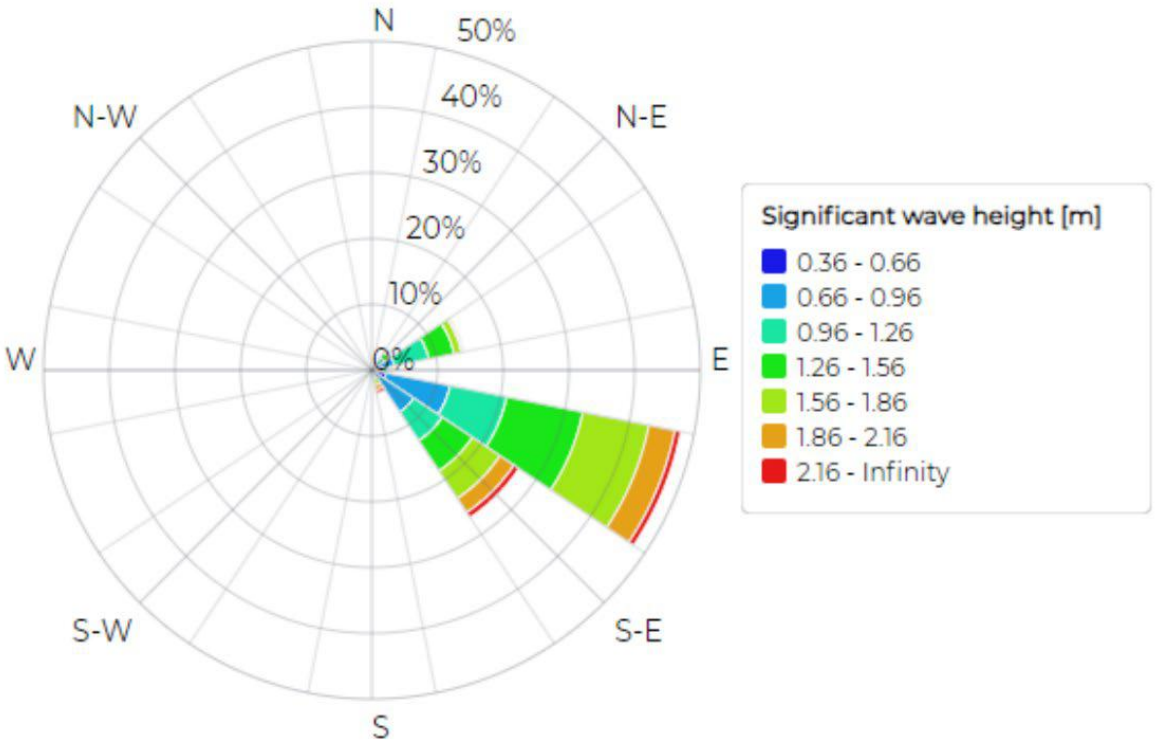
The interaction between these winds and the Indian Ocean's complex bathymetry, including features like the Carlsberg Ridge, affects wave height and direction (Fasullo *et al.,* 2007). Additionally, cyclonic storms can create extreme wave conditions, impacting coastal areas and shipping routes. Understanding these patterns is crucial for maritime safety and coastal management.

**Figure 8-1** shows significant wave heights and their direction for the Mombasa landing. Metocean data shows the annual occurrence of wave heights >1 m is 72.93%. The mean wave height is 1.29 m.

Wind speed and direction at the Mombasa landing are detailed in **Figure 8-2** and **Figure 8-3**. **Figure 8-2** shows lower wind speeds, <10-20 kilometre per hour (kmph) are dominant between the months September to March, annually. Between May and August, annually, higher wind speeds of <20-30 kmph are observed more frequently.

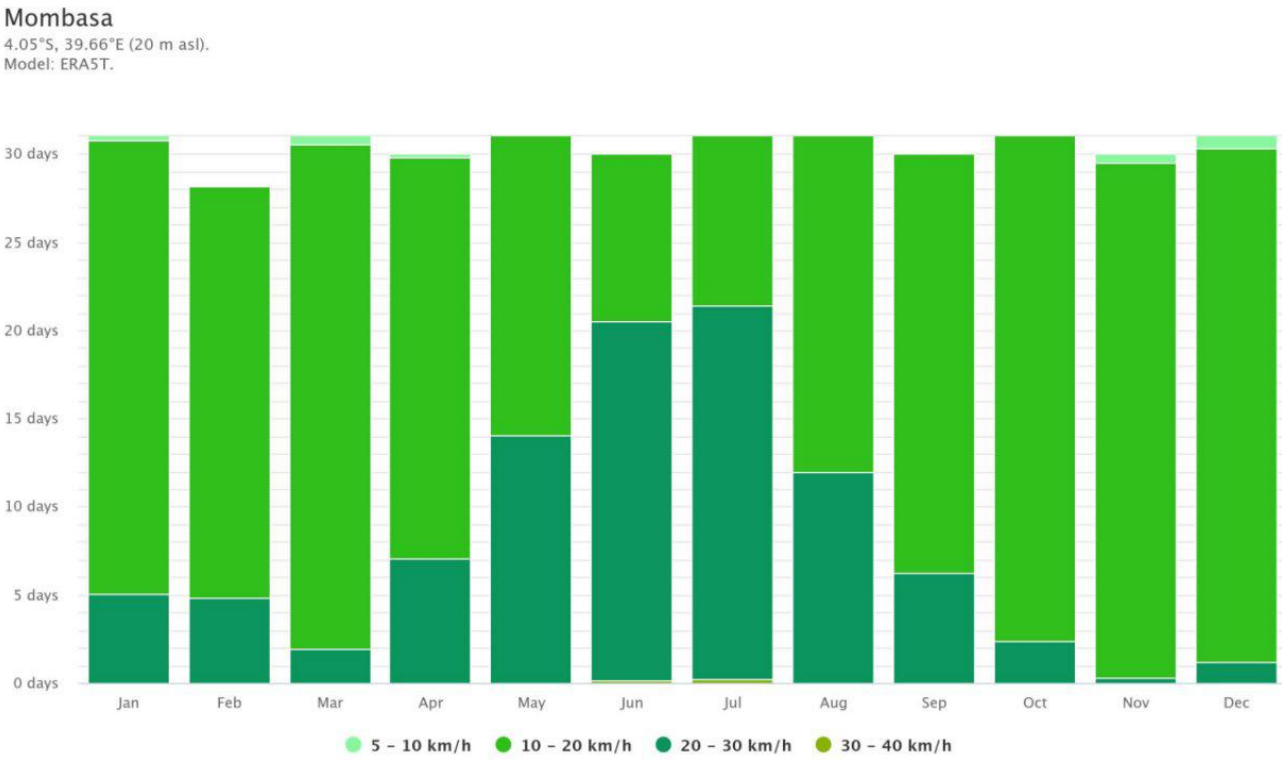
The distribution rose from **Figure 8-3** displays the direction of wind speeds per hour through the year. There is a clearly dominant wind direction blowing from South-Southwest (SSW) with winds between 10-20 kmph blowing for 865.7 h/year.

FIGURE 8-1 WAVE HEIGHT AT THE DARAJA PROJECT AREA



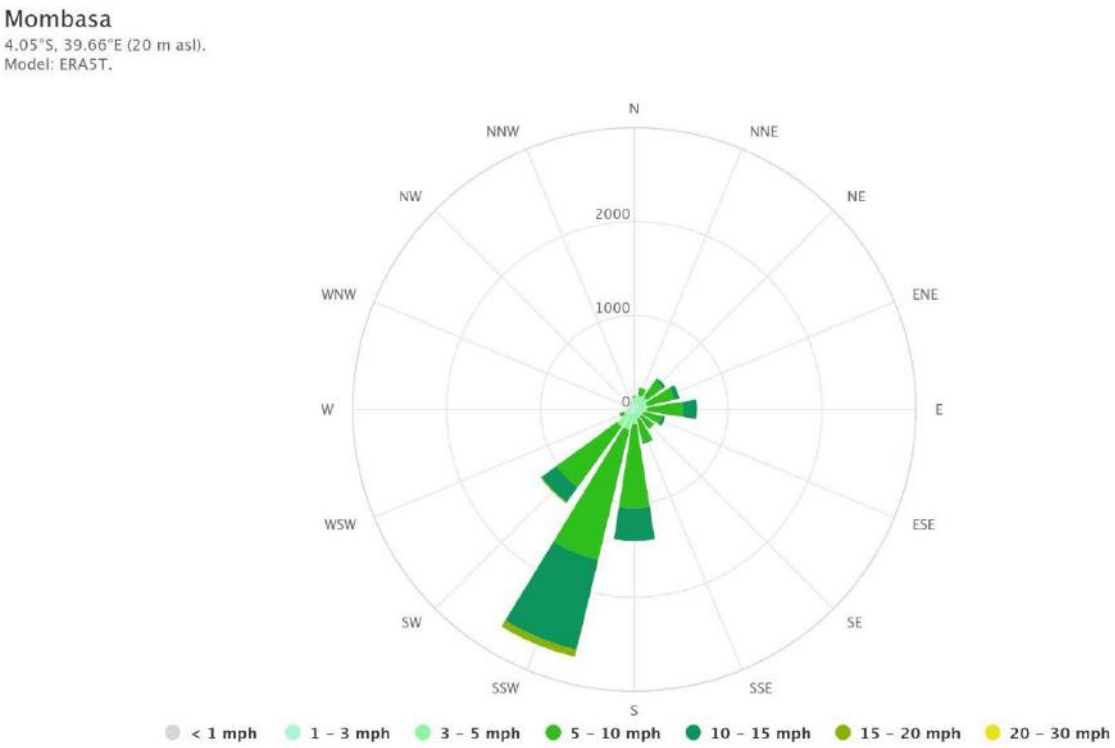

Source: Analytics, 2024

FIGURE 8-2 WINDSPEED IN KM/H PER MONTH FOR THE DARAJA PROJECT AREA




Source: Meteoblue, 2024

FIGURE 8-3 WIND DIRECTION SPEEDS FOR DARAJA PROJECT AREA




Source: Meteoblue, 2024

## 8.1.2 CLIMATE RISK AND VULNERABILITY

This section provides the climate risk and vulnerability assessment for Mombasa based on the ThinkHazard! platform developed by the World Bank's GFDRR, which uses scientific, open-access data and a standardized methodology to classify natural hazards into four risk levels—Very Low to High (Douglas *et. al.,* 2017) — based on probabilistic and susceptibility data, considering both the intensity and frequency of events such as floods, earthquakes, wildfires, and extreme heat.

Nyali, located in Mombasa County, faces significant climate change risks primarily manifesting as river floods, wildfires, tsunamis, extreme heat, earthquakes, coastal floods, water scarcity, urban floods, and landslides. Mombasa has a history of extreme climatic events, with over 70% of natural disasters attributed to these phenomena (ThinkHazard!, 2020). Major floods are estimated to occur approximately every ten (10) years, while moderate floods appear every three (3) to four (4) years, leading to considerable socio-economic impacts, including crop and livestock losses, reduced hydropower generation, and increased economic costs. Droughts have devastating effects, consistently affecting the agricultural sector and contributing to economic losses each year (World Bank Group, 2021).

TABLE 8-1 RELEVANT NATURAL HAZARDS IN NYALI, MOMBASA

| Risk | Risk-Level |
|---|---|
| River Flood | High |
| Wildfire | High |

| Risk | Risk-Level |
|---|---|
| Tsunami | Medium |
| Extreme Heat | Medium |
| Earthquake | Medium |
| Coastal Flood | Medium |
| Water Scarcity | Low |
| Urban Flood | Low |
| Landslide | Very Low |

Source: ThinkHazard!, 2020

#### 8.1.2.1 RIVER FLOODING

Nyali is increasingly susceptible to river flooding events, largely due to intensified rainfall patterns influenced by climate change. These floods can result in significant damage to infrastructure, displacement of communities, and deterioration of agricultural lands. The increased frequency and intensity of rainfall can overwhelm drainage systems, leading to surface runoff that contributes to the flooding of low-lying areas and riverbanks. The river flood hazard in Nyali is classified as high, indicating a greater than 20% likelihood of potentially damaging and life-threatening river floods occurring within the next decade. Consequently, project planning, design, and construction methods must accommodate this level of river flood hazard. Furthermore, given the high confidence in increased intense precipitation because of climate change, future hazards are expected to intensify.

#### 8.1.2.2 WILDFIRE

In Nyali, the wildfire hazard is classified as high, indicating over a 50% likelihood of encountering conditions conducive to significant wildfires that may result in loss of life and property in any given year. Consequently, it is essential to consider the impact of wildfires throughout all phases of the Daraja Project, particularly during design and installation / construction, incorporating appropriate planning and emergency response strategies. Hazards include not only direct flame exposure, but also ember storms and low-level surface fires, with extreme fire weather potentially compromising infrastructure integrity due to strong winds and debris. Modelled projections of future climate identify a likely increase in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. In areas already affected by wildfire hazard, the fire season is likely to increase in duration, and include a greater number of days with weather that could support fire spread because of longer periods without rain during fire seasons. Climate projections indicate that there could also be an increase in the severity of fire.

#### 8.1.2.3 TSUNAMI

In Nyali, the tsunami hazard is classified as medium, indicating more than a 10% chance of a potentially-damaging tsunami occurring in the next 50 years. Consequently, for the Daraja

Project, planning decisions, design, and installation / construction methods should take into account the level of tsunami hazard. The areas at risk of tsunami will increase as global mean sea level rises. Projects in low-lying coastal areas such as deltas, or in island states should be designed to be robust to projected increases in global sea level.

#### 8.1.2.4 EXTREME HEAT

In Nyali, the extreme heat hazard is classified as medium, indicating a greater than 25% likelihood of experiencing at least one period of prolonged exposure to extreme heat, leading to heat stress, within the next five (5) years. Consequently, for the Daraja Project, planning, design, and installation / construction methods should consider this risk. Furthermore, according to the Intergovernmental Panel on Climate Change synthesis report (IPCC, 2023), the global surface temperature was 1.09 °C higher during the period from 2011 to 2020 compared to 1850 to 1900, with increases being more pronounced over land at 1.59 °C, while the ocean experienced a rise of 0.88 °C. The ongoing GHG emissions are projected to result in more frequent temperature extremes over the next 50 years, with regional variations indicating a slightly lower temperature increase in Nyali compared to the global average.

#### 8.1.2.5 EARTHQUAKES

Nyali, being located in the coastal region of Kenya, has a medium earthquake risk level, meaning the potential chances of an earthquake occurring and causing damage in the next 50 years is at 10%. Trends indicate that no earthquakes of magnitude 5 or above have occurred in Nyali recently. High-magnitude earthquakes are less common than those of lower magnitudes. Consequently, for the Daraja Project, planning, design, and installation / construction methods should account for the potential for earthquakes.

#### 8.1.2.6 COASTAL FLOODING

Nyali is increasingly susceptible to coastal flooding events, largely due to intensified rainfall patterns influenced by climate change. These floods can result in significant damage to infrastructure, displacement of communities, and deterioration of agricultural lands. The increased frequency and intensity of rainfall can overwhelm drainage systems, leading to surface runoff that contributes to the flooding of low-lying areas and riverbanks. The coastal flood hazard in Nyali is classified as medium, indicating a greater than 20% likelihood of potentially damaging and life-threatening coastal floods occurring within the next decade. Consequently, for the Daraja Project, planning, design, and installation / construction methods must accommodate this level of coastal flood hazard. Furthermore, given the high confidence in increased intense precipitation as a consequence of climate change, future hazards are expected to intensify.

#### 8.1.2.7 WATER SCARCITY

In 1992, Kenya was classified as a water-scarce country, with available water resources calculated at 647 cubic meters per capita, which is below the internationally accepted threshold of 1,000 $m^3$. This water scarcity index has deteriorated in conjunction with rapid population growth, with projections indicating a decline from approximately 586 $m^3$ per capita in 2010 to as low as 293 $m^3$ per capita by 2050. Consequently, Kenya is particularly vulnerable to the adverse effects of climate change, which poses serious implications for the country's Vision 2030, adversely affecting sectors such as tourism, agriculture, industry, and energy. Freshwater resources in Kenya are highly susceptible to significant inter- and intra-annual

rainfall variability, which includes extremes such as floods and droughts. Water scarcity in Nyali is classified as low, indicating a 1% likelihood of drought occurring within the next decade. Consequently, the potential impact of drought / water scarcity should be considered throughout all phases of the Daraja Project, particularly regarding its effects on personnel and stakeholders, as well as during the design of infrastructure.

#### 8.1.2.8 URBAN FLOODING

Urban flood hazard in Nyali is classified as low, indicating a chance of more than 1% that potentially damaging and life-threatening river floods occur in the coming ten (10) years. Consequently, for the Daraja Project, planning decisions, design, and installation / construction methods should take into account the level of urban flood hazard.

#### 8.1.2.9 LANDSLIDES

Landslide susceptibility in Nyali is classified as very low, indicating that the region's rainfall patterns, terrain slope, geology, soil composition, land cover, and potentially seismic activity contribute to localized landslides being a rare hazard phenomenon. For the Daraja Project, planning decisions regarding siting, design, and installation / construction methods should account for the potential for landslides.

### 8.1.3 OCEANOGRAPHY

#### 8.1.3.1 BENTHIC PROFILE

The benthic physical profile along the Daraja Project route within the MMNR reveals a diverse and dynamic seabed structure shaped by both natural geomorphological processes and biological activity. The shallow inshore zone, extending from the BMH MBA to approximately 2.9 km offshore, is characterised by coarse calcareous sands interspersed with shell fragments and coral rubble. This zone supports dense seagrass meadows, predominantly *Thalassodendron ciliatum*, and transitions into areas of hard substrate with scattered coral heads and macroalgae. Visual assessments and grab samples confirm that the upper sediment layer consists of loose to dense, slightly gravelly fine sand, often underlain by indurated sediment or rock. The presence of seagrass and macroalgae indicates a productive benthic environment, although coral cover is relatively low (<10%), particularly in the Nyali Coral Garden area, which has been impacted by anthropogenic pressures and recent bleaching events.

Beyond the 2.9 km mark, the seabed slopes steeply, transitioning into deeper waters with increasing sediment thickness. From 10.5 km offshore and beyond the MMNR boundary, the substrate becomes predominantly soft, composed of thick layers of fine to medium sand with occasional boulders and rocky outcrops. This deeper benthic zone is less biologically complex but remains ecologically significant due to its role in sediment transport and nutrient cycling. Geotechnical borehole and test pit data confirm the presence of compacted sand overlying rock at various depths, with penetration depths ranging from 0.5 to 2 m. These findings are consistent with the bathymetric and sub-bottom profiling data, which show a generally stable seabed suitable for surface subsea cable laying and burial. The physical characteristics of the benthic environment, including sediment composition, slope, and substrate type, have been carefully considered in the cable route design to minimize ecological disturbance and ensure long-term subsea cable stability.

#### 8.1.3.2 CURRENTS

The WIO is influenced by several significant ocean currents that shape its climate, marine ecosystems, and weather patterns. One of the primary currents is the Somali Current, which flows northward along the East African coast, reversing direction seasonally under the influence of the monsoon winds. During the Southwest Monsoon (June to September, annually), the Somali Current strengthens, causing upwelling, which brings nutrient-rich cold water to the surface and supports marine life (Schott, 2009).

Another key current is the Agulhas Current, which flows south-westward along the southeast coast of Africa, transporting warm water from the Indian Ocean into the South Atlantic. This current plays a critical role in global thermohaline circulation and affects regional climate (Beal, 2011).

The East African Coastal Current (EACC) also flows northward year-round, influencing the circulation of warm waters. During the Northeast Monsoon (December to March, annually), the South Equatorial Current shifts, directing water toward the African coast before being diverted by the island of Madagascar (Schott and McCreary, 2001). These currents influence not only local marine biodiversity but also regional weather, including monsoons, cyclones, and rainfall distribution.

Further to information obtained from the Admiralty Sailing Directions, the 'Metocean-Analytics' tool has been used. The Metocean-Analytics database has been accessed and reviewed, which provides global historical weather. To analyse expected current speeds, seven points on the proposed Daraja Project route were selected and data extracted. The points selected are highlighted in **Table 8-2**. Points are numbered from approximately north to south.

TABLE 8-2 METOCEAN CURRENT ANALYSIS DATA POINTS

| Point ID | Latitude | Longitude | Max Surface Current Speed (knots) | Median Surface Current Speed |
|---|---|---|---|---|
| 1 | 004° 04.142' S | 039° 42.561' E | 1.58 | 0.94 |
| 2 | 004° 05.993' S | 041° 51.804' E | 0.83 | 0.31 |
| 3 | 004° 44.605' S | 043° 46.831' E | 1.33 | 0.33 |
| 4 | 002° 22.342' S | 053° 39.434' E | 3.09 | 0.52 |
| 5 | 009° 58.131' S | 057° 23.555' E | 1.71 | 0.48 |
| 6 | 014° 31.187' S | 057° 11.030' E | 1.36 | 0.30 |
| 7 | 017° 00.398' S | 054° 09.316' E | 1.03 | 0.27 |

Surface currents, mid-water currents and waves can affect subsea cable laying activities. Bottom currents can cause abrasion of the subsea cable where it is laid over obstacles that produce cable suspension. Overall, currents have an important impact on the installation and survival of cables laid on or just beneath the seabed.

- Strong surface and mid-water currents can affect survey and subsea cable laying activities; the subsea cable may end up being laid away from the track of the main lay installation vessel because of current action.

- Strong bottom currents can cause strumming of a suspended cable laid over obstacles (i.e. rocks) or between steep slopes, resulting in abrasion to the subsea cable and consequent chafe faults.
- Sediment movement by strong bottom currents can temporarily uncover a buried cable and even result in subsea cable suspensions, exposing the subsea cable to subsequent damage by fishing activities or chafe. This is particularly the case in areas of sand waves.

To minimise the risk of subsea cable movement and therefore abrasion resulting from the activity of the current, sufficient slack should be deployed to reduce the risk of subsea cable suspension. In deep water beyond the burial limit, currents may accelerate around seabed obstructions to cause cable strum in areas of steep slopes. Armouring for the subsea cable will need to take account of the possible risks of subsea cable suspensions. Note that the major mitigation is PLIB of the subsea cable as any areas of suspension can be rectified.

Generally surface currents across the proposed Daraja Project can be considered high. This has been noted for the installation activities, with the subsea cable installation period selected to align with a period of lower surface current and wave action.

#### 8.1.3.3 TIDES AND TIDAL STREAMS

**Tides**

During the northeast monsoon season, 80% of the swells originate from the northeast, reaching a maximum significant height of 6 m. The sea is generally calm during the inter-monsoon period (March-April), with wave heights dropping significantly to 2.5 m and shifting clockwise to approach from a southerly direction with large fluctuations. During the southeast monsoon (May-October), the waves are usually very large, with a maximum significant height of 8 m, predominantly approaching the coast from the southeast and southwest. Calm conditions resume during the subsequent inter-monsoon period, with waves approaching the coast from the northeast.

**Tidal Streams**

The tides along the Kenyan coast are semidiurnal, with a mean spring tidal amplitude not exceeding 4 m and a neap tide amplitude of approximately 2 m. Offshore waters experience swells of varying magnitudes depending on the season. Consequently, currents in reef channels and creeks are very fast, completing a full cycle in approximately 12.5 hours. This may affect the Daraja Project's operations in three (3) ways:

- Challenges in navigating vessels through lagoon reefs during subsea cable laying.
- Sediment resuspended by the tidal stream can reduce visibility for divers laying and burying the subsea cable.
- Sediment and other water-borne substances resuspended by the installation activities can be 'washed' by the tidal streams towards sensitive habitats.

To mitigate this last point, the highest risk operations may need to occur during ebbing tides when water flows toward the open sea. Mitigation measures for the Daraja Project are summarised in **Table 11-1**.

The KMFRI monitors sea levels in Mombasa Harbour, and the Kenya Ports Authority (KPA) provides annual tide tables online. Due to global climate change, sea level rise in the WIO is projected to be 20-50 cm per century.

Tides and tidal streams are assessed together with currents (**Section 8.1.3.2**) as marine physical processes in **Section 10.1.3.2**.

#### 8.1.3.4 SEA TEMPERATURE AND SALINITY

Sea water temperature and salinity variations along the proposed subsea cable route affect the ecological baseline as well as physical sea water parameters such as the speed of sound. The water temperature of the WIO varies significantly with latitude. Near the equator, temperatures generally range from 27 °C to 29 °C, influenced by the warm currents and direct sunlight. Moving towards the sub-tropical areas, such as near the southern and northern boundaries, temperatures drop to around 22 °C to 25 °C due to cooler currents and reduced solar exposure (NOAA, 2020).

Salinity levels in the WIO are also variable. Near the equator, salinity tends to be slightly lower, around 35 practical salinity units (PSU), due to freshwater inputs from rainfall. In contrast, areas further from the equator experience higher salinity levels of 35.5 to 36 PSU due to increased evaporation and lower freshwater influx (IOC, 2021). These variations in temperature and salinity significantly impact marine ecosystems, influencing species distribution and oceanic currents (World Ocean Atlas, 2019).

#### 8.1.3.5 WATER QUALITY

Coastal water quality in Kenya is affected by sewage disposal, oil pollution, and dredge spoil dumping along the Mombasa coast. The Nyali Lagoon benefits from clean water exchange with the Indian Ocean, reducing land-based pollutants. However, surface runoff, groundwater, and raw sewage occasionally contaminate the lagoon, as indicated by nutrient spikes and faecal bacteria (KWS, 2001; Mwaura *et al.,* 2017). Land-use activities around the Nyali coral garden also impact water quality, particularly from effluents and poor-quality water flowing from Tudor mangrove creek (WRTI and KWS 2021; Mwaura *et al.,* 2017). At high tide, the waves at Nayli Beach resuspend material reducing visibility to less than 1 m within the lagoon.

On-site sanitation and diffuse pollution continue to be significant contributors to the degradation of water quality in the Nyali-Bamburi-Shanzu lagoon system. Research by Mwaguni *et al.* (2017) revealed that concentrations of E. coli and nutrients in the lagoon waters tend to rise during the wet season, primarily due to surface runoff, leachates from nearby dumpsites, and the inefficiency of on-site sanitation systems. These findings underscore the lagoon's susceptibility to land-based pollution, particularly during periods of heavy rainfall when the influx of contaminants is heightened.

In addition to these land-based sources, hydrodynamic and morphological processes along the Nyali coastline also play a critical role in shaping water quality. According to Mwakumanya and Tole (2021), the presence of low-energy surging waves and pronounced swash activity at Nyali Beach facilitates the redistribution of sediments, which in turn can intensify the spread of pollutants in nearshore waters. This dynamic is especially pertinent to subsea cable projects such as the Daraja Project, where construction / installation activities such as trenching or subsea cable laying may disturb sediments and temporarily increase turbidity and the dispersion of contaminants. More recently, a study by Swaleh *et al.* (2022) examined the potential of marine microalgae to remove nutrients from wastewater in coastal Kenya, including areas near Nyali. The study found that nutrient enrichment from untreated wastewater continues to affect coastal water quality, particularly in lagoon systems adjacent to

urban settlements. Additional information on water quality within the MMNPR can be found in **Appendix I**.

## 8.1.4 GEOLOGY AND PHYSIOGRAPHY

### 8.1.4.1 THE COASTAL GEOLOGICAL TIMESCALE

Geologically, the Kenya coast shares similarities with the regional geological setting, featuring Archean-age crystalline rocks within the hinterland and recent unconsolidated sediments at the coast. The coastal plain has been shaped by Quaternary Sea level changes, from 1 million years ago to the present. The Last Glacial Maximum low sea level stand (approximately 130 meters below current levels) significantly influenced the coastal plain and continental shelves around 18,000 years ago.

Late Pleistocene Sea level changes resulted in deposits of "Beach rock" and Aeolianite (lithified dune sequences) and calcarenite along the coastline. Most of these deposits are offshore, forming narrow bands of outcrops that trace old coastlines affected by past sea levels. These formations also serve as a foundation for coral reefs. Beach rock and Aeolianite sequences are common features along the subtropical and tropical coasts of East Africa. Coastal areas are underlain by Mesozoic to recent sediments.

Kenya's continental shelf is generally narrow, with its edge located between 60 m and 100 m at relatively shallow depths. In some regions, there is a very narrow shelf, which may indicate faulting activity. Sand is the main sediment type, grading into mud with depth. The coastline is tectonically stable, with no significant earthquake sources nearby. Major volcanoes are found on land in the Great Rift Valley and the Comoros. Deepwater turbidity currents pose a hazard where loose sediment accumulates on steep slopes, especially if earthquakes do occur. The Kenya coast experienced minor impacts from the 26 December 2004, tsunami, with tidal surges ranging from 0.5 to 1 m. No major nearby tsunami sources are known. As a result, the Daraja Project area is considered to be geologically stable, with sandy / muddy subtidal benthic habitats deeper than 30 m and rocky reef areas shallower than 25 m.

### 8.1.4.2 SEDIMENT LITHOLOGY

The sediment lithology along the Kenyan coast features a mix of alluvium and terrigenous to aeolian (windblown) sediments. The coastline is primarily characterised by coral reefs, with notable aeolian sediments, particularly in the northern areas around Malindi and Ungwana, due to the presence of sand dunes.

### 8.1.4.3 BATHYMETRY

Bathymetry measures the depth of water bodies. Along the subsea cable route at Nyali Beach, depths remain shallow (4 m or less) for the first 2.9 km before dropping to 47 m by KP 3.2. The seabed is smooth from the shore with coarse sediment over rock and occasional boulders, changing to a rough seabed with gentle to moderate gradients in deeper waters. Seamounts observed in Kenya’s deep water range from 2,750 to 3,500 m in depth, measuring between 800 m and 2,000 m and averaging 890 km². These seamounts support high-productivity ecosystems through upwelling.

## 8.1.5 BEACH EROSION AND SCOUR

Coastal erosion is a process influenced by wave action, tidal currents, sediment dynamics and human interactions.

Coastal erosion and scour in the WIO are driven by natural forces such as wave action, ocean currents, and rising sea levels, as well as human interventions. Kenya–experiences significant erosion, especially during the seasonal monsoon winds and storm surges (Masalu, 2002).

Scour, the removal of sediment around submerged structures, is intensified by strong currents (Cochran, 2010). These processes pose substantial risks to coastal infrastructure, ecosystems, and subsea installations, including pipelines and subsea telecommunication cables.

Erosion significantly affects Mombasa's coastline, leading to the loss of coastal land and threatening infrastructure. Mombasa's coastline is exposed to strong wave action and rising sea levels, exacerbating shoreline retreat, especially during the southwest monsoon season (Masalu, 2002).

Coastal developments, such as hotels and roads, are at risk, and erosion also threatens local ecosystems, including coral reefs and mangroves. Human activities, such as sand mining and deforestation, further accelerate the problem, weakening natural coastal defences.

### 8.1.6 SEASCAPE, VISUAL AND LIGHT POLLUTION

The visual character of Nyali is defined by the interplay between its natural coastal features and the built environment. The beach itself presents a visually appealing landscape, comprising fine white coral sands that gently slope toward the WIO, bordered by patches of coastal vegetation including coconut palms and creeping dune flora such as Ipomoea pes-caprae. The seascape is further enhanced by expansive ocean views and the presence of offshore coral reefs, which contribute to the aesthetic and ecological value of the area. The built environment along the beachfront includes a mix of high-end hotels, residential apartments, and commercial establishments, generally set back from the HWM to preserve the visual openness of the shoreline. The BMH MBA location is situated along a public access road leading to the beach, in an area characterized by sparse vegetation and a few temporary structures such as kiosks and informal eateries. The visual setting is consistent with other developed sections of the Nyali beachfront, where infrastructure and human activity are integrated into the coastal landscape without significantly detracting from its scenic quality.

### 8.1.7 AIR QUALITY

Air quality in Nyali, Mombasa is generally considered to be good, owing to the area’s proximity to the ocean and the prevailing sea breezes that facilitate the dispersion of airborne pollutants. The coastal atmosphere is typically characterised by fresh, saline-laden air, with natural sources of particulates including sea spray and wind-blown sand, particularly during dry and windy conditions. On the other hand, recent statistics from the 2024 Air Quality Regulations by NEMA reveal that coastal urban centers such as Mombasa and Kilifi experience PM2.5 levels ranging between 25–40 µg/m³, often exceeding the World Health Organisation (WHO) annual guideline of 5 µg/m³. These elevated levels are primarily attributed to vehicular emissions, port-related industrial activities, and domestic biomass fuel use. The UNEP Air Quality Monitoring Platform further confirms that Mombasa records some of the highest PM10 concentrations among coastal cities in East Africa, especially during the dry season when dust and combustion particles accumulate.

Anthropogenic influences on air quality are present but localized, primarily arising from vehicular emissions along access roads serving the beachfront hotels and residential areas. Additional sources include the intermittent use of diesel-powered generators, particularly during power outages, which contribute to localized emissions of nitrogen oxides, sulfur

dioxide, and particulate matter. Occasional open burning of waste in informal settings may also occur, although such practices are limited in scope. Despite these sources, the overall air quality remains within acceptable thresholds for a coastal urban environment, supported by the natural ventilation provided by the marine setting and the absence of heavy industrial activity in the immediate vicinity.

### 8.1.8 AMBIENT AND UNDERWATER NOISE

The acoustic environment of the Nyali coastal region is shaped by a combination of natural and anthropogenic sound sources, reflecting the area's mixed-use character. Naturally occurring sounds include the continuous breaking of ocean waves along the shoreline, the movement of wind through coastal vegetation, and the calls of seabirds and other fauna, which collectively contribute to a tranquil soundscape, particularly during early morning and evening hours. Superimposed upon this natural acoustic backdrop are various human-generated sounds associated with the area's vibrant tourism and residential activities. Nyali Beach is a well-frequented destination, and the presence of hotels, restaurants, and recreational facilities introduces intermittent noise from vehicular traffic, service deliveries, and public gatherings. Additionally, beach-based activities such as boat excursions, camel rides, and informal commerce contribute to localized increases in ambient noise levels. The overall noise environment is therefore characterised by temporal variability, with quieter periods interspersed with moderate to elevated sound levels during peak tourism and operational hours.

Noise in the marine environment comes from a variety of natural and anthropogenic sources and varies in terms of amplitude and frequency depending on the source. Limited data from studies describe natural noise in the area. In general, natural noise in the marine environment can be linked to the following sources:

- Waves (from 15 to 30 kilohertz [kHz]);
- Precipitation (around 15 kHz);
- Wind (from 500 Hz to 25 kHz);
- Sea turbulence (low frequency); and
- Biological noise (e.g. marine mammals and birds).

No known underwater noise surveys have been conducted in the Daraja Project's AoI to describe the characteristics of the existing biological and anthropogenic noises. A number of biological and anthropogenic emitters are nevertheless present in the study area. For example, due to the high density of marine traffic around the Daraja Project's area, current underwater noise levels are predicted to be elevated.

Some marine species, notably cetaceans use acoustic channels to communicate and convey information. From an anthropogenic standpoint, low frequency sounds from boat noises are presumed throughout the installation corridor given the ship navigation routes in Kenyan waters. Continuous sounds can also have differing effects on fish groups, depending on their hearing sensitivity as detailed in **Table 8-3** (Popper *et al.,* 2014). In the absence of defined quantitative thresholds, the table presents impact criteria as relative risk levels (high, moderate, low) for fish at different distances from the source of the continuous sound which is defined in relative terms as near (N), intermediate (I) and far (F) (**Table 8-3**).

TABLE 8-3 SHIPPING AND CONTINUOUS SOUNDS FISH GROUP SENSITIVITIES

| Type of Animal | Mortality and potential mortal injury | Impairment | | | Behaviour |
|---|---|---|---|---|---|
| | | Recoverable injury | TTS | Masking | |
| Fish: No swim bladder (particle motion detector) | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) Moderate<br>(I) Low<br>(F) Low | (N) High<br>(I) High<br>(F) Moderate | (N) Moderate<br>(I) Moderate<br>(F) Low |
| Fish: swim bladder is not involved in hearing (particle motion detection) | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) Moderate<br>(I) Low<br>(F) Low | (N) High<br>(I) High<br>(F) Moderate | (N) Moderate<br>(I) Moderate<br>(F) Low |
| Fish: swim bladder involved in hearing (primarily pressure detection) | (N) Low<br>(I) Low<br>(F) Low | 170 dB rms for 48 h | 158 dB rms for 12 h | (N) High<br>(I) High<br>(F) High | (N) High<br>(I) Moderate<br>(F) Low |
| Eggs and Larvae | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) High<br>(I) Moderate<br>(F) Low | (N) Moderate<br>(I) Moderate<br>(F) Low |

Note: near (N), intermediate (I) and far (F)

Source: Popper *et al*., 2014

The speed of sound in water varies with temperature and, to a lesser extent, with pressure and salinity. Sound velocity varies from about 1,540 metres per second (m/s) on the subsurface water layers to about 1,490 m/s at depth over 1,000 m.

## 8.2 BIOLOGICAL ENVIRONMENT

### 8.2.1 DESIGNATED AND PROTECTED AREAS

Approximately 17.8 km of the proposed subsea cable route will traverse a MPA, namely the MMNR. In addition, the subsea cable passes approximately 6.3 km south of the MMNP at its nearest point.

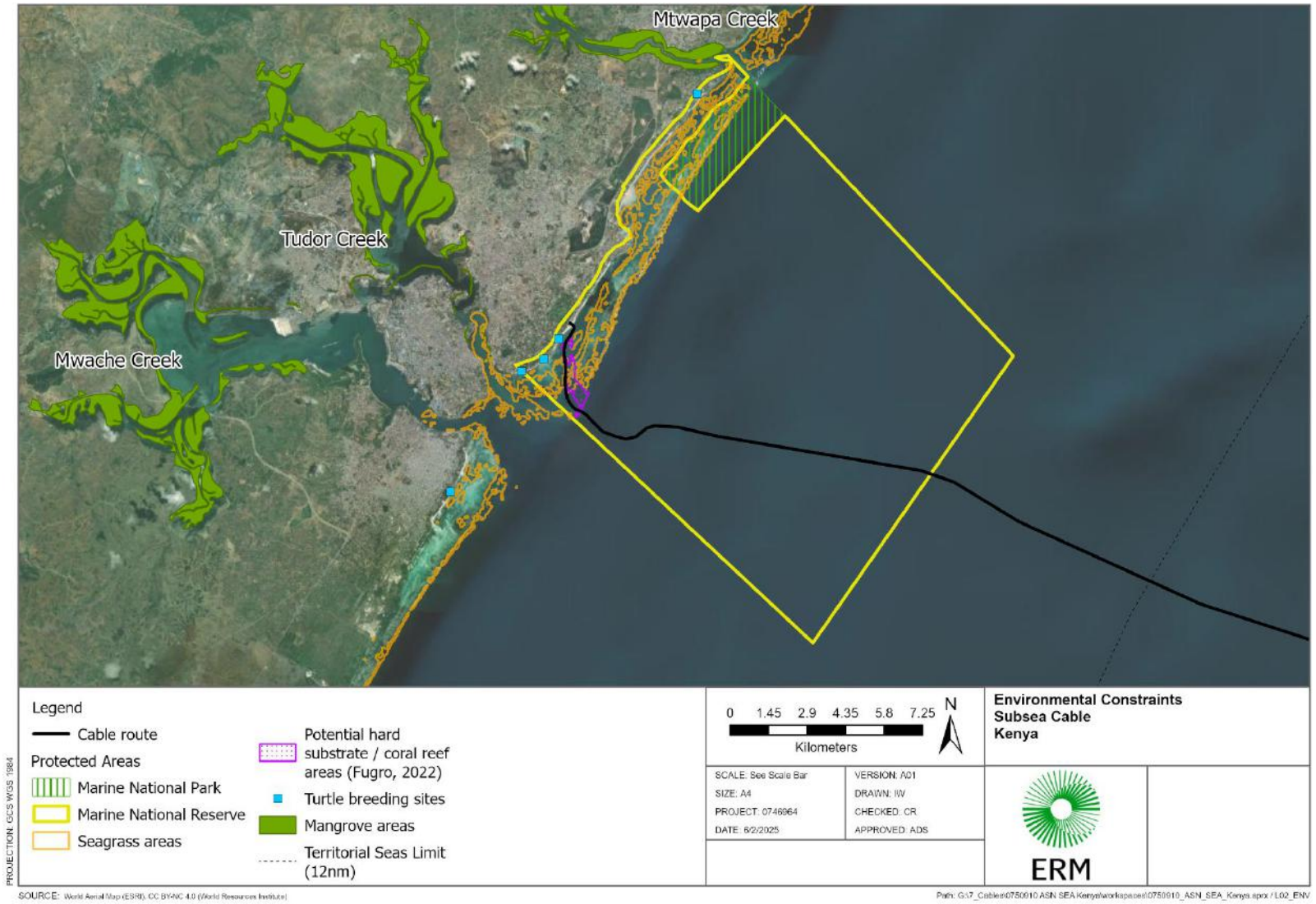
The MMNPR, covering 10 km$^2$ and 200 km$^2$ respectively for the National Park and Reserve, was established in 1986 and formalised in 1991, and is delineated in a zonation scheme that entails two (2) management regimes within its border; a national park and national reserve. The Park is fully protected (no-take zones) and covers a small area (i.e. the green diagonal shaded boundary in **Figure 8-4**), which falls within the Marine Reserve, whereas the reserve is partially protected (allows small-scale fishing) and extends from the reefs adjacent to Tudor creek (English point) (i.e. the large yellow boundary in **Figure 8-4**).

The MMNPR harbours rich marine ecosystems and habitats, including coral reefs and seagrass beds, which provide refuge to important and endangered species such as sea turtles, dugongs,

and dolphins. The MPA is adjacent to a tourist hotspot area with a high number of hotels and resorts, offering recreational ventures such as snorkelling and SCUBA diving within the fringing reef. Artisanal fisheries commonly exploit a wide range of fish species in the MMNR, including cephalopods such as octopus and squid (WRTI and KWS 2021). However, Octopus populations appear to be declining, likely due to strong influence of long-term climate drivers such as increasing sea surface temperatures (Chande *et al.,* 2021 and Borges *et al.,* 2022).

The sensitive receptors noted in this section, including coral reefs and seagrass beds located within the designated and protected area, have been assessed under "Impacts on Coastal / Nearshore Habitats" in **Section 10.2.1**.

## FIGURE 8-4 SUBSEA CABLE OVERVIEW: KENYA TS



## 8.2.2 COASTAL / NEARSHORE HABITATS

### 8.2.2.1 CORAL REEFS

**General Project Area**

The coral reef system in the MMNPR, is classified in two (2) distinct spatial groups; the outer fringing reef, and the inner patch reef.

The **outer fringing reef** starts from the reef crest / reef flat extending from 9-25 m below sea level (bsl), from which it slopes off into deeper waters (30-200 m). According to WRTI (2021), the outer reef floor is characterised mainly by hard rock substrate with coral cover (<45%), mainly *Acropora* and *Echinopora*. Depending on the exact location on the reef, the bottom type can also be covered by fine sediments, soft corals and sand.

**Patch reefs** occur immediately within the MMNPR lagoon with depths ranging from less than 1m at low tide to 5-8 m. They fringe at leeward side of the reef crest and slopes into sand and seagrass beds to the shore. According to WRTI (2021), patch reefs are generally well known for well-developed coral growth and biodiversity, with high cover (60%) of large, massive corals (*Galaxea, Porites*), encrusting (*Montipora*) and branching form (*Acropora*).

There are several main reef patches in close proximity to the subsea cable route, as such careful route selection has been carried out to avoid disturbing these reefs. The patch reefs in the reserve (i.e. in Nyali) are used extensively for tourism, science, and fishing, implying a high value to many stakeholders.

**Site-Specific Conditions**

According to a marine survey conducted by WRTI (2021) within a 'Nyali coral reef area' of the MNNPR, the localised site is characterised by high macro-algae (33%, ±25) and turf algae (24%, ±17), with very low hard coral cover (<10%, ±13). The site is highly influenced by land-use activities such as effluents through ground-water seepages found on the beach and poor water quality from the Tudor mangrove creek flowing outward. The high level of macro-algae / turf and rubble indicate significant disturbance of these reefs, mainly due to proximity to groundwater seepage, high fishing pressure and recurrent bleaching episodes. High coral rubble in the site is attributable to fishing activity using poor fishing methods such as beach seine netting and coral trampling by speargun fishermen. Fish presence was observed to be low (four [4] individuals. per 250 $m^2$) and mainly of small sizes (<15 centimetre [cm]) and less diversity on site.

The Daraja Project will be routed through the outer fringing reef via a natural break in the fringing reef, known as a 'mlango', thereby minimising the potential for interaction with any areas of coral. The Daraja Project route enters the lagoon slightly further south of the 'mlango' in order to reduce the likelihood of directly impacting the coral on the outer fringing reef.

Once the subsea cable enters into the lagoon it will be laid towards the direction of the proposed BMH MBA location. The lagoon, as described above, contains varied habitats of seagrass beds, patch corals, and sub-bottom substrates.

### 8.2.2.2 SEAGRASS

Seagrasses are marine angiosperms with a worldwide distribution. Seagrass beds / meadows are one of the most ecologically rich and productive marine ecosystems (Duarte and Chiscano,

1999). Humans and other species are supported by these ecosystems through a wide range of services (Fourqurean *et al.,* 2012; Githaiga *et al.,* 2017; Hejnowicz *et al.,* 2015; Waycott *et al.,* 2009), including provision of habitat, nursery and feeding grounds to several species, as well as being a major 'provisioning service' through fishery production (Unsworth *et al.,* 2018). Seagrasses serve as a primary food source for threatened and endangered species such as the green turtle (*Chelonia mydas*), the hawksbill turtle (*Eretmochelys imbricata*) and the dugong (*Dugong dugon*) (International Union for Conservation of Nature [IUCN], 2020). In addition, seagrass meadows sequester large amounts of carbon annually, contributing to up to 18% of organic carbon within the oceans (Fourqurean *et al.,* 2012; UNEP, 2020).

12 seagrass species have been identified within the East African Coastal waters, mostly present within lagoons between the fringing reefs and the mainland (Short *et al.,* 2007; Mwikamba *et al.,* 2024). A study by Wakibya (1995) indicated that all 12 species were present within Mombasa. A more recent study on the abundance, distribution and diversity of seagrass species in lagoon reefs on the Kenyan coast (Aboud and Kannah, 2017) identified eight (8) seagrass species within the Nyali area, 2 km north of Mombasa Town. According to WRTI (2025), seagrass are the main cover in the MMNR lagoon, from deeper locations in the channel at 8-10 m to the intertidal area. The coverage of seagrass beds ranges from 33% to 74%, averaging 59% (WRTI, 2025). The intertidal zones are characterised by *Thalassodendron ciliatum*, while shallow waters in the nearshore are characterised by species like *Syringodium, Halodule* and *Cymodocea* which are less dense and more patchy than *Thalassodendron ciliatum* (WRTI, 2025). The seagrass beds in Nyali lagoon in 2004/2005 had an outbreak of grazing sea urchin (*Tripneustes gratilla*) which resulted in the reduction of seagrass beds along this stretch of the southern Kenyan coast (Alcovero and Mariani 2002). However, the seagrass beds showed a significant recovery following a decline in the urchin population by 2008 (Uku *et al.,* 2020).

Artisanal fisheries within the Nyali area heavily depends on fish that feed and / or live permanently in seagrass beds. As a result, fishing techniques have been adapted to target species within this habitat (WRTI, 2021).

#### 8.2.2.3 SOFT-BOTTOM SUBSTRATES

Sandy substrates are distributed throughout the fringing reef area and consist largely of coarse-grained carbonate sand derived from corals, shells, algae, and other organisms growing in the reef system. The reef system contains little terrestrial sediment. The sandy substrates host a diverse array of microbial and interstitial flora and fauna. Sea cucumbers, which play a crucial role in processing sand for food, are significant macrofauna in the sandy substrate areas. They are present in the MMNR due to limited / restricted extraction by fishermen. Within the MMNR lagoon, the sandy bottoms consist of clean coralline sand (WRTI, 2025).

#### 8.2.2.4 MANGROVE FOREST

Mangrove forests are commonly found along the Kenyan coast, within coastal intertidal zones. They offer a range of valuable goods and services, benefiting the economy, ecology, and environment on local, national, and international scales. Mangrove wood is used for firewood and construction materials. Additionally, these ecosystems provide habitats for fish and other wildlife, protect against shoreline erosion, and help regulate the climate by capturing and storing carbon. Mombasa County accounts for 6% of Kenya's mangrove forest cover (approximately 37,350 hectares [ha]). In Mombasa County, mangroves are found in Tudor,

Mwache, and Mtwapa Creeks (from closest to farthest from the Daraja Project; refer to **Figure 8-4**).

Tudor Creeks is the closest mangrove forest to Nyali Beach. The creek's mangrove community includes *Rhizophora mucronata* and *Ceriops tagal*, with rare species such as *Heritiera littoralis* and *Xylocarpus moluccensis*. Typical zonation from sea to land includes *Sonneratia alba*, *R. mucronata*, *Bruguiera gymnorrhiza*, *Ceriops tagal*, *Avicennia marina*, *Xylocarpus granatum*, *Lumnitzera racemosa*, and *H. littoralis* (WRTI, 2025). This nearest mangrove forest is 2.7 km away, which is located outside of the Daraja Project's AOI, therefore mangrove forest has been scoped out of further consideration within the ESIA Report.

#### 8.2.2.5 SANDY BEACHES

Nyali beach is characterised by white coral sand of marine origin and is a well visited beach with recreational spots for tourists and plays a crucial role in the country's tourism sector.

Hotels have been developed along these shorelines to meet the growing tourist demand, often encroaching on the fragile beach ecosystems. These ecosystems are also vital habitats for various fauna, including sea turtles, birds, and marine invertebrates.

Nyali Beach sand consists of quartzitic terrigenous fine sands with grain sizes ranging from Φ[4]2.83 to Φ2.63. The sand grains are coarser during the northeast monsoon and finer during the southeast monsoon seasons. The beach has a gentle slope of 3.34 to 2.62 degrees, with a width ranging between 64.44 m and 80.16 m (WRTI, 2021).

WRTI (2021) indicate that turtle nesting has decreased in the area to approximately eight (8) nests (at the time of reporting). In addition to the beach being heavily utilised for tourism and recreational activities, it is used as a fish landing area.

#### 8.2.2.6 COASTAL VEGETATION

Coastal vegetation along Mombasa includes mangroves, palm trees, grasses, and riparian creeper species such as *Ipomea pes Caprae*. Coastal riparian vegetation plays an important role in entrapment of blowing sand and stabilisation of beaches.

The BMH MBA is located on a public access road off Nyali Beach, which is highly disturbed as a result of anthropogenic activity. The onshore component of the subsea cable route up to the BMH MBA is characterised by a gentle slope from the high-tide point, extending to the public road, comprised of sandy soils.

Along the route between the high tide mark and the proposed BMH MBA, the vegetation cover is sparse, mostly consisting of patches of riparian vegetation along the property boundaries on either side of the public access road. The direct footprint of the route between the high tide mark and proposed BMH MBA is bare, except for two (2) coconut trees present in close proximity to the proposed BMH MBA location, as shown in **Figure 3-4**.

[4] To note: Φ (or Phi) is a grain size scale where **Φ = -log2d**; where d is diameter of a grain in mm.

## 8.2.3 MARINE SPECIES COMPOSITION

### 8.2.3.1 BENTHIC FAUNA

**Macrobenthos**

16 macrobenthic taxa were recorded in a study by Mohamed *et al.* (2018) on the distribution of sediment macro- and meiobenthic fauna along the Kenyan continental shelf. Of these, Amphipoda and Polychaeta were the most abundant taxa, followed by Ostracoda, Tanaidacea, and Nematoda.

The Amphipoda had a relative abundance of 27% in Mombasa, followed by Polychaeta with 22%, Ostracoda at 12%, followed by Tanaidacea and Nematoda. Other taxa with recognisable abundance during this study included Copepoda, Isopoda, Oligochaeta, Tubellaria, Gastropoda and Cumacea. Nemertina, Sipuncula, Gnathostomulida, Echinodermata and Halacaroidea were the least abundant taxa and were grouped as 'others'

Out of the three (3) other study sites, Mombasa displayed the second highest diversity and evenness.

**Meiobenthos**

A total of 23 meiobenthic taxa were recorded by Mohamed *et al*. (2018). Mombasa recorded the highest meiobenthic density; almost double that of the second highest density in the study, with Nematoda and Copepoda being the most abundant.

In Mombasa, Nematoda had a high relative abundance of 46%, followed by Copepoda, Polychaeta, Amphipoda, Tubellaria and Gastrotricha. Most of the other taxa (Tanaidacea, Isopoda, Halacaroidea, Priapaulida, Oligochaeta, Cumacea, Rotifera, Sipuncula, Gastropoda, Gnathostomulida. Pycnogonida, Kinorhyncha, Bivalvia, Echinodermata) recorded relative abundances of less than 3% in all stations and were grouped as 'others'.

Additional information on benthic species within **Section 8.1.3.1**.

### 8.2.3.2 BONY FISHES AND ELASMOBRANCHS

The coastal waters of Kenya are abundant in marine fish species, especially within marine protected areas (Fondo *et al.,* 2014).

Bony fishes (*Osteichthyes*) are a diverse taxonomic group of fish that have skeletons primarily composed of bone tissue, as opposed to cartilage. Most of the major fish spawning and migratory routes occur farther inshore (Pereira, 2014). The fish exploited by fishermen are usually demersal and include scavengers (*Lethrinidae*, *Lutianidae*, and *Haemulidae*), parrot fish (*Scaridae*), and rabbit fish (*Siganidae*). There are also pelagic species like Barracuda (*Sphyraena* spp.), Kingfish, and mullets present. Mangrove crabs are the main target species in crustacean fisheries, while small quantities of spiny lobsters (*Pallinuridae*) and cephalopods such as squid (*Loliginidae*) and octopus (*Octopodidae*) are caught (WRTI and KWS, 2021).

**Appendix I** provides the monitoring data of fish species present in the MMNPR which was collected in 2018. The data provides detail of the average densities of fish for the MNNPR.

Specifically, in the Nyali coral garden the fish density and diversity is low, around four (4) individuals per 250 $m^2$ and consisting mainly of small individuals (<15 cm).

Elasmobranches are cartilaginous (*Chondrichythes*) and comprise of sharks, rays, skates and sawfish. The species of conservation concern within Kenya include 16 shark species (two [2]

are endangered, and 14 are vulnerable), four (4) ray species (one [1] is critically endangered, three [3] are vulnerable), all species of sawfish and eight (8) finfish species (one [1] is endangered, and seven [7] are vulnerable) including two (2) seahorse species (GoK, 2017; IUCN, 2015). There is currently limited information available regarding sharks and rays in MPAs in Kenya as they are mobile and presumably do not enter the Nyali lagoon often.

#### 8.2.3.3 MARINE MAMMALS

Several species of whales have been recorded in Kenyan marine waters. The most common whale species is humpback whale (*Megaptera novaeangliae*) (IUCN Least Concern). Humpback whales migrate along the Kenyan coast annually from Antarctica heading north, between early June and October (peak migration in Kenya in August), and are frequently sighted. Other species include minke whale (*Balaenoptera acutorostrata*) (IUCN Least Concern), Bryde's whale (*Balaenoptera edeni*) (IUCN Least Concern), toothed sperm whale (Physeter *macrocephalus*) (IUCN Vulnerable), orca / killer whale (*Orcinus orca*) (IUCN Data Deficient), false killer whale (*Pseudorca crassidens*) (IUCN Near Threatened), melon-headed whale (*Peponocephala electra*) (IUCN Least Concern) and, most recently, blue whale (*Balaenoptera musculus*) (IUCN Endangered).

Dolphin species include Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) (IUCN Near Threatened) which MMNPR is noted as being part of the 'home range' of the species (KWS, 2016), pantropical spotted dolphin (*Stenella attenuate*) (IUCN Least Concern), common dolphin (*Delphinus delphis*) (IUCN Least Concern) and spinner dolphin (*Stenella longirostris*) (IUCN Least Concern). The IUCN Endangered humpback dolphin (*Sousa plumbea*) is found occasionally in Kenya's coastal and marine waters (IUCN, 2020).

Blue whales are also commonly sighted offshore of the fringing reefs of Mombasa but are hardly ever seen to come into inshore waters. Migrations of Humpback whales occur north and south along the Kenyan coast annually. Humpback whales are top level predators, and they impact local food webs and ecosystem and are important indicators of the health of the marine environment.

#### 8.2.3.4 MARINE TURTLES

Three (3) turtle species commonly feed and lay eggs on the Kenya coast – the hawksbill turtle (*Eretmochyles imbricata*: critically endangered), the green turtle (*Chelonia mydas*: Endangered) and the olive ridley turtle (*Lepidochelys olivacea*: vulnerable) (Okemwa *et al.,* 2004). They feed in the lagoons and lay eggs (nest) at the edge of the highest tide zone on sandy beaches. Sea turtles used to commonly nest on the beaches between Mtwapa Creek and Tudor Creek (**Figure 8-4**).

The green turtle is the most common species in Kenyan waters, constituting approximately 97% of reported nests, followed by hawksbill at 2.5% and olive ridley at 0.5 % (NEMA, 2017; IUCN, 2020).

According to WRTI (2025), due to the loss of nesting grounds by anthropogenic activities including the erection of seawalls and installation of lights along the beach, turtles currently nest in a select few sites along the stretch of beach, including at English Point Marina, Mkomani in the south, the Nyali Beach stretch (the stretch between Mombasa Reef, White Sands and Milele Beach hotels), and Shanzu beach (at Pride Inn, Serena, Intercontinental and Dolphin Beach Hotels). KWS rangers in collaboration with various hoteliers and community scouts survey the beach to identify and record nesting sites.

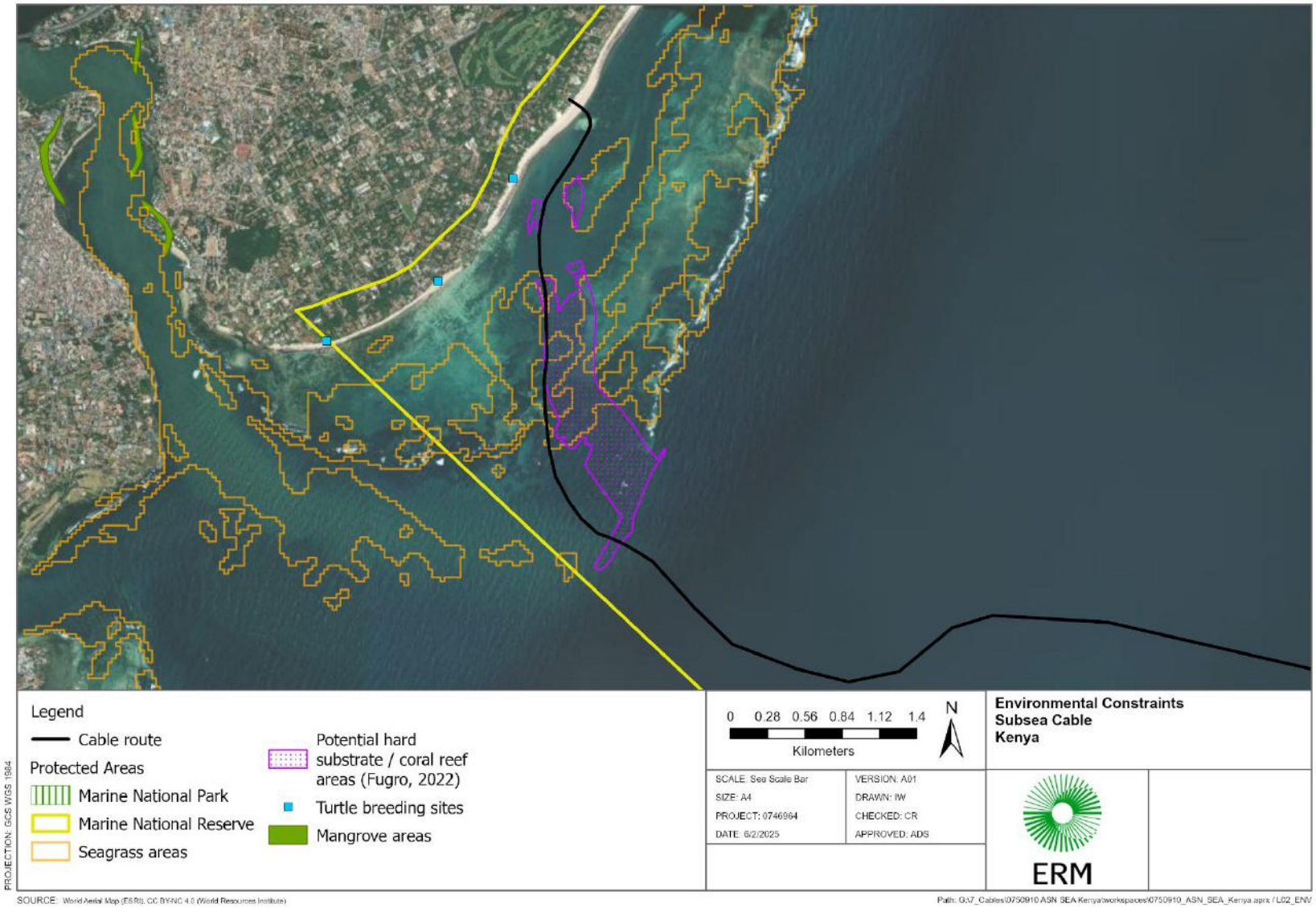
Previous turtle nesting surveys indicate that nests have been identified across Nyali Beach, with the closest approximately 500 m from the proposed BMH MBA location (**Figure 8-6**). A safe turtle hatchery has been established by the Early Birds Banda Project approximately 500 m south of the proposed BMH MBA (i.e. behind the black bins in **Figure 8-5**). In addition, safe turtle hatcheries have been established beneath the Nyali Serena and Pride Inn hotels, which are 9 km North of the proposed BMH MBA location. Eggs laid in unsafe nests, and identified by the above-mentioned entities, are usually relocated to the hatcheries to protect them and increase the survival of the hatchlings.

FIGURE 8-5 SAFE TURTLE HATCHERIES ON NYALI BEACH


The peak nesting season is usually between April and August, annually. In 2020 during the WRTI (2020) survey, a total of 43 nests were recorded between Mtwapa Creek and Tudor Creek beaches, out of which eight (8) were recorded on Nyali beach, compared to 23 found on Shanzu Beach further North of the Project location (**Appendix I**).

Active monitoring of nesting sites along the beach near to the landing site and proposed BMH MBA must occur prior to any activities occurring, as well as on the day of the proposed activities, to identify any nests requiring relocation. Mitigation measures for the Daraja Project are summarised in **Table 11-1**.

## FIGURE 8-6 SUBSEA CABLE OVERVIEW: KENYA NEARSHORE



#### 8.2.3.5 BIRDS

There are 18 Important Bird Areas (IBAs) along the Kenya coast which host globally threatened species, restricted-range species and exceptionally large numbers of congregating birds. The closest IBA to the proposed landing site is the Kaya Waa Ecoforest, approximately 20 km to the south.

A variety of migratory shorebirds and seabirds, including crab-plovers, sandplovers, gulls, terns, noddies, and shearwaters, congregate to forage in intertidal mudflats, reef flats, tidal creeks, mangroves, estuaries, saltpans, beaches, and rocky cliffs (GoK, 2017). The terrestrial environment is used for reproduction and rearing young.

## 8.3 SOCIO-ECONOMIC ENVIRONMENT

### 8.3.1 ADMINISTRATIVE STRUCTURE AND POPULATION DYNAMICS

#### 8.3.1.1 NATIONAL GOVERNMENT ADMINISTRATIVE UNITS

The Cabinet Secretary for Interior and Co-ordination of the National Government established six (6) Administrative Units within the Coastal Region, as service delivery co-ordination units. The Daraja Project landing site falls within Mombasa County.

#### 8.3.1.2 SUB COUNTY GOVERNMENT ADMINISTRATIVE UNITS

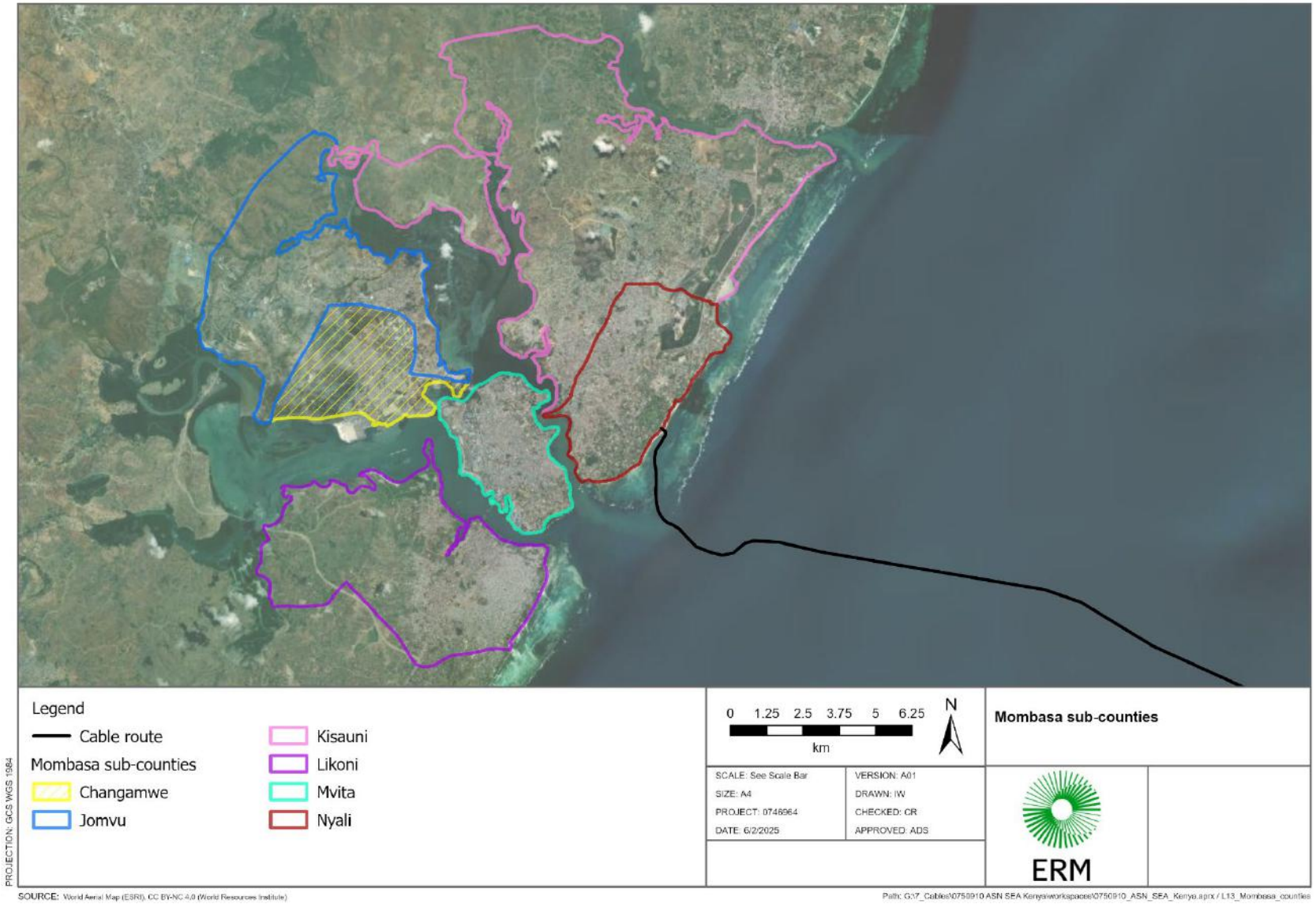
Mombasa County is divided into six (6) sub-counties, as shown in **Figure 8-7**. The Daraja Project landing site falls within Nyali Sub-county.

#### 8.3.1.3 POPULATION DYNAMICS

Population distribution and settlement patterns in Mombasa County are influenced by proximity to vital social and physical infrastructure networks such as roads, housing, water and electricity. The current population in the county is approximately 1.2 million, out of which approximately 657,288 are male and 609,069 are female. The population is projected to rise to 1.4 million by 2022 (CGoM, 2018).

The population of the broad groups in Mombasa County comprises of the Infant (<1 Year), Under 5, Pre-School (3- 5 Years), Primary School (6 –13 Years), Secondary School (13 –19 Years), Youth (15 –29 Years), Women of Reproductive Age (15 – 49 Years), and Economically Active Population (15 – 64 Years) and Aged (65+).

## FIGURE 8-7 SUB-COUNTIES IN MOMBASA COUNTY



## 8.3.2 LAND USES

### 8.3.2.1 GENERAL LANDUSE: NYALI BEACH

Nyali area, located in Mombasa County, Kenya, is a high-end residential and commercial area with diverse land uses. The primary land uses in Nyali include:

**Army Barracks**

The presence of the Kenya army military barracks near the Nyali beach, and in close proximity to the BMH MBA plays a critical role in local security and socio-economic dynamics. The barracks contribute to the area's stability, providing a sense of safety and discipline while also having an economic impact through employment of military personnel and support staff. This facility influences local infrastructure, as roads, utilities, and community services are often maintained with heightened security standards. In addition, the barracks also introduce specific considerations, such as restricted access zones, heightened surveillance, and potential land-use limitations, which could impact project planning and public access. The ESIA must consider the interaction between the military facility and the subsea cable, so that the subsea cable landing does not disrupt military operations or compromise security protocols. Engagement with military authorities and adherence to national security guidelines are essential for harmonious project implementation.

**Residential Use**

Nyali is well-known for its upscale residential properties, including villas, townhouses, and apartments. The area is popular among expatriates and wealthy locals due to its serene environment and proximity to the ocean and beach front.

**Commercial Use**

Nyali area hosts various commercial establishments, including:

- Shopping malls: Nyali City Mall and Nyali Centre are prominent hubs for shopping, dining, and entertainment.
- Office Spaces: Several office buildings and coworking spaces cater to businesses in sectors like tourism, real estate, and finance.
- Retail outlets, banks, and restaurants are concentrated along major roads.

**Recreational Use**

Beaches like Nyali Beach provide public and private access for recreation and water sports. Recreational facilities also include golf courses, gyms, and spas. Parks and community centres cater to family-friendly activities.

**Educational and Institutional Use**

Numerous schools and institutions serve Nyali residents, including:

- Private and international schools like Oshwal Academy and Braeburn Mombasa International School.
- Vocational and training institutions.

**Industrial Use**

Light industrial activities, such as small-scale manufacturing and warehousing, occur in certain areas within Nyali.

**Transport and Infrastructure**

The area features a well-maintained road network connecting to Mombasa Island and surrounding regions. Close proximity to the Nyali Bridge facilitates easy access to the mainland.

**Public Services**

Hospitals, police stations, and fire services are part of the community infrastructure. Utilities such as water, electricity, and telecommunications are extensively developed.

**Hospitality and Tourism**

Nyali is a significant tourism zone in Mombasa, featuring:

- Hotels and Resorts: High-end resorts and beachfront hotels, such as Sarova White sands, Voyager Beach Resort, Muthu Beach Hotel and Nyali Sun Africa Beach Hotel.
- Restaurants and Bars: A variety of dining options offering local and international cuisines.
- Entertainment Venues: Clubs, casinos, and leisure spots cater to both tourists and residents.

**Religious and Cultural Use**

Various religious establishments, including churches, mosques, and temples, serve the diverse community in Nyali. Cultural centres and event spaces host local and international gatherings.

#### 8.3.2.2 LANDUSE AT LANDING POINT

Boat operators that offer tourist activities, including glass-bottom boat tours and snorkelling within the MMNPR operate along the beach, seeking to sell trips / leisure activities to tourists. Additionally, fishermen who belong to the Nyali BMU have set up temporary living structures along the beach to use during the fishing season. Upon the fishing season ending, the fishermen leave these temporary structures.

Two (2) temporary structures have been established along either side of the subsea cable route, at the high-tide mark, as shown in **Figure 8-8**. The structure on the left of the Figure was identified as a restaurant / bar named ‘Costa Rica’ as seen from its signboard. The proposed subsea cable route transects this structure to access the BMH MBA, as such this structure will require relocation. The structure to the right of the **Figure 8-8** appeared to be under construction, based on the understanding from the site visit conducted on 3 October 2024 and 20 February 2025. The subsea cable route does not transect this structure to access the BMH MBA. Additionally, the access road to the beach will be kept open for pedestrians during installation.

Safaricom Plc has development permission and TOL for the BMH MBA and seaward-facing ducts and headwall in this area (**Appendix G**) and has been in discussion with the structure owner.

FIGURE 8-8 TEMPORARY FACILITIES AT THE BMH ACCESS SITE


Source: ASN, 2024

### 8.3.3 ECONOMY AND EMPLOYMENT

Nyali is a mixed-use area with a strong reliance on tourism, real estate, small-scale businesses, hospitality, retail and fishing, which serve as key income sources for local communities. Employment opportunities in the region are characterised by informal labour and seasonal variability, often leaving many residents underemployed or reliant on low-paying jobs. The introduction of new infrastructure projects, like the subsea cable landing, is expected to stimulate economic activity, create jobs, and attract investment, thereby enhancing the overall socio-economic status of the area.

### 8.3.4 TOURISM AND RECREATION

Nyali Beach is a popular tourist destination for international and domestic tourists, with hotels and tourist related activities and enterprises present along the beach. Recreational activities around the proposed Project area include swimming, snorkelling, scuba diving, boating, sunbathing, beach sports / games, and camel riding. Additionally, hire-boat operators who provide leisure activities, operate along the beach seeking to sell trips / activities to tourists.

The peak tourist season in Mombasa is between December to February and July to August, annually. There are no known restrictions (seasonal or otherwise) for tourism and / or recreational activities.

### 8.3.5 FISHERIES

The fishing season in Mombasa aligns with the peak tourism period from December to March, annually (FAO, 2016). Fishing activities are primarily conducted in the nearshore reef lagoons or fringing back reefs throughout the year, especially during the northeast monsoon from January to July, annually. Fish catches are lower during the southeast monsoon (May to September, annually). Coastal artisanal fisheries are mostly subsistence-based, using small craft. In contrast, deeper-water fishing in the broader EEZ involves distant-water fishing vessels targeting species with purse seines and long-line techniques (FAO, 2016). Commonly targeted species near the MPA include rabbitfish, emperors, snappers, and parrotfish (WRTI

and KWS, 2021). Other marine species that are found within the MMNR in Nyali and hunted by the local fishermen include the octopi, using traditional methods like spearguns and hooked sticks during low tide. This intense fishing pressure, driven by both local consumption and increasing export demand, has led to reduced octopus densities in the region. Octopi are important benthic species found in the shallow coastal waters of Nyali, Mombasa, within the WIO. They inhabit coral reefs, rocky crevices, and seagrass beds, where they serve as both predators and prey, contributing to ecological balance. However, their populations in the Kenyan MMNR have seen a noticeable decline due to a combination of overfishing, habitat degradation, and pollution. Intensive artisanal fishing practices, including the harvesting of juvenile octopi, have significantly impacted local stocks. Additionally, the deterioration of coral reef habitats caused by coastal development, sedimentation, and climate change-induced bleaching events further threatens their survival.

Marine fish and fish products are exported globally, with aquarium fish being the highest value-added product from reefs. Kenya is the leading exporter of marine aquarium fish in the WIO region.

Coastal communities in Mombasa have traditionally relied on fisheries as a crucial part of their livelihoods (GoK, 2012). These resources are still exploited using simple dugout canoes and traditional fishing gear. In the MMNR area, artisanal fishing is primarily done with handlines and basket traps. Although methods like spear guns, monofilament, and beach seine netting are banned, they are reportedly still in use (GoK, 2012). Access to fishing grounds and the types of vessels used include traveling by foot or swimming, dugout and plank canoes, double outriggers, motorboats, and fiberglass boats.

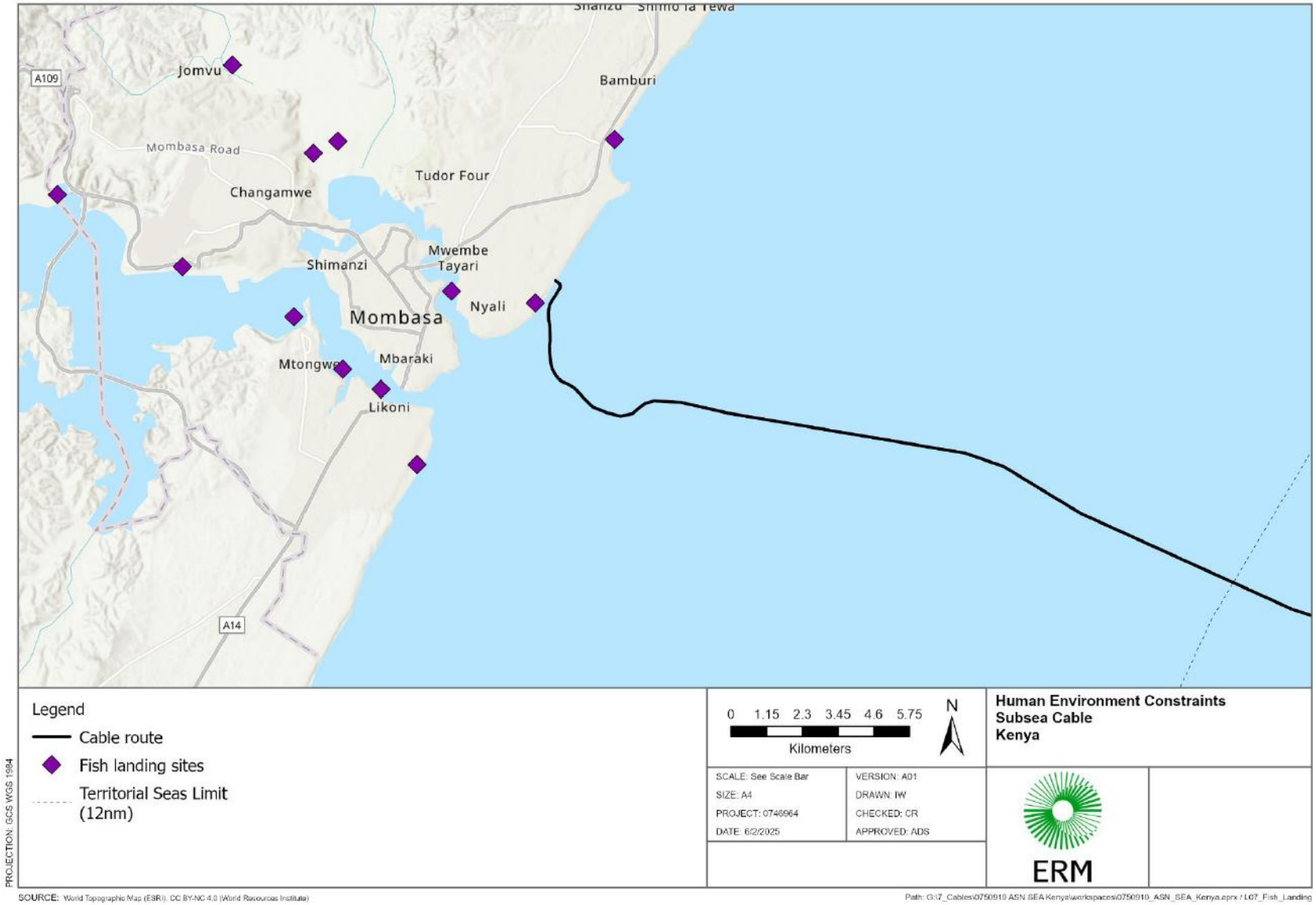
The Kenyan fishing industry is co-managed through BMUs, which were established by the Kenya Fisheries Department under the Ministry of Fisheries Development in 2006 (FAO, 2012). The Director of Fisheries oversees the creation of a BMU for each fish landing site, following the Fisheries Act and the Fisheries Regulations of 2007 (Cap. 378). BMUs are composed of fishermen, fish traders, boat operators, the Kenyan government, local organisations, and other stakeholders involved in beach and marine activities (WRTI, 2025). The main goal of BMUs is to promote sustainable fisheries along the Kenyan coast. They achieve this by managing landing stations, mediating conflicts, and monitoring fisheries and fishing activities within their respective areas.

One of the fish landing sites in the Mombasa area is on Nyali Beach and is managed by the Nyali Beach BMU (**Figure 8-9**). The fish landing sites are designated locations where fishers depart from and return to on a daily basis for their fishing activities. The fish landing sites may be linked to other on-land facilities such as a fish market / cold storage.

There are no known restrictions to fishing (seasonal or otherwise), fishers are generally allowed to fish all year round.

Assessment of the environmental pressures already occurring provide context for assessing potential cumulative impacts of the proposed Daraja Project. In addition, implementing mitigation measures to preserve and restore critical habitats will help ensure the sustainability of the octopi population and the livelihoods they support.

## FIGURE 8-9 FISH LANDING SITES, NYALI BEACH, MOMBASA



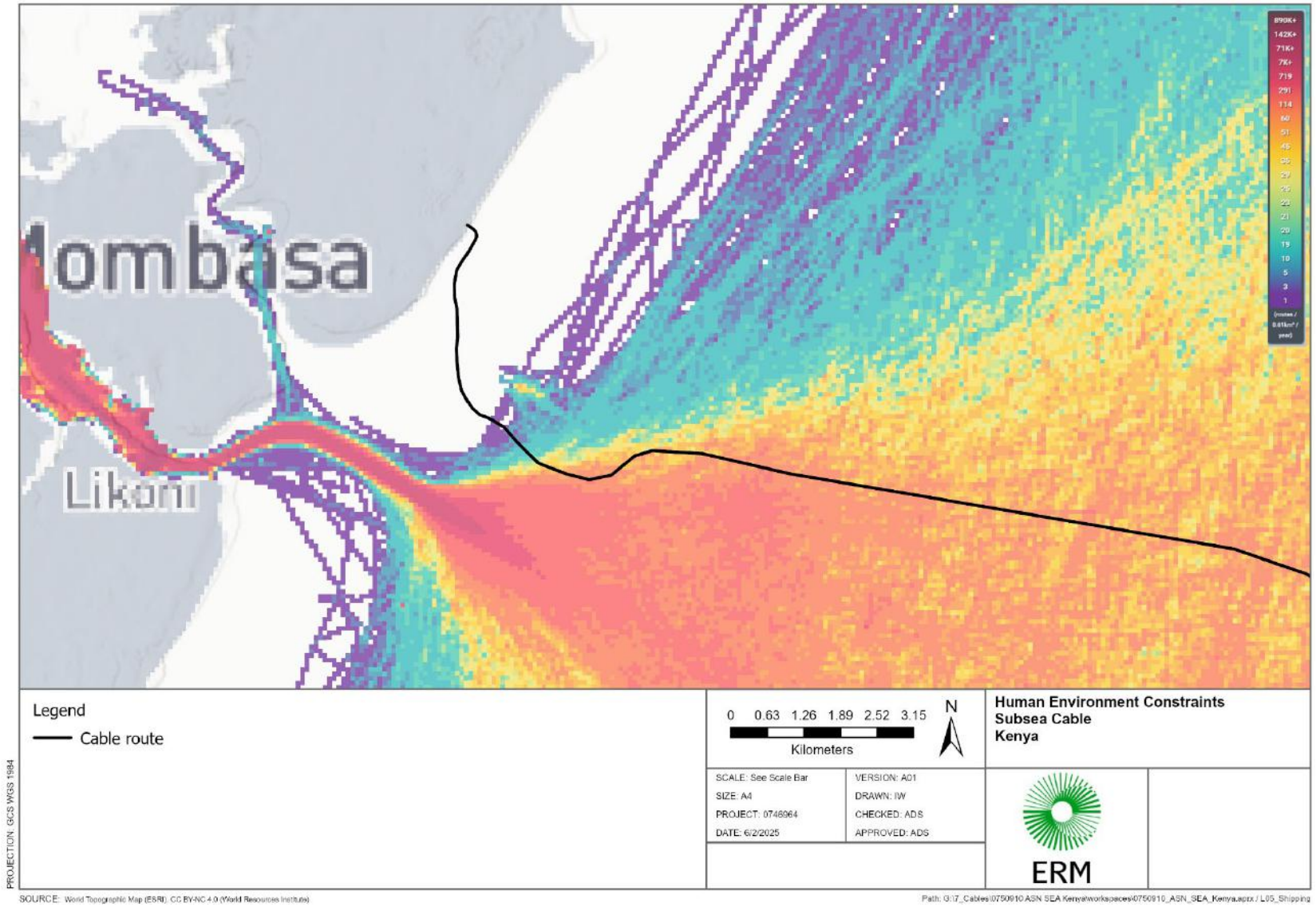
### 8.3.6 SHIPPING AND NAVIGATION

The KPA manages and operates the Port of Mombasa, which has been a key hub for international trade since its construction in the late 19th century. As Kenya's largest seaport, it also serves inland countries like Uganda, the Democratic Republic of Congo, Southern Sudan, and Rwanda. Additionally, the port exports agricultural products to the hinterland. Annually, the port handles between 1,684 and 1,832 vessels traveling to Europe, North and South America, Asia, the Middle East, Australia, and other parts of Africa. The port features a natural deep harbour with 19 berths, including six (6) dedicated to container handling and two (2) for cruise ships (KPA, 2018).

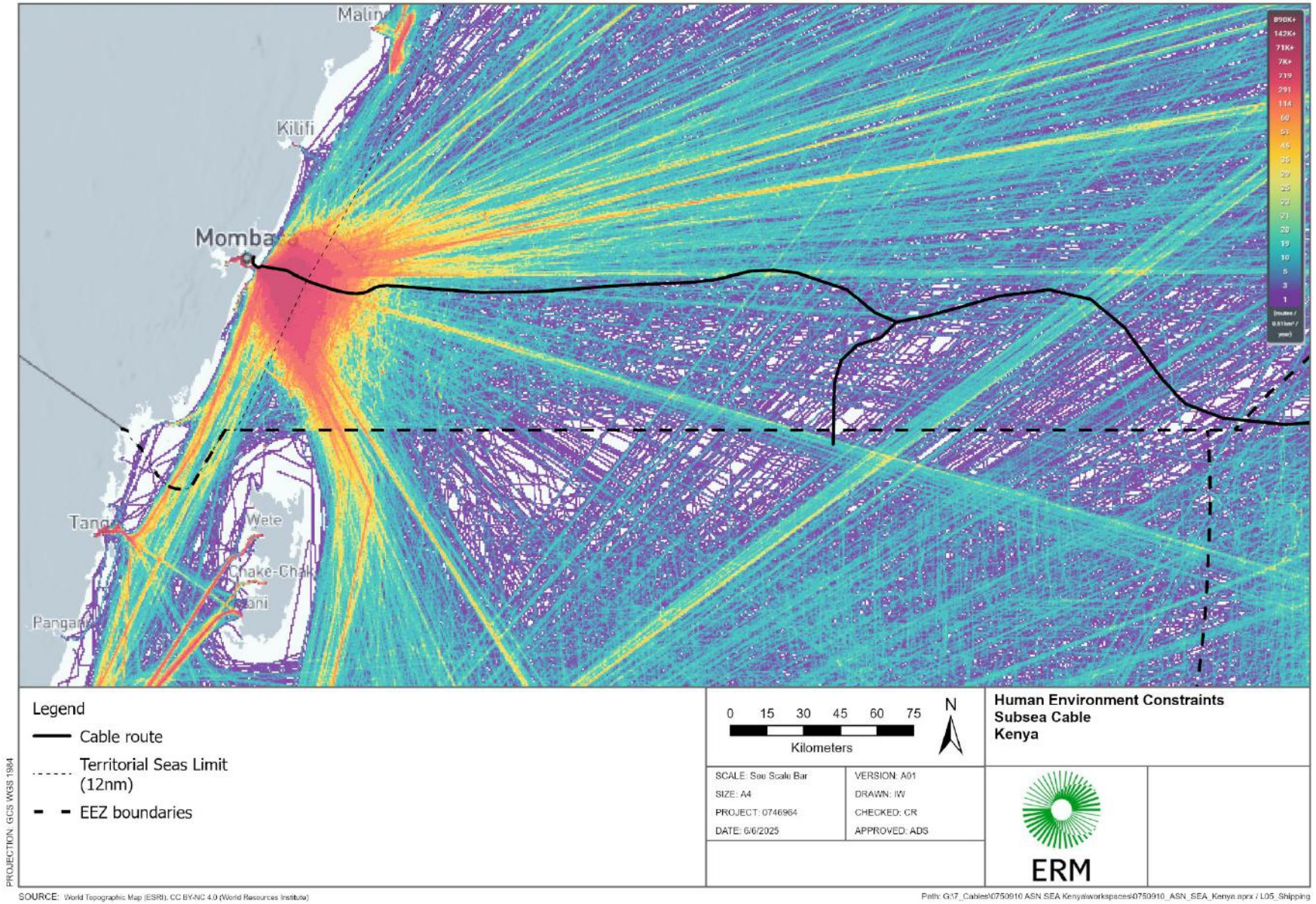
Mombasa harbour experiences high marine traffic density, particularly at the mouth of Kilindini Port. The port lacks a Traffic Separation Scheme or a primary anchorage, which means ship counts outside the port entrance may include multiple counts of anchored ships. The proposed subsea cable will potentially cross an area with relatively high ship traffic but avoids the busiest corridor at the port entrance.

Marine traffic density data for the Port of Mombasa is presented in **Figure 8-10** and **Figure 8-11**.

## FIGURE 8-10 MARINE TRAFFIC DENSITY DATA FOR 2024, PORT OF MOMBASA



## FIGURE 8-11 MARINE TRAFFIC DENSITY DATA FOR 2024 IN KENYAN WATERS



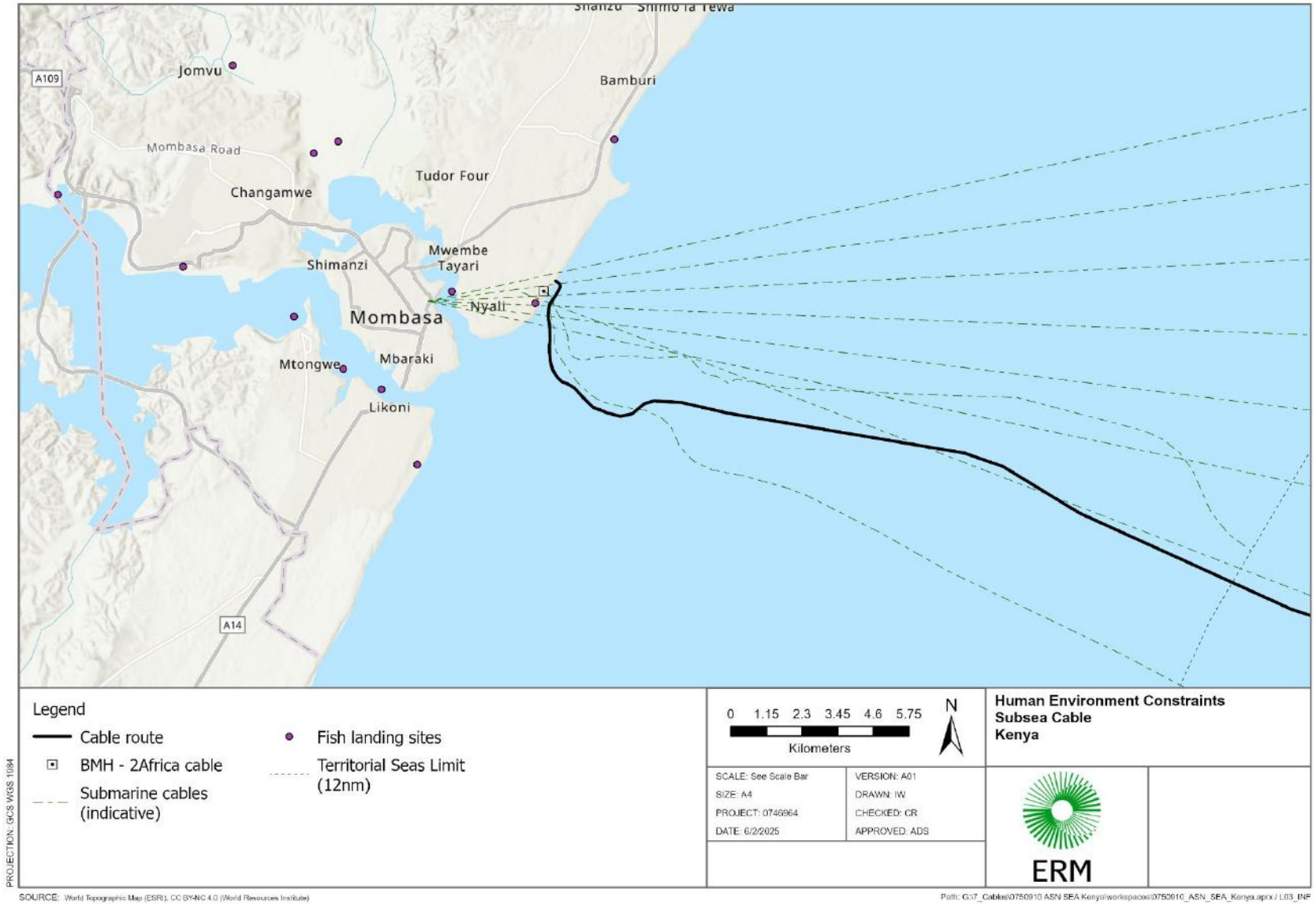
### 8.3.7 INFRASTRUCTURE (INCLUDING SUBMARINE CABLE INFRASTRUCTURE)

Nyali area in Mombasa County is a key landing point for several important subsea cables that enhance the region's connectivity. Below is a description of existing subsea cable projects that have landed in Mombasa (**Figure 8-12**):

- DARE 1: This is one of the largest submarine cables in East Africa, delivering 36 terabytes of data. It connects Djibouti, Somalia, and Kenya, significantly improving broadband connectivity and reducing data costs.
- SEACOM: This submarine cable was one of the first to connect East Africa to Europe and Asia, providing high-speed internet and boosting the region's digital infrastructure.
- EASSy: This submarine cable links several East African countries to the global internet, enhancing regional connectivity.
- LION2: This submarine cable connects Madagascar to the African mainland, further integrating the region's internet infrastructure.
- 2AFRICA: The 2Africa submarine cable landed in Mombasa in December 2022, at Shanzu Beach (Mombasa North) and Nyali Beach (Mombasa South). Stemming from Europe and the Middle East with the aim of connecting 43 countries across Africa, Europe and Middle East with a total length of over 45,000 km.
- PEACE: The PEACE Cable connects Africa, Europe, and Asia, specifically, France to Pakistan via the Europe-Asia route, and Mombasa, Kenya, via an Indian Ocean route, providing the most direct connectivity route from Asia and East Africa to Europe.

These submarine cables are crucial for supporting the growing digital economy in Mombasa and the broader East African region. They help reduce latency, improve internet speeds, and support various digital services.

## FIGURE 8-12 SUBSEA CABLE OVERVIEW: MARINE INFRASTRUCTURE



### 8.3.8 PUBLIC HEALTH

In 2006, Kenya introduced a community-centered approach to healthcare through the Community Health Strategy, as outlined in the Second National Health Sector Strategic Plan. This plan established the framework for delivering health services to the population. The strategy is revised every five years, incorporating insights gained from previous implementations. The latest version emphasizes integrating community health into the broader healthcare system by promoting collaboration and accountability among all stakeholders (Kenya Ministry of Health, 2020).

Kenya continues to face significant health challenges, including high rates of maternal and child mortality, as well as a heavy burden of infectious diseases like HIV, tuberculosis, and malaria. The Kenya Centre for Disease Control works closely with the government to combat these issues and strengthen the health system. In response to the COVID-19 pandemic, the Ministry of Health established the National Response and Emergency Committee in 2020 to lead efforts in prevention, containment, and mitigation.

The public healthcare system in Nyali and the broader Mombasa area is fairly well developed and is improving through national and county-level reforms. Mombasa County has partnered with the Ministry of Health to digitise health services and strengthen community health programs. A significant portion of the county's budget (KES 4.75 billion; approximately USD 36.8 million) has been allocated to healthcare. This funding supports new hospital construction such as the development of the Kongowea level 4 hospital, facility upgrades which include the refurbishment of Likoni Sub-county hospital, and mental health services. Advanced diagnostic tools like Magnetic resonance imaging (MRI) and CT scanners are also being introduced. Mombasa is also piloting the Taifa Care universal health coverage program, which aims to provide affordable, universal healthcare.

### 8.3.9 CULTURAL HERITAGE

The NMK has located more than 30 shipwrecks in the WIO, some dating to 500 years ago. All shipwrecks found underwater are properties of the Kenyan government. The shipwrecks are protected as underwater museums to be preserved for future generations (Nation, 2020).

Additionally, the Kenyan coastal region has historical and archaeological sites associated with the Swahili culture in East Africa, including the Mombasa and Lamu Old Town, which are designated Conservation Areas and are managed by the NMK. However, these sites are not within the Daraja Project AOI.

According to previous environmental studies undertaken in the Nyali area, archaeological sites with prehistoric stone implements dating to the Middle stone age were observed in limestone quarries in the area. However, there are no known cultural heritage or living heritage sites in the proposed landing area on Nyali Beach or its immediate vicinity (Refer to **Section 7.3**).

# 9. IMPACT ASSESSMENT METHODOLOGY

This chapter describes the methodology that will be used to evaluate potential environmental and social impacts associated with the installation and operation of the Daraja Project. It outlines the key stages of the assessment process and the approach taken to identify and evaluate the potential impacts and effects associated with the Daraja Project.

The assessment methodologies take into account the requirements of EMCA 1999 (amended 2015), as well as relevant best international practice, including:

- The UK IEMA: Suite of General and Topic Specific Guidelines for Environmental Impact Assessment (various dates); and
- The UK CIEEM: Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal (2010).

The Daraja Project has integrated environmental and social considerations into the route design and optimisation process, including desktop studies and a CRS. The route design and optimisation process aim to avoid or reduce disturbance of known sensitive environmental and social receptors wherever possible.

## 9.1 OVERVIEW OF THE IMPACT ASSESSMENT PROCESS

A potential impact is considered to be any change to a resource or receptor which results from the presence of a project component or by the execution of a project related activity. The assessment of the potential adverse and beneficial impacts associated with a proposed project requires a well-defined methodology in order to accurately determine the significance of the predicted impacts on, or benefits to, the surrounding physical, biological, and socio-economic environment.

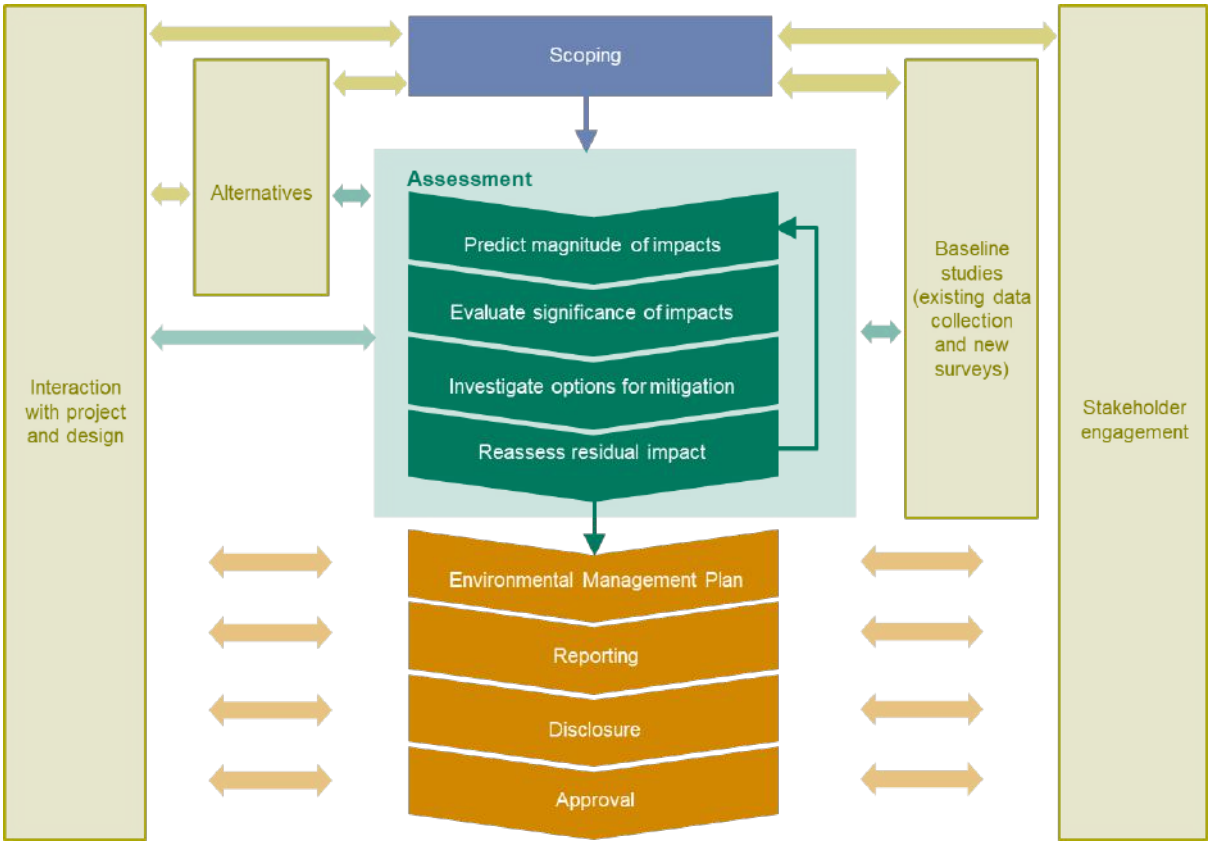
For the impact assessment exercise during the ESIA study, a clearly defined system was used to rate potential impacts in order to achieve the following objectives:

- To apply an analytical assessment and rating of potential impacts associated with the activities of the Daraja Project;
- To prioritise and define mitigation measures and enhancement measures for the potential impacts; and
- To provide applicable and well-defined mitigation measures (in line with the mitigation hierarchy, (refer to **Section 9.1.7**) in order to reduce potentially negative impacts and enhance potential benefits, and to develop an appropriate monitoring programme for identified potential residual impacts.

The impact assessment exercise has been undertaken through a systematic process that predicts and evaluates the impacts of the Daraja Project's activities on selected aspects of the environmental and social receptors. Furthermore, the impact assessment will identify measures that the project will need to take to avoid, reduce, remedy, offset or compensate for potential adverse impacts, as far as is reasonably practicable.

The overall approach to be followed in the impact assessment process is shown schematically in **Figure 9-1** below, while the key steps taken are described in subsequent sections below.

FIGURE 9-1 IMPACT ASSESSMENT APPROACH OVERVIEW




Source: ERM, 2012

An impact assessment process methodology should minimise subjectivity as far as possible and accurately assess the project's potential impacts. In order to achieve this, the methodology defined below has been followed.

### 9.1.1 IMPACT IDENTIFICATION AND CHARACTERISATION

A potential 'impact' is any change to a resource or receptor caused by the presence of a project component or by a project-related activity. Potential impacts can be negative or positive. Potential impacts are described in terms of their characteristics, including the impact type, and their spatial and temporal features (namely extent, duration and scale). Terms which will be used in the characterisation of impacts within this study are described in **Table 9-1**.

TABLE 9-1 IMPACT CHARACTERISTICS

| Characteristic | Definition | Terms |
|---|---|---|
| Type | A descriptor indicating the relationship of the impact to the project (in terms of cause and effect). | **Direct** – Potential impacts that result from a direct interaction between the project and a resource / receptor (e.g. between occupation of the seabed and the habitats which are affected).<br>**Indirect** - Potential impacts that follow on from the direct interactions between the project and its environment as a result of subsequent interactions within the environment |

| Characteristic | Definition | Terms |
|---|---|---|
| | | (e.g. viability of a species population resulting from loss of part of a habitat as a result of the project occupying the seabed).<br>**Induced** - Potential impacts that result from other activities (which are not part of the project) that happen as a consequence of the Project.<br>**Cumulative** - Potential impacts that arise as a result of an impact and effect from the project interacting with those from another activity (including those from concurrent or planned future third party activities) to create an additional impact and effect. |
| Duration | The time period over which a resource / receptor is affected. | **Temporary** - Potential impacts are predicted to be of short duration and intermittent/occasional.<br>**Short term** - Potential impacts that are predicted to last only for six (6) months or less.<br>**Medium term** - Potential impacts that are predicted to last more than six (6) months to three (3) years.<br>**Long term** - Potential impacts that will continue from three years and will last for less than ten (10) years.<br>**Permanent** - Potential impacts that cause a permanent change in the affected receptor or resource or ecological process, and which endures beyond ten (10) years. |
| Extent | The reach of the potential impact (i.e. physical distance a potential impact will extend to). | **On-site** - Potential impacts that are limited to the project site.<br>**Local** - Potential impacts that are limited to the project site and adjacent areas.<br>**Regional** - Potential impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type / ecosystems, i.e. extend to areas outside the project site.<br>**National** - Potential impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.<br>**Trans-boundary/International** - Potential impacts that affect internationally important resources such as areas protected by international conventions or impact areas beyond the national boundary of the country in which the project is based. |
| Scale | Quantitative measure of the potential impact. | The size of the potential impact (e.g. area damaged or impacted, the fraction of a resource that is lost or affected, etc.). This characteristic has no fixed designations as it is intended to be a numerical value. |

When categorising a potential impact, it is important to note that this process will take into account any control measures that are already part of the project design. Additional mitigation measures aimed at further reducing the significance of impacts will also be proposed where necessary or appropriate.

### 9.1.2 SCOPING

The first stage of the impact assessment process involved identifying the potential impacts of the Daraja Project activities that require further investigation. The scoping phase includes the systematic consideration of the potential for interaction between activities involved in subsea

cable projects and aspects of the physical, biological, and social environment that may be affected.

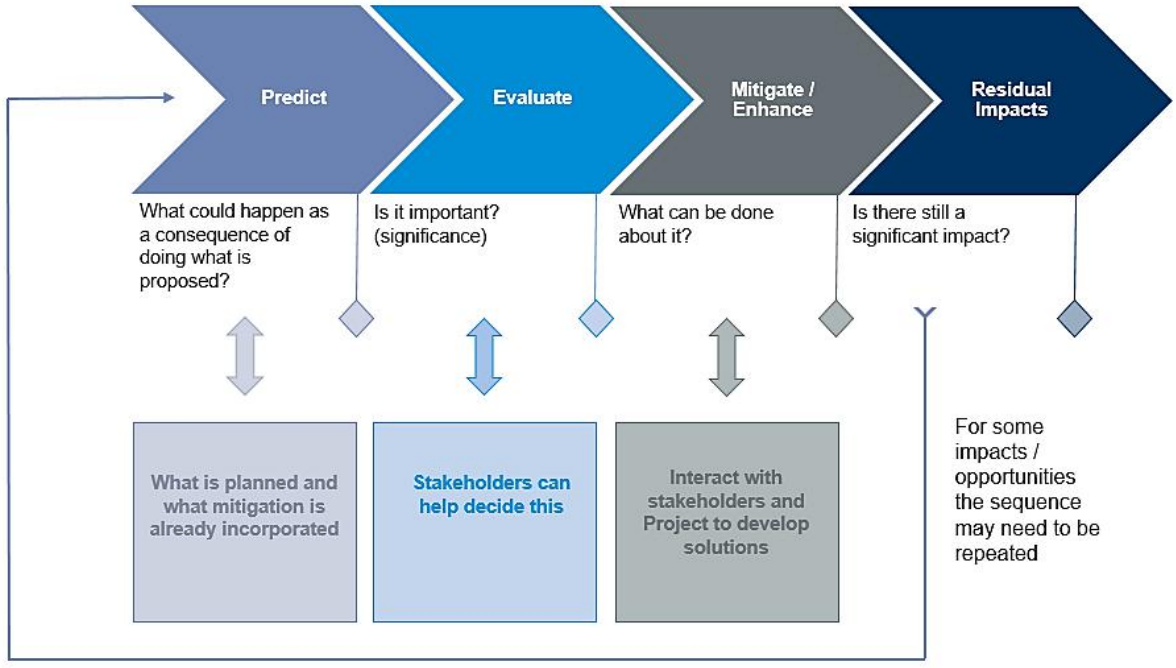
It should be noted that although scoping is carried out early in the impact assessment process, it is a continuous activity as the Daraja Project develops and changes are made that are then reassessed. Scoping takes into account new issues and information as they emerge during the study duration and as a result of development of the Daraja Project design.

A scoping report and Terms of Reference (ToR) for the Daraja Project was prepared and submitted to NEMA and subsequently approved via letter dated 11 March 2025 which is appended to this report (**Appendix E**).

### 9.1.3 IMPACT PREDICTION

The assessment of impacts proceeded through an iterative process considering four (4) questions, as illustrated in **Figure 9-2**. Where potentially significant residual impacts remain, further options for mitigation have been considered. Potential impacts will subsequently be re-assessed until they are as low as is technically and financially feasible for the Daraja Project.

FIGURE 9-2 POTENTIAL IMPACT PREDICTION AND EVALUATION PROCESS




Source: ERM, 2012

### 9.1.4 DETERMINING MAGNITUDE

This study will describe what could happen by predicting the magnitude of impacts and quantifying these to the extent practicable. The term 'magnitude' is used as shorthand to encompass all the dimensions of the potential impact including:

- The nature of the change (what is affected and how);
- Its size, scale or intensity;
- Its geographical extent and distribution;
- Its duration, frequency, reversibility; and

- Where relevant, the probability of the impact occurring as a result of accidental or unplanned events.

Magnitude therefore describes the actual change that is predicted to occur in the resource or receptor.

An overall grading of the magnitude of impacts is provided, taking into account all the various dimensions to determine whether a potential impact is of Negligible, Small, Medium or Large Magnitude. Each potential impact will be evaluated on a case-by-case basis and the rationale for each determination is described.

The magnitude designations themselves are universally consistent. However, this scale is defined according to the type of impact and is dependent on associated circumstances. For example, for readily quantifiable impacts, numerical values can be used whilst for other topics a more qualitative classification may be necessary. Some impacts will result in changes to the environment that may be immeasurable, undetectable or within the range of normal natural variation. Such changes are regarded as having no impact and characterised as having a negligible magnitude. In the case of a positive impact, no magnitude designation has been assigned as it is considered sufficient for the purpose of the impact assessment to indicate that the Daraja Project is expected to result in a positive impact.

#### 9.1.4.1 DETERMINING MAGNITUDE FOR BIOPHYSICAL IMPACTS

For biophysical impacts, the semi-quantitative definitions for the spatial and temporal dimension of the magnitude of impacts used in this assessment are provided below.

**Large Magnitude Impact** affects an entire area, system (physical), aspect, population or species (biological) and at sufficient magnitude to cause a significant measurable numerical increase in measured concentrations or levels (to be compared with legislated or international limits and standards specific to the receptors) (physical) or a decline in abundance and/ or change in distribution beyond which natural recruitment (reproduction, migration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations (physical and biological). A Large Magnitude impact may also adversely affect the integrity of a site, habitat or ecosystem.

**Medium Magnitude Impact** affects a portion of an area, system, aspect (physical), population or species (biological) and at sufficient magnitude to cause a measurable numerical increase in measured concentrations or levels (to be compared with legislated or international limits and standards specific to the receptors) (physical) and may bring about a change in abundance and/or distribution over one or more plant/animal generations, but does not threaten the integrity of that population or any population dependent on it (physical and biological). A Medium magnitude impact may also affect the ecological functioning of a site, habitat or ecosystem but without adversely affecting its overall integrity. The area affected may be local or regional.

**Small Magnitude Impact** affects a specific area, system, aspect (physical), group of localised individuals within a population (biological), and at sufficient magnitude, resulting in a small increase in measured concentrations (to be compared with legislated or international limits and standards specific to the receptors) (physical). This will be over a short time period (one plant/ animal generation or less but does not affect other trophic levels or the population itself), and in a localised area.

**Negligible Magnitude Impact** is one where the impact to the resource/receptor is immeasurable, undetectable or within the range of normal from natural background variations.

#### 9.1.4.2 DETERMINING MAGNITUDE FOR SOCIO-ECONOMIC IMPACTS

For socio-economic impacts, the magnitude considers the perspective of those affected by taking into account the likely perceived importance of the potential impact, the ability of people to manage and adapt to change and the extent to which a human receptor gains or loses access to, or control over socio-economic resources resulting in a positive or negative effect on their well-being.

The quantitative elements are included into the assessment through the designation and consideration of scale and extent of the potential impact.

### 9.1.5 DETERMINING RECEPTOR SENSITIVITY

In addition to characterising the magnitude of impact, the other principal step necessary to assign significance for a given potential impact is to define the sensitivity, vulnerability or importance of the potentially impacted resource or receptor. There are a range of factors to be taken into account when defining the sensitivity of the receptor, which may be physical, biological, cultural or human. Where the receptor is physical (for example, a water body) its current quality, sensitivity to change, and importance (on a local, national and international scale) are considered.

Where the receptor is biological or cultural (i.e. the marine environment or a coral reef), its importance (local, regional, national or international) and sensitivity to the specific type of impact are considered. Where the receptor is human, the vulnerability of the individual, community or wider societal group is considered. As in the case of magnitude, the sensitivity designations themselves are universally consistent, but the definitions for these designations will vary on a resource/receptor basis. The universal sensitivity of a receptor is defined as being Low, Medium and High.

For ecological impacts, sensitivity is assigned as Low, Medium or High based on the conservation importance of habitats and species. **Table 9-2** presents the criteria for deciding on the value or sensitivity of individual species.

TABLE 9-2 BIOLOGICAL AND SPECIES VALUE / SENSITIVITY CRITERIA

| Sensitivity | Low | Medium | High |
|---|---|---|---|
| Criteria | Not protected or listed as common/ abundant; or not critical to other ecosystem functions (i.e. key prey species to other species). | Not protected or listed but may be a species common globally but nationally rare, with little resilience to ecosystem changes, important to ecosystem functions, or one under threat or population decline. | Specifically protected under national legislation and/or international conventions e.g. Convention on the International Trade in Endangered Species (CITES)<br>Listed as rare, threatened or endangered e.g. IUCN red list. |

Note: The criteria are applied with a degree of caution. Seasonal variations and species lifecycle stage will be taken into account when considering species sensitivity. For example, a population might be deemed as more sensitive during the breeding/ spawning and nursery periods. This table uses listing of species (i.e. IUCN red list) or protection as an indication of the level of threat that this species

experiences within the broader ecosystem (global, regional, local). This is used to provide a judgement of the importance of affecting this species in the context of Project-level changes.

For socio-economic impacts, the degree of sensitivity of a receptor is defined as the level of resilience (or capacity to cope) with sudden social and economic changes. **Table 9-3** presents the criteria for deciding on the value or sensitivity of socioeconomic receptors.

TABLE 9-3 SOCIO-ECONOMIC VALUE / SENSITIVITY CRITERIA

| Sensitivity | Low | Medium | High |
|---|---|---|---|
| Criteria | Those affected are able to adapt with relative ease and maintain pre-impact status. | Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support. | Those affected will not be able to adapt to changes nor continue to maintain pre-impact status. |

### 9.1.6 EVALUATION OF SIGNIFICANCE

The next step in the assessment is to take the information on the magnitude of impacts and explain what this means in terms of its importance to society and the environment. This is to enable decision makers and stakeholders to understand how much weight should be given to the issue in deciding on their view of a project. This is referred to as Evaluation of Significance.

For the purposes of this study, the following definition is used:

*'An impact is significant if, in isolation or in combination with other impacts, it should, in the judgment of the team undertaking the assessment, be reported in the impact assessment so that it can be taken into account in decision making on whether the project should proceed and if so under what conditions.'* (ERM, 2013)

This recognises that evaluation requires an exercise of judgment and that judgments may vary between parties in the process. The evaluation of impacts that is presented in this study is based on the professional judgment and experience of the team undertaking the assessment. The team undertaking the assessment is informed by reference to the national legal standards, international regulations, government policies, supplier policies/ standards/ guidelines and applicable industry practices (e.g. the ICPC recommendations).

Where standards are not available or provide insufficient information on their own to allow a grading of significance, the significance has been evaluated taking into account the magnitude of the impact and the value or sensitivity of the affected resource or receptor. Magnitude is defined across the various dimensions described in the previous sub-section (refer to **Section 9.1.4**). The value of a resource is judged taking into account its quality and its importance as represented, for example, by its local, regional, national or international designations; its importance to the local or wider community; or its economic value. The assessment of receptor sensitivity, for example a faunal community or an industry (e.g. fishing, shipping), takes into account their anticipated response to the change and their ability to adapt to and manage the effects of the impact (refer to **Section 9.1.5**).

### 9.1.6.1 PLANNED EVENTS

For planned events, magnitude and sensitivity/ vulnerability/ importance will be looked at in combination to evaluate whether an impact is significant and if so its degree of significance. The principle is illustrated in **Figure 9-3**.

FIGURE 9-3 EVALUATION OF SIGNIFICANCE (PLANNED EVENTS)

| | | **Sensitivity/Vulnerability/Importance of Resource/Receptor** | | |
|---|---|---|---|---|
| | | **Low** | **Medium** | **High** |
| **Magnitude of Impact** | Negligible | Not Significant | Not Significant | Not Significant |
| | Small | Not Significant | Minor | Moderate |
| | Medium | Minor | Moderate | Major |
| | Large | Moderate | Major | Major |

Source: ERM, 2012

The matrix applies universally to all resources / receptors, and all potential impacts to these resources / receptors, as the resource / receptor-specific considerations are factored into the assignment of magnitude and sensitivity / vulnerability / importance designations. **Box A** provides context for the various impact significance ratings.

BOX A CONTEXT OF IMPACT SIGNIFICANCES

A potential impact is **Not Significant** when a resource / receptor will essentially not be affected in any way by a particular activity, or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

A potential impact of **Minor Significance** is one where a resource / receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity / vulnerability / importance. In either case, the magnitude should be well within applicable standards.

A potential impact of **Moderate Significance** has an impact magnitude that is within applicable standards but falls somewhere in the range from a threshold below which the impact is Minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or causing a major impact is not best practice. The emphasis for Moderate impacts is therefore on reducing them to a level that is As Low As Reasonably Practicable (ALARP). This does not mean that impacts of Moderate significance have to be reduced to Minor, but that Moderate impacts are being managed effectively and efficiently.

A potential impact of **Major Significance** is one where an accepted limit or standard may be exceeded, or Large magnitude impacts occur to highly valued/sensitive resource/receptors.

An aim of the impact assessment is to get to a position where the project does not have any Major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be Major residual impacts after all practicable mitigation options have been exhausted (i.e. As Low As Reasonably Practicable has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the project.

### 9.1.6.2 UNPLANNED / ACCIDENTAL EVENTS

In addition to the potential impacts generated by planned events, the impact of unforeseen or accidental events must also be taken into account. In these cases, the likelihood or frequency,

and consequence severity, are looked at in combination to evaluate whether an impact due to an accidental event is significant and, if so, its degree of significance.

For unplanned events, the likelihood (probability) of an event occurring has been ascribed using a qualitative scale of probability categories as described in **Table 9-4**. Likelihood is estimated on the basis of experience and/ or evidence that such an outcome has previously occurred.

TABLE 9-4 DEFINITION OF LIKELIHOOD DESIGNATION (UNPLANNED EVENTS)

| Likelihood | Definition |
|---|---|
| Extremely unlikely (1) | The event is extremely unlikely to occur under normal operating conditions; not known in the industry. |
| Unlikely (2) | The event is unlikely but may occur at some time during normal operating conditions; known of in the industry. |
| Low (3) | The event is likely to occur at some time during normal operating conditions; likely to occur once or more in life of the Project. |
| Medium (4) | The event is very likely to occur during normal operating conditions; likely to occur once or twice per year. |
| High (5) | The event will occur during normal operating conditions (is inevitable); likely occurs more than twice per year, or is continuous or certain to occur. |

Source: ERM, 2012

The potential consequence of an impact occurring is a combination of those factors that determine the magnitude of the unplanned impact (in terms of the extent, duration and intensity of the impact). Consequence in unplanned events is similar to significance (magnitude x sensitivity) of planned events and is classified as either **Incidental, Minor, Moderate, Major** or **Severe**. The criteria used to designate the severity or consequence of an unplanned/ accidental event is presented in **Table 9-5**.

TABLE 9-5 CONSEQUENCE FOR UNPLANNED EVENTS

| Consequence | Definition |
|---|---|
| Incidental (A) | • Potential impacts such as localised or short-term effects on environmental media*, meeting all environmental standards.<br>• Potential impacts such as localised or short-term effects on habitats or species.<br>• Rapid degradation of spilled materials and rapid recovery of affected resources.<br>• Slight, temporary, adverse impact on a few individuals. |
| Minor (B) | • Potential impacts such as widespread, short-term effects on environmental media, meeting all environmental standards.<br>• Potential impacts such as localised, long-term degradation of sensitive. habitat or widespread, short-term impacts to habitat or species<br>• Rapid degradation of spilled materials and rapid recovery of affected resources.<br>• Temporary (<1 year), adverse impacts on community which are within international health standards. |

| Consequence | Definition |
|---|---|
| Moderate (C) | • Potential impacts such as widespread, long-term effects on environmental media, meeting all environmental standards.<br>• Potential impacts such as localised but irreversible habitat loss or widespread, long-term effects on habitat or species.<br>• Degradation of spilled materials and full recovery of affected resources.<br>• Adverse specific impacts on multiple individuals that can be restored in <1 year OR one (1) or more injuries, not lost-work injuries. |
| Major (D) | • Potential impacts such as significant, widespread and persistent changes in environmental media OR exceedance of environmental standards<br>• Potential impacts such as significant, widespread and persistent changes in habitat or species.<br>• Recovery of affected resources is very slow.<br>• Adverse long-term, multiple impacts at a community level, but restoration possible. OR one (1) or more lost-work injuries to a member of the public including permanently disabling injuries. |
| Severe (E) | • Exceedance of environmental standards and fine/ prosecution.<br>• Potential impacts such as persistent reduction in ecosystem function on a landscape scale or significant disruption of a sensitive species.<br>• Adverse long-term, varied and diverse impacts at a community level or higher – restoration unlikely. |

* Environmental media are defined as components of the natural environment, such as, air quality, water quality, sediment quality, biological quality.

Source: ERM, 2012

After taking likelihood and consequence into consideration, the risk matrix presented in **Figure 9-4** is used to evaluate the impacts of unplanned / accidental events and determine the significance pre-mitigation.

FIGURE 9-4 EVALUATION OF SIGNIFICANCE (UNPLANNED EVENTS)

| | | | **Likelihood** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Extremely unlikely** | **Unlikely** | **Low** | **Medium** | **High** |
| | | | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
| **Consequence** | Incidental | (A) | Not Significant | Not Significant | Not Significant | Not Significant | Not Significant |
| | Minor | (B) | Not Significant | Not Significant | Not Significant | Minor | Moderate |
| | Moderate | (C) | Minor | Minor | Moderate | Moderate | Major |
| | Major | (D) | Moderate | Moderate | Major | Major | Major |
| | Severe | (E) | Major | Major | Major | Major | Major |

Source: ERM, 2012

### 9.1.7 MITIGATION

The impact assessment process aims to ensure that decisions on projects are made based on their potential impacts on the environment and society. A vital step within the process is

therefore the identification of measures that can be taken to mitigate potential impacts, allowing appropriate mitigation measures to be incorporated into the design and planning for the proposed project.

The process involves identifying where significant impacts could occur and then working with the project team to identify practical and affordable ways of mitigating those potential impacts as far as possible.

Where a significant impact is identified, the approach taken to defining mitigation measures will be based on a typical hierarchy of decisions and measures, as described in **Box B**. The priority is to first apply mitigation measures to the source of the impact (i.e. to avoid or reduce the magnitude of the impact from the associated project activity), and then to address the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e. to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude).

BOX B MITIGATION HIERARCHY

| |
|---|
| **Avoid at Source; Reduce at Source:** avoiding or reducing at source through the design of the project i.e. avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity. |
| **Abate on Site:** add something to the design to abate the impact i.e. pollution control equipment. |
| **Abate at Receptor:** if an impact cannot be abated on-site then control measures can be implemented off-site i.e. traffic measures. |
| **Repair or Remedy***:* some impacts involve unavoidable damage to a resource (i.e. material storage areas) and these impacts require repair, restoration and reinstatement measures. |
| **Compensate in Kind; Compensate through Other Means** where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate i.e. financial compensation for degrading agricultural land and impacting crop yields. |

### 9.1.8 RESIDUAL IMPACTS

In some cases, it may only be possible to reduce the impact to a certain degree through mitigation (i.e. there is an impact remaining even after mitigation). These impacts are therefore residual in the sense that they remain after mitigation measures have been applied to the intended activity.

Where an impact could not be completely avoided, the residual impact has been reassessed and the possibility for further mitigation considered. All residual significant impacts are described in this study with commentary on why further mitigation is not feasible.

### 9.1.9 CUMULATIVE IMPACTS

A cumulative impact is one that arises from a result of an impact from the proposed project interacting with an impact from another activity to create an additional impact. How the impacts and effects are assessed is strongly influenced by the status of the other activities (e.g. already in existence, approved or proposed) and how much data is available to characterise the magnitude of their impacts.

The approach for assessing cumulative impacts and effects resulting from the project and another activity affecting the same resource/receptor is based on a consideration of the approval/existence status of the 'other' activity and the nature of information available to aid

in predicting the magnitude of impact from the other activity. Potential cumulative impacts have also been described where applicable.

### 9.1.10 ASSUMPTIONS AND LIMITATIONS

Impact assessment is a process that aims to identify and anticipate possible impacts based on past and present baseline information. As this study deals with the future there is, inevitably, some uncertainty about what will happen in reality. Impact predictions have been made based on the best available data, methods and scientific knowledge available at this time. Where significant uncertainty remains in the impact assessment, this is acknowledged, and the level of uncertainty is provided.

In line with best practice, the impact assessment process will adopt a precautionary approach to the identification and assessment of impacts. Where it has not been possible to make direct predictions of the likely level of impact, limits on the maximum likely impact have been reported and the design and implementation of the project (including the use of appropriate mitigation measures) will ensure that these are not exceeded. Where the magnitude of impacts cannot be predicted with certainty, the team undertaking the assessment has used professional experience to judge whether a significant impact is likely to occur or not. Throughout the assessment, this conservative approach has been applied to the allocation of significance.

# 10. IMPACT ASSESSMENT

This Chapter provides the impact assessments for planned events for the physical, biological and socio-economic environments (**Sections 10.1** to **10.3**). These potential impacts will be assessed in detail and an assessment table will be provided for each potential impact. Key mitigation measures are noted for each potential impact. A detailed summary of mitigation measures is provided in **Table 11-1**.

In addition, unplanned events (**Section 10.4**) and cumulative impacts (**Section 10.5**) are also assessed. The assessed significance of each potential impact are also stated in these Sections.

A summary of the assessed potential impacts and their significance (post-mitigation) is provided in **Table 10-35**.

## 10.1 PHYSICAL ENVIRONMENT

### 10.1.1 IMPACTS ON METEROLOGY

The Daraja Project will not result in any significant or permanent changes to meteorology receptors in the Daraja Project AOI. Key related parameters have been assessed under potential impacts to climate change (**Section 10.1.2**). Therefore, this receptor has been **Scoped Out** of the assessment.

### 10.1.2 IMPACTS ON CLIMATE CHANGE RISK ASSESSMENT AND VULNERABILITY

The impact assessment for climate change risks for Daraja Project will focus on the medium and high risks highlighted in **Table 8-1**, and those specifically related to the Daraja Project AOI. As such, inland / terrestrial receptors such as wildfire, water scarcity, urban flooding and landslide have been **Scoped Out** of the assessment.

There are risks of potential impact on the Daraja Project as a result of climate change due to intensifying natural hazards and altering marine environments, which can lead to cable damage and disruptions (e.g. from intensive storms, rising sea levels, coastal erosion etc.). However, given that the Daraja Project's installation / construction activities are localised and within a short duration, and with adequate protection, the significance of impact from climate change on the Daraja Project is **Not Significant.** The below sub-sections are specifically on the assessment of the potential impacts from the Daraja Project on climate change.

#### 10.1.2.1 RIVER FLOODING

**Description of Baseline Environment**

Nyali is highly susceptible to river flooding due to intensified rainfall patterns influenced by climate change. Major floods occur approximately every ten (10) years, while moderate floods appear every three (3) to four (4) years. With climate change, the frequency and intensity of rainfall are expected to increase, leading to more frequent and severe river floods. The likelihood of potentially damaging and life-threatening river floods is greater than 20% within the next decade

**Proposed Project Activities**

River flooding can disrupt the installation and operation of the Daraja Project, hinder operations of coastal facilities, and complicate transportation and logistics for project materials and personnel due to infrastructure damage and accessibility issues.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow water.
- Construction of the BMH MBA.

***Operational Phase***

- Operation and repair activities for the subsea cable.

**Mitigation Measures**

- Site selection avoids flood-prone zones.
- Emergency response planning are incorporated into the design.

**Sensitive Receptors**

- Coastal infrastructure.
- Local communities.
- Agricultural lands.

**Significance of Impact**

The magnitude of river flooding impacts is considered Large, as it affects extensive areas, including infrastructure, agricultural lands, and communities. The flooding can cause significant disruptions, damage to property, and loss of livelihoods. The sensitivity of the receptors varies: coastal infrastructure is highly sensitive due to its critical role in supporting the subsea cable operations and its vulnerability to water damage; local communities are highly sensitive due to the potential for displacement and health risks; agricultural lands are moderately sensitive as flooding can lead to soil erosion and crop loss but may recover over time. Given the high magnitude of the impact and the High sensitivity of the receptors, the significance of river flooding impacts in Nyali is Major.

However, given the Daraja Project's activities, locations and mitigation measures, magnitude of potential river flooding impacts caused by the effects of the Daraja Project is Small. Therefore, the significance of potential river flooding impacts caused by the effects of the Daraja Project is **Not Significant**.

TABLE 10-1 SUMMARY OF IMPACT ASSESSMENT FOR POTENTIAL RIVER FLOODING

| **Type of Impact** | | |
|---|---|---|
| Direct (River Flooding), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Large | The extent of river flooding is extensive, affecting large areas including infrastructure, agricultural lands, and communities |
| Duration | Short-term | Flooding events can last from several days to weeks, depending on the severity of the rainfall and river overflow |

| | | |
|---|---|---|
| Scale | 2 km | The scale of impact is large, with significant disruptions to daily life, property damage, and potential loss of livelihoods |
| Frequency | Short term | Major floods occur approximately every ten (10) years, while moderate floods appear every three (3) to four (4) years. |
| Likelihood | Likely | With climate change, the likelihood of potentially damaging and life-threatening river floods is greater than 20% within the next decade |
| **Magnitude** | | |
| The magnitude of potential river flooding impacts from the Daraja Project is considered Negligible due to the limited installation footprint area, location of the Daraja Project, and short duration of activities. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| Coastal infrastructure has Medium sensitivity due to its critical role in supporting subsea cable operations and its vulnerability to water damage. | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

#### 10.1.2.2 TSUNAMI RISKS

**Description of Baseline Environment**

Nyali's coastal location makes it susceptible to tsunamis, which can be triggered by underwater earthquakes. The tsunami hazard is classified as medium, with more than a 10% chance of a potentially damaging tsunami occurring in the next 50 years. The Kenya coast was impacted to a minor extent by the tsunami of 26 December 2004, experienced as tidal surges of 0.5-1 m. No closer major tsunami sources are known.

**Proposed Project Activities**

Tsunami risks can compromise the integrity and functionality of the Daraja Project, damage coastal infrastructure, and necessitate robust emergency response and evacuation procedures to ensure the safety of personnel and equipment.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow water.
- Construction of the BMH MBA.

***Operational Phase***

- Operation and repair activities for the subsea cable.

**Mitigation Measures**

- Cable burial and use of articulated pipes in vulnerable nearshore areas.
- Emergency preparedness protocols developed in coordination with local authorities.
- Avoidance of high-risk coastal zones through route planning.

**Sensitive Receptors**

- Subsea cable – risk of physical damage.
- Coastal infrastructure – exposed to wave forces.
- Local communities – potential for injury, displacement, and fatalities.

**Significance of Impact**

The magnitude of potential tsunami impacts in Nyali is Large, as tsunamis can cause widespread destruction, including damage to subsea cables, coastal infrastructure, and loss of life. The sensitivity of the receptors is Medium: subsea cables play a critical role in communication and their vulnerability to physical damage; coastal infrastructure is sensitive due to its exposure to wave forces and potential for structural damage; local communities are sensitive due to the risk of injury, displacement and potential loss of life. Given the Large magnitude of the impact and the Medium sensitivity of the receptors, the significance of tsunami risks in Nyali is Major.

However, given the Daraja Project's activities, locations, installation / construction activities and mitigation measures, magnitude of potential tsunami impacts caused from the effects of the Daraja Project is Small. Additionally, given the mitigation measures, sensitivity to potential tsunami impacts caused from the effects of the Daraja Project is Medium. Therefore, the significance of potential tsunami impacts caused by the effects of the Daraja Project is **Not Significant**.

TABLE 10-2 SUMMARY OF IMPACT ASSESSMENT FOR POTENTIAL TSUNAMI RISKS

| **Type of Impact** | | |
|---|---|---|
| Direct (Tsunami Risks), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Large | Tsunamis can affect extensive coastal areas, causing widespread destruction |
| Duration | Short-term | The immediate impact of a tsunami is short-term, but recovery and rebuilding can take years. |
| Scale | Regional | The scale of impact is large, with significant disruptions to daily life, property damage, and potential loss of livelihoods |
| Frequency | Rare | The tsunami hazard is classified as medium, due to the absence of major nearby tsunami-generating sources and the region's geological stability. |
| Likelihood | Likely | There is more than a 10% chance of a potentially damaging tsunami occurring in the next 50 years. |
| **Magnitude** | | |
| The magnitude of potential tsunami impacts from the Daraja Project is considered Negligible due to the limited installation footprint area, location of the Project, and short duration of activities. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitive** | | |
| Subsea cables are highly sensitive due to their critical role in communication and vulnerability to physical damage; coastal infrastructure is highly sensitive due to exposure to wave forces | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

#### 10.1.2.3 EXTREME HEAT

**Description of Baseline Environment**

Nyali experiences high temperatures, which are expected to increase with climate change. The extreme heat hazard is classified as medium, with a greater than 25% likelihood of experiencing prolonged exposure to extreme heat within the next five (5) years. Ongoing GHG emissions are projected to result in more frequent temperature extremes over the next 50 years. Regional variations indicate a slightly lower temperature increase in Nyali compared to the global average.

**Proposed Project Activities**

Extreme heat can affect the subsea cable laying and repair operations, reduce the performance of electronic equipment, and pose health risks to workers, impacting their safety and productivity.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow and deep water.
- Construction of the BMH MBA.

***Operational Phase***

- Operation and repair activities for the subsea cable.

**Mitigation Measures**

- Work scheduling during cooler hours to protect workers.
- Provision of shaded rest areas and hydration stations.
- Use of heat-resistant equipment and cooling systems for sensitive electronics.

**Sensitive Receptors**

- Project workers – risk of heat stress and reduced productivity.
- Electronic equipment – performance degradation and overheating.

**Significance of Impact**

The magnitude of potential extreme heat impacts is Small, as it will still affect the performance of electronic equipment, worker safety, and productivity. The sensitivity of the receptors is Medium: project workers are moderately sensitive due to the risk of heat stress and reduced productivity; electronic equipment is moderately sensitive as extreme heat can affect its performance and lifespan. Given the medium magnitude of the impact and the Moderate sensitivity of the receptors, the significance of extreme heat impacts is **Minor**.

TABLE 10-3 SUMMARY OF IMPACT ASSESSMENT FOR POTENTIAL EXTREME HEAT

| **Type of Impact** | | |
|---|---|---|
| Direct (Extreme Heat), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Extreme heat affects the entire project area, impacting both workers and equipment. |

| | | |
|---|---|---|
| Duration | Short-term | Heatwaves can last from several days to weeks |
| Scale | Large | Heatwaves cover extensive Project area |
| Frequency | Short term | The number of "very hot days" (daily maximum temperatures above 35 °C) is expected to increase by approximately 25 days per year by 2030, 36 by 2050, and 59 by 2080 under a medium/high emissions scenario (RCP 6.0) |
| Likelihood | Likely | Greater than 25% likelihood of experiencing prolonged exposure to extreme heat within the next five (5) years. |
| **Magnitude** | | |
| The magnitude of extreme heat impacts is Small as it will still affect the performance of electronic equipment, worker safety, and productivity | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Moderate Sensitivity** | | |
| Project workers are moderately sensitive due to the risk of heat stress; electronic equipment is moderately sensitive as extreme heat can affect performance and lifespan. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

#### 10.1.2.4 EARTHQUAKES

**Description of Baseline Environment**

Nyali is in a region that can experience seismic activity, though it is not a high-risk earthquake zone. The earthquake hazard is classified as medium, with a 10% chance of a damaging earthquake occurring in the next 50 years. Trends indicate that no earthquakes of magnitude 5 or above have occurred in Nyali recently. Kenya's coastline is relatively stable tectonically, and no major earthquake sources are found nearby. The closest major volcanoes are on land in the Great Rift Valley and in the Comoros. Deepwater turbidity currents are a potential hazard wherever loose sediment is deposited on steep slopes, particularly if earthquakes occur.

**Proposed Project Activities**

Earthquakes can threaten the structural integrity of the Daraja Project and coastal support infrastructure, requiring effective emergency response and recovery operations to address potential damage and the continuity of project activities.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow and deep water.
- Construction of the BMH MBA.

***Operational Phase***

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- Flexible subsea cable design and burial techniques to accommodate seabed shifts.
- Seismic risk assessments inform route optimisation.
- Emergency response plans for rapid recovery.

**Sensitive Receptors**

- Subsea cable – vulnerable to seabed shifts.
- Coastal infrastructure – structural integrity at risk.

**Significance of Impact**

The magnitude of potential earthquake impacts in Nyali is Medium, as earthquakes can cause structural damage to subsea cables and coastal infrastructure. The sensitivity of the receptors is High: subsea cables are highly sensitive due to their critical role in communication and their vulnerability to physical damage; coastal infrastructure is highly sensitive due to the potential for structural damage and the need for emergency response and recovery operations. Given the Medium magnitude of the impact and the High sensitivity of the receptors, the significance of potential earthquake impacts in Nyali is Major.

However, given the Daraja Project's activities, locations, installation / construction activities and mitigation measures, magnitude of potential earthquake impacts caused from the effects of the Daraja Project is Negligible. Additionally, given the mitigation measures, sensitivity to potential earthquake impacts caused from the effects of the Daraja Project is Low. Therefore, the significance of potential earthquake impacts caused by the effects of the Daraja Project is **Not Significant**.

TABLE 10-4 SUMMARY OF IMPACT ASSESSMENT FOR POTENTIAL EARTHQUAKES

| **Type of Impact** | | |
|---|---|---|
| Direct (Earthquakes), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Earthquakes can affect both subsea cables and coastal infrastructure |
| Duration | Short-term | The immediate impact of an earthquake is short-term, but recovery can take months to years. |
| Scale | Medium | The scale of impact is medium, with potential for structural damage and disruption to operations |
| Frequency | Medium | There is a 10% chance of a damaging earthquake occurring in the next 50 years |
| Likelihood | Likely | Given the regional seismic activity, the likelihood of an earthquake is moderate. |
| **Magnitude** | | |
| The magnitude of potential earthquake impacts from the Daraja Project is considered Not Significant due to the limited installation footprint area, location of the Project, and short duration of activities. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

#### 10.1.2.5 COASTAL FLOOD

**Description of Baseline Environment**

Nyali is increasingly susceptible to coastal flooding due to intensified rainfall patterns and rising sea levels influenced by climate change. The coastal flood hazard is classified as medium, with a greater than 20% likelihood of potentially damaging and life-threatening coastal floods occurring within the next decade. Given the high confidence in increased intense precipitation and sea level rise, future coastal flood hazards are expected to intensify.

**Proposed Project Activities**

Coastal flooding and sea level rise can impact subsea cable landfall points, damage coastal infrastructure, and lead to community displacement and socio-economic disruptions, affecting overall project operations and sustainability.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow water.
- Construction of the BMH MBA.

***Operational Phase***

- Operation and repair activities for the subsea cable.

**Mitigation Measures**

- Setback and elevation of coastal infrastructure.
- Corrosion-resistant materials used in construction.
- Long-term monitoring and adaptive design principles applied.

**Sensitive Receptors**

- Coastal infrastructure.
- Local communities.

**Significance of Impact**

The magnitude of potential coastal flood and sea level rise impacts in Nayli is Large, as they can cause widespread flooding, damage to infrastructure, and displacement of communities. The sensitivity of the receptors is Medium: coastal infrastructure is moderately sensitive due to its exposure to flooding and potential for structural damage; local communities are moderately sensitive due to the risk of displacement, loss of property, and socio-economic impacts. Given the Large magnitude of the impact and the Medium sensitivity of the receptors, the significance of potential coastal flood and sea level rise impacts in Nyali is Major.

However, similar to river flooding, given the Daraja Project's activities, locations and mitigation measures, magnitude of potential coastal flood and sea level rise impacts caused from the effects of the Daraja Project is Small. Therefore, the significance of potential coastal flood and sea level rise impacts caused by the effects of the Daraja Project is **Not Significant**.

TABLE 10-5 SUMMARY OF IMPACT ASSESSMENT FOR POTENTIAL COASTAL FLOODING

| **Type of Impact** | | |
|---|---|---|
| Direct (Coastal Flooding), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Large | Coastal flooding and sea level rise affect extensive coastal areas |
| Duration | Long-Term | Flooding events can last from several days to weeks, while sea level rise is a long-term issue |
| Scale | Regional | large, with significant disruptions to infrastructure and communities |
| Frequency | Medium | Classified as medium, with a greater than 20% likelihood of potentially damaging floods occurring within the next decade |
| Likelihood | Likely | There is a greater than 25% likelihood of experiencing damaging coastal flooding events within the next decade. |
| **Magnitude** | | |
| The magnitude of potential river flooding impacts from the Daraja Project is considered Negligible due to the limited installation footprint area, location of the Project, and short duration of activities. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| Coastal infrastructure is moderately sensitive due to exposure to flooding; local communities are moderately sensitive due to risk of displacement and socio-economic impacts. | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

## 10.1.3 IMPACTS ON OCEANOGRAPHY

### 10.1.3.1 BENTHIC PROFILE

**Description of Baseline Environment**

The Daraja Project will be installed through a diverse and dynamic seabed structure shaped by both natural geomorphological processes and biological activity. Kenya's continental shelf is generally narrow, with its edge located between 60 to 100 m at relatively shallow depths. In some regions, there is a very narrow shelf, which may indicate faulting activity. Sand is the main sediment type, grading into mud with depth.

**Proposed Project Activities**

The Daraja Project activities associated with the installation phases of the Daraja Project may act as the sources for potential changes to the morphology of the seabed or coastline within the marine physical processes of the Daraja Project AOI; specifically, RC (including PLGR), and the installation of the subsea cable into the seabed via a towed subsea cable burial plough.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow water

***Operational Phase***

- Repair activities for the subsea cable

**Mitigation Measures**

- Use of sea plough with minimal seabed impact.
- Advanced route planning to avoid steep slopes and sensitive geomorphological features.
- Natural sediment reworking expected to restore morphology.

**Sensitive Receptors**

- Physical benthic profile – potential for localised alteration.

**Significance of Impact**

As outlined in **Section 3.4**, RC (including PLGR) involves running a towed grapnel along the seabed so that the subsea cable route is clear of debris and obstructions.

The route clearance procedure is designed to achieve subsea penetration depths of approximately 40 to 80 cm, depending on the stiffness of the seabed sediments. The typical lateral disturbance is between 0.75 and 1.00 m. Given the nature of the procedure and equipment (i.e. RC and PLGR) any resulting impacts are expected to be superficial, localised, and temporary, with natural sediment reworking by ocean currents aiding recovery.

Effective route engineering allows significant seabed features, particularly those with steep slopes, to be avoided. The burial plough is designed to operate within defined tolerances, and its movement typically results in back-trenching. This process allows the subsea cable to remain buried and minimises long-term alterations to physical benthic profile. The area affected by the plough is generally limited to the width of the asset itself, further reducing the potential for lasting morphological impacts.

For the Daraja Project in Kenyan waters, the potential seabed impact footprint is confined to the contact points of four (4) plough skids and the plough share. Where the subsea cable is surface laid, the footprint will be limited to the size of the subsea cable on the seabed, together with any articulated pipe and fixings. Upon completion of ploughing, the seabed will remain largely undisturbed, aside from temporary track marks. These marks are expected to fade quickly due to natural sediment transport processes, allowing the seabed to return to its original condition in a short timeframe.

Based on the installation methodology and subsea cable design specifications, the magnitude of impact is Small and the sensitivity of the receptor is Low. Therefore, any physical changes to the benthic profile will be **Not Significant**.

TABLE 10-6 SUMMARY OF IMPACT ASSESSMENT FOR SUBSEA CABLE INSTALLATION ON CHANGES TO THE BENTHIC PROFILE

| **Type of Impact** | | |
|---|---|---|
| Direct (impacts on the benthic profile), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Potential impacts are localised to the immediate area of subsea cable installation. |

| | | |
|---|---|---|
| Duration | Medium-term | Impacts are short-term, occurring during the installation phase and until recovery of the seabed. |
| Scale | Small | The scale of impact is small, with minimal changes to the benthic profile. |
| Frequency | Medium-term | Impacts occur during installation activities and until recovery of the seabed. |
| Likelihood | Likely | Given the installation methods, the likelihood of significant change is low |
| **Magnitude** | | |
| The magnitude of impacts on the benthic profile is Small due to the minimal and localised nature of changes | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

#### 10.1.3.2 MARINE PHYSICAL PROCESSES (CURRENTS, TIDES AND TIDAL STREAMS)

**Description of Baseline Environment**

Offshore currents are mainly driven by the northward-flowing EACC, which strengthens during the Southeast Monsoon and weakens during the Northeast Monsoon. Inshore and fore reef waters are more influenced by tidal flushing and prevailing winds, with peak channel currents reaching about 1 m/s, and ebb flows slightly stronger than flood flows.

**Proposed Project Activities**

Project activities associated with the installation and operational phases of the Daraja Project may act as the sources for potential changes to the marine physical processes within the Daraja Project's AOI.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow and deep water.

***Operational Phase***

- Operation and repair activities for the subsea cable.

**Mitigation Measures**

- Route selection avoids outcropping bedrock and sensitive features.
- Low-impact plough burial techniques used.

**Sensitive Receptors**

- Marine physical processes – potential for localised disruption.

**Significance of Impact**

Subsea cable installation works in shallow water have the potential to temporarily affect marine physical processes within the Daraja Project's AOI. However, within the deep water region of the Daraja Project, water depths are such that any temporary localised changes to the morphology of the seabed, for example associated with plough burial of the subsea cable, will not be sufficient to alter the marine physical processes. Furthermore, as described above, the absence of outcropping bedrock, and abundance of sandy gravels along the subsea cable route, means that the installation of subsea cable protection measures on the seabed which may have increased the potential for localised alterations to marine physical processes, are not planned.

Based on the above, the magnitude for potential marine physical processes impacts are Small and sensitivity to the receptor is Low. Therefore, the significance of marine physical processes impacts is **Not Significant**.

TABLE 10-7 SUMMARY OF IMPACT ASSESSMENT FOR SUBSEA CABLE INSTALLATION ON CHANGES TO MARINE PHYSICAL PROCESSES

| **Type of Impact** | | |
|---|---|---|
| Direct (Marine Physical Processes), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Subsea cable installation works in shallow water have the potential to temporarily affect tidal or oceanic currents. |
| Duration | Short-term | The impact has the potential will be short term during installation process. |
| Scale | 2 km | Impact may occur within 2 km of the subsea section. |
| Frequency | Short term | Temporary, localised and will be short-term. |
| Likelihood | Likely | Impact is Likely. |
| **Magnitude** | | |
| Small magnitude related to the shallow waters | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

### 10.1.3.3 SEA TEMPERATURE AND SALINITY

**Description of Baseline Environment**

The WIO, including the Kenyan coast, exhibits significant spatial variability in seawater temperature and salinity. Near the equator, temperatures typically range from 27 °C to 29 °C due to warm currents and high solar radiation. Salinity levels also vary, with equatorial regions averaging around 35 PSU due to freshwater input from rainfall, while more arid zones reach 35.5–36 PSU due to higher evaporation rates.

**Proposed Project Activities**

The installation of the subsea cable, including ploughing and jetting, may cause localised and temporary disturbances to the water column. These disturbances could theoretically influence micro-scale temperature and salinity gradients, particularly in stratified layers.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation in shallow and deep waters.

***Operational Phase***

- Operation and repair activities for the subsea cable.

**Mitigation Measures**

- Use of low-impact sea plough that minimises vertical mixing of water layers.
- Avoidance of any identified sensitive thermocline zones where feasible.

**Sensitive Receptors**

- Marine species sensitive to temperature and salinity gradients, such as coral reefs and pelagic fish.
- Acoustic systems relying on stable sound velocity profiles.

**Significance of Impact**

Given the dynamic and well-mixed nature of the coastal marine environment in the Daraja Project area, any changes to temperature and salinity are expected to be localised and temporary, therefore the Magnitude of potential impact is Negligible. The installation process does not introduce heat or salinity-altering substances, and any vertical mixing is expected to dissipate rapidly due to natural currents and turbulence. The sensitivity of the receptor is considered as Low. Therefore, the overall significance on temperature and salinity is considered **Not Significant**.

TABLE 10-8 SUMMARY OF IMPACT ASSESSMENT FOR CHANGES IN SEA TEMPERATURE AND SALINITY RECEPTORS

| **Type of Impact** | | |
|---|---|---|
| Direct (Sea Temperature and Salinity), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Effects are expected to be confined to the immediate vicinity of the cable route. |
| Duration | Short-term | Disturbance will occur only during installation and dissipate quickly. |
| Scale | <100 m | Effects are limited to the immediate area around the plough. |
| Frequency | Short term | Occurs only during installation activities. |
| Likelihood | Unlikely | Given the natural mixing and lack of thermal / salinity inputs, significant changes are unlikely. |

| Magnitude |
| --- |
| Negligible, No measurable long-term change in temperature or salinity expected. |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** |
| **Low Sensitivity** |
| **Significance (Post-Mitigation)** |
| **Not Significant** |

#### 10.1.3.4 WATER QUALITY

**Deterioration of Water Quality from Resuspension of Sediments**

***Description of Baseline Environment***

Geologically, the Kenya coast shares similarities with the regional geological setting, featuring Archean-age crystalline rocks within the hinterland and recent unconsolidated sediments at the coast. The substrate in the area comprises coarser sediments such as sand, gravelly sand and sandy gravel.

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable (e.g. burial) have the potential to decrease water and sediment quality receptors within the Daraja Project AOI through resuspension of sediment, which will cause an increase in temporary suspended sediment concentrations (SSC).

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works in shallow and deep water.

*Operational Phase*

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- The route survey allows for selection of seabed that provides good conditions for burial using a sea plough.
- Sea-ploughs used for subsea cable burial have been optimised by the industry to limit physical impacts to a narrow trench, minimising sediment disturbance and resuspension of sediments.

***Sensitive Receptors***

- Nyali lagoon – the ratio of sediment to water depth is greater, therefore sediment plumes created by jetting by diver or ROV will be more visible.
- Fishing – sensitive to localised turbidity created by burial activities.

Sediment in suspension can cause temporary and localised reductions in visibility and increased turbidity. The areas where plough burial is planned are in the vicinity of river mouths, where some level of sediment discharge and turbidity is common.

***Significance of Impact***

The seabed in the Daraja Project AOI predominantly consists of coarse sediments, including sand, gravelly sand, and sandy gravel. As a result, while SSC are expected to increase immediately following the subsea cable installation, they are predicted to return to background levels within a short distance—approximately 66 m in areas with hard ground and 70 m in sandy areas. Fine sediment deposition may extend up to 2 kilometres from the installation site, but far-field deposition is expected to be minimal, with thicknesses of less than 1 mm, even under worst-case jetting scenarios.

During installation, some disturbance to surrounding sediments and geological features may occur due to the displacement and resettling of suspended particles. However, these impacts are expected to remain confined to the immediate footprint of the cable plough and will not significantly affect the broader seabed environment.

Given the dynamic nature of the marine environment along the subsea cable route, resuspended sediments are expected to settle quickly. Consequently, any effects on seabed conditions and water quality will be localised and short-term. Due to the Low sensitivity of the affected receptors and the Medium magnitude of the impact, the overall significance of effects is therefore **Minor**.

TABLE 10-9 SUMMARY OF IMPACT ASSESSMENT FOR RESUSPENSION OF SEDIMENT ON WATER QUALITY RECEPTORS

| **Type of Impact** | | |
|---|---|---|
| Direct (Water Quality), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact has the potential to migrate, with fine deposition occurring out to a maximum of 2 km. |
| Duration | Short-term | The impact has the potential will be short term during installation process. |
| Scale | 100 m | Impact may occur within 100 m of the plough. |
| Frequency | Short term | Once the impact occurs, will be short-term. |
| Likelihood | Likely | Impact is Likely. |
| **Magnitude** | | |
| Medium magnitude related to the likely extent of sediment resuspension within the plough servitude, however fishing activity may still be moderately impacted | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

**Deterioration of Water Quality from Resuspension of contaminants**

***Description of Baseline Environment***

Coastal water quality in Kenya is impacted by sewage, oil, and dredging, especially near Mombasa. Nyali Lagoon benefits from ocean water exchange but still faces contamination from

runoff, sewage, and nearby land use, particularly from Tudor Creek. Shallow reef areas are mostly covered by coarse carbonate sand from reef organisms, with little terrestrial sediment. These sandy substrates support diverse microbial and interstitial life.

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable (e.g. cable burial) have the potential to cause deterioration of the water and sediment quality receptors within the Daraja Project AOI through resuspension of contaminants potentially present within sediments.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works in shallow and deep water.

*Operational Phase*

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- Use of a sea plough for subsea cable burial to minimise seabed disturbance and resuspension of contaminants.

***Sensitive Receptors***

- Water and sediment quality – potential contaminant release.

***Significance of Impact***

Water and sediment quality within the Daraj Project AOI is generally good (**Section 8.1.3.5**). Coastal water quality in Kenya is affected by sewage disposal, oil pollution, and dredge spoil dumping along the Mombasa coast. The Nyali Lagoon benefits from clean water exchange with the WIO, reducing land-based pollutants. However, surface runoff, groundwater, and raw sewage occasionally contaminate the lagoon, as indicated by nutrient spikes and faecal bacteria (KWS 2001; Mwaura *et al.,* 2017).

Within a marine environment with dynamic tidal water flow in and out of the MMPR and multiple sources of contamination it is impossible to isolate and monitor the impact of installation on water quality, so the potential impacts are reduced by careful management of the activities to reduce the risk and consequences of the installation on water quality.

In conclusion, due to the Low sensitivity of the receptors and the Small magnitude of impact, the overall significance of the potential effects is therefore **Not Significant**.

TABLE 10-10 SUMMARY OF IMPACT ASSESSMENT FOR RESUSPENSION OF CONTAMINANTS ON WATER QUALITY RECEPTORS

| **Type of Impact** | | |
|---|---|---|
| Direct (Water Quality), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Resuspension of sediments affects the immediate area around the installation site. |
| Duration | Short-term | Impacts are short-term, occurring during and shortly after installation |

| | | |
|---|---|---|
| Scale | 100m | The scale of impact is small, with localized increases in turbidity |
| Frequency | Short term | Impacts occur only during installation activities |
| Likelihood | Likely | Given the low contaminant levels, the likelihood of significant resuspension is low. |
| **Magnitude** | | |
| The magnitude of impacts on water and sediment quality is Small due to the localised and temporary nature of changes | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

**Deterioration of Water Quality due to vessel discharges**

***Description of Baseline Environment***

Routine vessel discharges that can negatively impact water quality include three main types: black water, which is sewage that may contain harmful microorganisms, nutrients, suspended solids, or organic matter; grey water, which comes from showers, sinks, laundry, and dishwashing and may include food waste; and deck drainage or bilge water, which can be contaminated with oil and lubricants.

***Proposed Project Activities***

Vessel activities associated with installation of the subsea cable have the potential to cause deterioration of the water and sediment quality receptors within the Daraja Project AOI through routine vessel discharges.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works in shallow and deep water.

*Operational Phase*

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- Compliance with MARPOL 73/78 for all discharges.
- Bilge oil filters clean bilge water on the boat before being discharged overboard.
- Ballast water managed per BWM Convention and International Maritime Organization (IMO) guidelines.

***Sensitive Receptors***

- Marine water and sediment – risk of pollution.

***Significance of Impact***

Discharges from Daraja Project vessels will be small and will not take place within 3 nm of land as the vessels will be adhering to MARPOL 73/78 standard. Mitigation measures will be in place

such as comply with applicable legislation and MARPOL 73/78 which includes requirements to avoid and minimise the discharge of harmful substances to the marine environment.

Ballast water discharges from the installation vessel will be managed in accordance with the BWM Convention. The Convention requires all vessels to implement the Ballast Water and Sediment Management Plan, have a Ballast Water Record Book, and carry out ballast water management procedures following the required standards, Resolution MEPC.127 (53): Guidelines for ballast water management and development of ballast water management plans.

In conclusion, given that vessel discharges will not take place within 3 nm of the coast, there is Low sensitivity of the receptors and the Small magnitude of impact, the therefore overall significance of the potential effects is **Not Significant**.

TABLE 10-11 SUMMARY OF IMPACT ASSESSMENT FOR VESSEL DISCHARGES ON WATER AND SEDIMENT QUALITY RECEPTORS

| **Type of Impact** | | |
|---|---|---|
| Direct (Water and Sediment Quality), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Vessel discharges affect the immediate area around the installation site |
| Duration | Short-term | Impacts are short-term, occurring during vessel operations |
| Scale | Small | The scale of impact is small, with localised potential for pollution |
| Frequency | Short term | Impacts occur only during vessel operations |
| Likelihood | Unlikely | Given compliance with regulations, the likelihood of significant discharges is low. |
| **Magnitude** | | |
| The magnitude of impacts on water quality is Small due to the localised and temporary nature of changes. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

**Increased suspended sediment Concentration**

***Description of Baseline Environment***

The upper layer of soft-bottom sediment and the habitats and species in this layer may be displaced or smothered by cable placement and burial.

***Proposed Project Activities***

The installation of the subsea cable on the seabed may cause localised resuspension of sediment during placement and burial activities, impacting benthic habitat. Soft sediment will be disturbed and may be resuspended, possibly resettling in nearby locations. Sediment in suspension can cause reduced visibility and increased turbidity.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Excavator trenching from the BMH MBA to the Lowest Astronomical Tide (LAT), covering 113 m, with burial to 2 m depth.
- Cable protection using articulated pipe in the beach zone.
- Use of a 25 m wide working corridor for trenching, access, and material stockpiling.
- Cable burial in the lagoon and nearshore areas using a combination of:
  - Handheld water jetting
  - Airlifting
  - Burial jetting sledge
  - Mobile ROV crawler
- These activities are expected to take up to 28 days, with work scheduled around tidal cycles to optimize burial depth and minimize reef contact.

*Operational Phase*

- Repair activities for the subsea cable

***Mitigation Measures***

- Maximise se of sea plough with minimal seabed impact.
- Avoidance of steep slopes and sensitive geomorphological features through advanced route planning.
- Surface laying in areas with coral-hard ground or shallow sand where burial is not feasible.
- Use of articulated pipe and seabed pinning in high-energy surf zones where burial is not possible.
- Schedule beach trenching at low tide to reduce sediment dispersion.
- Use diver-assisted methods (e.g. handheld jetting) in sensitive areas to minimize disturbance.
- Restrict use of airlifting and jetting sledge to areas with coarser sediments and sufficient depth.

***Sensitive Receptors***

- benthic species and sea grasses – potential for localised alteration.
- Coral patches and reef structures near the wave break zone.

***Significance of Impact***

Project activities during the installation phase of the Daraja Project are expected to cause temporary increases in SSC within the Study Area. These increases will be short-lived and spatially limited, with most sediment settling near the cable route. Coarse sediments will quickly settle to the seabed, while finer particles may form short-lived plumes that typically disperse within a few hundred meters due to tidal flows and ocean currents (OSPAR, 2009).

The extent of sediment plumes depends on seabed composition. Since the cable route primarily crosses coarse-grained sediments such as sandy gravels and gravelly sands, sediment dispersion is expected to be minimal. Fine-grained sediments, which generate larger plumes, are largely absent from the area, except for occasional patches of muddy sand.

During burial, the plough will temporarily suspend sediments, but most coarse material will refill the trench or settle nearby. The surface-lay process will cause negligible resuspension, and the narrow trench (approximately 1 m wide) created by the 20 cm plough share will naturally refill as the plough passes. Compared to other trenching methods, ploughing results in significantly lower sediment disturbance. Given the seabed conditions and trenching techniques, any SSC increases will be localized and short-term, with no significant lasting effects anticipated.

However, given that within the lagoon other trenching methods will be used, sediment disturbance from the various trenching and subsea cable installation methods will yield a range of impacts on SSC, depending on the technique used. Excavator trenching at the beach zone is expected to cause high but localised sediment disturbance, resulting in moderate SSC increases that are short-term in nature. Handheld water jetting, typically used by divers in shallow waters, causes moderate sediment disturbance and SSC impacts, with plumes that are localized and easier to control. Airlifting, which uses suction to remove sediment, is more intrusive, generating moderate to high sediment disturbance and high SSC impacts due to the direct discharge of sediments into the water column. The jetting sledge, a high-powered burial tool can cause high sediment disturbance and high SSC levels due to intense fluidisation of the seabed. The mobile ROV crawler, while also powerful, offers more controlled burial and results in moderate to high sediment disturbance with moderate SSC impacts.

In contrast, surface laying of the subsea cable in areas where burial is not feasible causes no sediment disturbance or SSC increase. Similarly, the use of articulated pipe and seabed pinning in high-energy zones introduces only low levels of disturbance and SSC, as these methods involve minimal interaction with the seabed. Overall, while some methods—particularly jetting and airlifting—pose higher risks of SSC increases, the impacts are expected to be temporary and spatially confined, with mitigation measures in place to manage ecological sensitivity in the lagoon and nearshore environments.

It should be noted that the SSC is a pathway which has the potential to affect other (non-physical processes) receptors such as benthic ecology, fish and shellfish ecology, marine mammals, and marine archaeology; these are considered in their respective subsections in **Section 10.2**.

TABLE 10-12 SUMMARY OF IMPACT ASSESSMENT FOR SUBSEA CABLE INSTALLATION ON INCREASED SUSPENDED SEDIMENT CONCENTRATIONS RECEPTORS

| **Type of Impact** | | |
|---|---|---|
| Direct (Increase in suspended sediments), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Any increases in suspended sediment concentrations are likely to be spatially restricted, impacts confined to beach, lagoon, and nearshore areas |
| Duration | Short-term | Impacts are short-term, occurring during the installation phase, up to 28 days during PLSE phase |
| Scale | Small-Moderate | The scale of impact is small, with multiple trenching methods used, some with high SSC potential |
| Frequency | Short term | Impacts occur only during installation activities |

| | | |
|---|---|---|
| Likelihood | Likely | Given the installation methods, the likelihood of significant changes is low. However, SSC increases is expected, especially with jetting and airlifting |
| **Magnitude** | | |
| The magnitude of impacts on SSC is Small due to the minimal and localised nature of changes. Invasive methods tend to cause moderate increase in SSC | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

### 10.1.4 IMPACTS ON GEOLOGY AND PHYSIOGRAPHY

**Description of Baseline Environment**

The Daraja Project's AOI lies within a geologically stable region along the Kenyan coast. The coastal geology is characterised by Archean-age crystalline rocks inland and recent unconsolidated sediments along the coast. The coastal plain has evolved through Quaternary sea level fluctuations, with significant geological features such as beach rock, Aeolianite, and calcarenite deposits. The coastline is tectonically stable, with no significant seismic activity or nearby tsunami sources.

**Proposed Project Activities**

Key activities primarily comprise vessel movements and vehicular activities during construction / installation of the BMH MBA.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow water.
- Construction of the BMH MBA.

***Operational Phase***

- Operational and repair activities for the subsea cable.

**Mitigation Measures**

- Use of Dynamic Positioning (DP) systems by the PLSE barge and main-lay vessel to minimise seabed disturbance.
- Avoidance of sensitive geological features (e.g. rocky outcrops, steep slopes) through route optimisation informed by CRS.

**Sensitive Receptors**

- Coastal and subtidal geological formation (e.g. beach rock, Aeolianite, reef foundations).
- Seabed: Sediment stability and seabed integrity along the subsea cable route.

**Significance of Impact**

The installation of the Daraja Project is not anticipated to result in significant geological impacts. The Daraja Project avoids major geological features and fault zones, thereby reducing physical disturbance to the seabed. The subsea cable will be buried in soft sediments where

feasible, and surface-laid in areas where burial is impractical, such as rocky or steep terrain. These practices are consistent with international best practices and are designed to preserve geological integrity.

Given the tectonic stability of the region, the absence of significant seismic or tsunami risks, and the temporary and localised nature of seabed disturbance during installation, the potential geological impacts are assessed as **Not Significant**. The Daraja Project has been **scoped out** of this assessment.

### 10.1.5 IMPACTS ON BEACH EROSION AND SCOUR

**Description of Baseline Environment**

Coastal erosion and scour along Kenya's coastline, particularly in Mombasa, are driven by a combination of natural and anthropogenic factors. Natural drivers include wave action, tidal currents, sediment transport, and rising sea levels, while human activities such as sand mining, deforestation, and unregulated coastal development exacerbate the problem. The southwest monsoon season intensifies wave energy, accelerating shoreline retreat and sediment displacement. Scour, the removal of sediment around submerged structures, is particularly pronounced in areas with strong currents and poses a significant risk to subsea infrastructure, including telecommunication cables (Cochran, 2010; Masalu, 2002).

**Proposed Project Activities**

The Daraja Project involves the installation and operation of a subsea cable system, with a beach landing at Nyali and construction of the BMH MBA.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation in shallow water.
- Construction of the BMH MBA.

***Operational Phase***

- Operation and repair of the subsea cable.

**Mitigation Measures**

- Cable route planning avoids areas of high erosion risk and sensitive habitats.
- Use of articulated pipe and seabed clamps in surf zones to prevent lateral movement and scour.
- Burial of cable to maintain existing sediment dynamics.
- PLIB to rectify any cable suspensions and minimise exposure.
- Beach restoration post-installation to original contours to maintain natural sediment dynamics.
- Monitoring and adaptive management during operation to detect and respond to erosion or scour risks.

**Sensitive Receptors**

- Coastal infrastructure (BMH MBA, hotels, roads).
- Subsea cable system and associated protective structures.

- Marine ecosystems, including coral reefs and seagrass beds.
- Local communities reliant on coastal resources and tourism.

**Significance of Impact**

The magnitude of coastal erosion and scour impacts is considered Medium, particularly during the monsoon season, due to the potential for infrastructure damage, habitat loss, and disruption of subsea cable operations. The sensitivity of receptors is Moderate: the BMH MBA and subsea cable are critical infrastructure; coral reefs and seagrass beds are ecologically significant and vulnerable; and local communities depend on the coastal zone for livelihoods and tourism.

However, due to the limited footprint, short duration of installation activities, and robust mitigation measures, the magnitude of potential erosion and scour impacts caused by the Daraja Project is Small. Therefore, the significance of potential erosion and scour impacts caused by the Daraja Project is **Minor**.

TABLE 10-13 SUMMARY OF IMPACT ASSESSMENT FOR SUBSEA CABLE INSTALLATION ON BEACH EROSION AND SCOUR RECEPTORS

| **Type of Impact** | | |
|---|---|---|
| Direct (Beach Erosion and Scour), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | The impact is spatially confined to the immediate cable landing zone (approx. 100–200 m), with no expected influence on adjacent coastal areas. |
| Duration | Short-term | Installation activities are brief, typically lasting a few days, and the beach is restored immediately after, limiting the duration of disturbance. |
| Scale | Small | The physical footprint of the works is narrow and does not extend beyond the trenching corridor or shallow nearshore zone. |
| Frequency | Short term | The impact occurs only once during the initial installation phase; no recurring activities are planned during the operational life of the subsea cable. |
| Likelihood | Unlikely | With mitigation measures such as articulated pipe and burial, the probability of significant erosion or scour is low under normal coastal conditions. |
| **Magnitude** | | |
| Low | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| The BMH MBA and subsea cable are critical infrastructure; coral reefs and seagrass beds are ecologically significant and vulnerable; and local communities depend on the coastal zone for livelihoods and tourism. | | |
| **Significant Rating (Post-Mitigation)** | | |
| **Minor** | | |

### 10.1.6 IMPACTS ON SEASCAPE, VISUAL AND LIGHT POLLUTION

**Description of Baseline Environment**

The Daraja Project's AOI is characterised as an open marine environment with regular vessel traffic, including commercial and industrial ships. Given the nature of the Daraja Project (specifically the installation of a subsea cable laying on or buried beneath the seabed) potential impacts on the seascape and associated visual amenity are expected to be minimal. Appropriate lighting is a safety requirement and lighting conditions are comparable to those of other large vessels commonly observed in Kenyan coastal waters.

**Proposed Project Activities**

Key activities primarily comprise vessel movements and vehicular activities during construction / installation of the BMH MBA.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow and deep waters.
- Construction of the BMH MBA.

***Operational Phase***

- Operational and repair activities for the subsea cable.

**Mitigation Measures**

- Short period of time the vessels are present in Kenyan waters
- One of many vessels present as near the shipping lane for the port.

**Sensitive Receptors**

- Landscape / Seascape and coastal views – potential visual disturbance.

**Significance of Impact**

Nearshore installation activities (i.e. PLSE and onshore subsea cable landing) will be restricted to daylight hours, further reducing potential visual impacts. The use of directional and hooded lighting on the cable-laying vessel will serve as a built-in mitigation measure to minimise light spill and glare. As a result, any visual disturbance will be localised, temporary, and consistent with existing maritime activity in the region. The transient nature of vessel movements, combined with the high density of marine traffic in adjacent commercial shipping lanes, supports the conclusion that visual impacts will be negligible.

The BMH MBA and subsea cable on the beach will be buried with only the manhole cover visible. Since the subsea cable will be installed on or below the seabed, no direct visual impacts are anticipated. During the Daraja Project lifecycle, any potential effects on the landscape / seascape are considered negligible. Consequently, the potential for significant seascape impacts has been assessed as **Not Significant** and has been **scoped out** of this assessment.

### 10.1.7 IMPACTS ON AIR QUALITY

**Description of Baseline Environment**

Recent statistics from the 2024 Air Quality Regulations by NEMA reveal that coastal urban centers such as Mombasa and Kilifi experience PM2.5 levels ranging between 25–40 µg/m³, often exceeding the WHO annual guideline of 5 µg/m³ (NEMA, 2024). These elevated levels are primarily attributed to vehicular emissions, port-related industrial activities, and domestic biomass fuel use. The UNEP Air Quality Monitoring Platform further confirms that Mombasa records some of the highest PM10 concentrations among coastal cities in East Africa, especially during the dry season when dust and combustion particles accumulate (UNEP, 2024).

Despite the natural advantage of coastal breezes, localised pollution hotspots persist near informal settlements and industrial zones, where waste burning and unregulated emissions are common. These findings underscore the urgent need for cleaner transport policies, waste management reforms, and transition to cleaner cooking fuels to improve air quality in Kenya's coastal regions.

**Proposed Project Activities**

Emissions will be generated from the operation of the cable-laying vessel and associated support vessels throughout the duration of the Daraja Project activities.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow and deep waters.
- Construction of the BMH MBA.

***Operational Phase***

- Operational and repair activities for the subsea cable.

**Mitigation Measures**

- Emission standards adhered to (MARPOL Annex VI).
- Efficient, well maintained engines and equipment used on the beach.
- Closely monitor the fuel consumption and associated GHG / CO2 emissions
- Route and transit logistics are optimised using AI to reduce fuel usage

**Sensitive Receptors**

- Local air quality from the emissions from vessels.

**Significance of Impact**

During operation the subsea cable makes no direct emissions to air.

During Project operations, vessels involved—particularly the cable-lay ship and supporting vessels—will emit various pollutants into the atmosphere. These emissions include carbon dioxide ($CO_2$), particulate matter, sulphur dioxide ($SO_2$), and nitrogen oxides ($NO_x$), all of which can degrade local air quality. The release of these pollutants may affect air quality in the vicinity of the operation zone, especially during prolonged vessel activity. Additionally, GHG emissions such as $CO_2$, and to a lesser extent nitrous oxide and methane, will be emitted, contributing to global climate change. These air emissions will primarily occur from the point

where the vessel begins subsea cable installation at a water depth of 15 m and continue seaward through the EEZ.

ASN will closely monitor the fuel consumption and associated GHG / CO2 emissions of all vessels mobilised on this project to reduce such emission as part of company initiative. This covers not only cable lay vessels, but also other vessels mobilised and chartered for marine surveys or other required offshore operations, along with freighters.

Built-in mitigation includes that the route and transit logistics are optimised using AI to reduce fuel usage. ASN vessels no longer use Heavy Fuel Oil and ASN's Marine Fleet Manager has obtained the Green Marine Europe Program label which is a commitment to improve environmental performance beyond European and International regulations.

The vessel will be in compliance with MARPOL 73/78 Annex VI on air pollution; and with the NOx Technical code (2008) Guidelines for Implementation, 2017 edition (IMO 2017). Emissions will therefore be similar to or lower than emissions from other large vessels traversing the EEZ and entering the Port of Mombasa. The vessel will not remain in one place for an extended duration.

Vessel emissions will have negative, direct impacts on air quality. These impacts will be temporary and local in scale. With in-built mitigation, potential impacts will be minor in significance. Potential air quality impacts from Daraja Project AOI is considered **Not Significant**. Therefore, potential air quality impacts have been **Scoped Out** of this assessment.

### 10.1.8 IMPACTS ON AMBIENT AND UNDERWATER NOISE

#### 10.1.8.1 DESCRIPTION OF BASELINE ENVIRONMENT

The Daraja Project AOI being within the coastal / beach environment in Nyali exhibits a soundscape shaped by both natural and human activities. Natural sounds such as ocean waves, wind through vegetation, and seabird calls dominate during early mornings and evenings, creating a generally tranquil environment. These are intermittently overlaid by anthropogenic noise from tourism (e.g. playful shouts, often accompanied by the sounds of music, footsteps on sand, and recreational activities), residential life, and local infrastructure such as vehicular traffic near access roads.

#### 10.1.8.2 PROPOSED PROJECT ACTIVITIES

Subsea cable installation / construction activities involve the use of heavy machinery and equipment that will cause a certain degree of noise pollution on the beach. The installation vessels propeller turning causes cavitation noise as does the engines within the ship's hull.

**Pre-Installation, Installation and BMH MBA Construction Phase**

- Subsea cable installation works.
- Construction of the BMH MBA.

**Operational Phase**

- Operation and repair activities for the subsea cable.

#### 10.1.8.3 MITIGATION MEASURES

- Standard vessel types with low noise profiles used.
- Route planning to avoid subsea cable spans and fix the subsea cable in high energy environments to prevent movement.
- Contractors shall use equipment that are in good working order and are well maintained.

#### 10.1.8.4 SENSITIVE RECEPTORS

- Marine fauna (assessed separately in **Section 10.2**).
- Human receptors – minimal due to offshore location.

#### 10.1.8.5 SIGNIFICANCE OF IMPACT

Strumming Effect (Lateral Movement of the Cables) may occur after the subsea cable has been laid. It involves the side-to-side movement of the subsea cable, caused by underwater currents. However, with technological advancements the amount of slack and PLI strumming is a much reduced risk.

The installation of the Earth System, including trenching and subsea cable pulling to the BMH MBA, is expected to generate noise, which may be disruptive to the surrounding environment. This activity will require the temporary closure of an approximately 25 m working area on the beach. The elevated noise levels could become a nuisance for beach users, potentially deterring tourists and visitors from the immediate area for several days.

Underwater noise and vibration impacts produced by installation activities have the potential to disturb sensitive ecological receptors such as marine mammals.

During operation the cable has no noise emissions and does not vibrate.

Vessels and the associated noise emissions are transient in nature and the Daraja Project activities will be temporary, therefore any interaction associated with the installation and repair phases of the Daraja Project would only be in the short term. The ambient noise generated by Daraja Project activities will be of a similar level to other vessel's in the lagoon or outside in deeper water including tourist, fishing and shipping activity. Therefore, no increase in the level of noise and vibration beyond baseline levels in the area is anticipated. As potential impacts will be temporary and noise levels will not exceed existing baseline activities, the potential effect of ambient noise from the Daraja Project activities on these receptors is considered to be **Not Significant**.

This impact is minimal and short term to be experienced only during the construction / installation phase. The potential for effects as a result of airborne noise and vibration effects from works associated with the installation and repair of the Daraja Project is **Not Significant**. Therefore strumming effect, ambient noise and vibration has been **scoped out** of this assessment, while potential underwater noise and vibration impacts on marine ecology are assessed in **Section 10.2**.

# 10.2 BIOLOGICAL ENVIRONMENT

## 10.2.1 IMPACTS ON COASTAL / NEARSHORE HABITATS

### 10.2.1.1 IMPACTS ON CORAL REEFS

**Habitat Disturbance or Loss**

***Description of Environmental Baseline***

The Daraja Project will cross a lagoon in the Nyali coral garden, which includes hard-bottom substrate dominated by macroalgae and rubble with a low coral cover of < 10% (WRTI and KWS, 2021). Laying of the subsea cable by divers could lead to disturbance including smothering or scraping the coral.

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable in shallow water (e.g. laying) have the potential to decrease the coral reef receptors within the Study Area through habitat disturbance or loss.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation in shallow water.

*Operational Phase*

- Operation and repair activities for the subsea cable

***Mitigation Measures***

- During route planning the subsea cable route was refined to avoid large densities of coral as far as possible. Moreover, the Daraja project route enters the lagoon slightly further south of the 'mlango' to reduce the likelihood of directly impacting coral on the outer fringing reef.
- In areas of reef which cannot be directly avoided through route planning, divers will hand lay the cable within the lagoon to avoid or minimise installation over coral.
- The subsea cable will be clamped in hard rock and coral areas to prevent movement.
- Project to obtain a Marine Wayleave to work in the MMPR from KWS.

***Sensitive Receptors***

Hard coral colonies, particularly any branching or massive coral species such as (Galaxea, Porites). Also, encrusting coral species (Montipora) and branching form species (Acropora).

This can impact associated reef species including crustaceans, small reef fish and mobile invertebrates that rely on coral and rubble for the habitat.

***Significance of Impact***

Due to the slow-growing nature of coral species any physical loss is a negative impact on the community as the recovery of the corals will be extensive. Moreover, due to the limited recoverable ability of coral species and the dependence of the surrounding community on the coral infrastructure, coral reefs are considered to have a Medium receptor sensitivity.

The laying of the subsea cable directly on coral communities will result in disturbance to the habitat. However, the area disturbed by the laying of the subsea cable is minimal due to the narrow cable footprint (50 mm or 130 mm for Articulated Pipe sections). Furthermore, to reduce the likelihood of the cable moving when laid on the seabed the cable will be clamped in areas of hard rock and coral, reducing the potential disturbance to coral reefs. Careful route planning will also help avoid areas of high coral density, and diver-assisted laying of the cable will help minimise contact with the coral reefs. Furthermore, coral cover in the Nyali coral garden is very low (<10%). Considering these factors, the magnitude of habitat disturbance or loss is considered Small.

Based on the determination of a Small magnitude, and Medium sensitivity, effects on habitat disturbance or loss is considered to be Moderate. However, once mitigations are in place, the significance of the potential impact will be reduced to **Minor**.

TABLE 10-14 SUMMARY OF THE IMPACT ASSESSMENT OF HABITAT DISTURBANCE AND LOSS ON CORAL REEFS

| **Type of Impact** | | |
|---|---|---|
| Direct (Coral Reefs: Habitat Disturbance or Loss), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact is primarily within the immediate vicinity of the cable corridor in the Nyali lagoon and the vessel footprint |
| Duration | Long-term | It will occur during the installation phase and be long-term due to the slow recovery rate of coral species. |
| Scale | 100 m | The habitat disturbance is spatially limited to the cable footprint in the lagoon. |
| Frequency | Short term | Impact, once it has occurred, will be short-term. |
| Likelihood | Likely | Impact is Likely. |
| **Magnitude** | | |
| Small magnitude as the area disturbed by the subsea cable is very small. Mitigation measures (hand-laying, clamping of cable and careful route planning) further reduce the overall magnitude of the impact. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| Coral reefs are highly sensitive to disturbance or loss due to the slow-growing nature of corals, which leads to long recovery times following physical damage or habitat alteration. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

**Temporary disturbance via increase in SSC and Siltation**

***Description of Environmental Baseline***

The Daraja Project will cross a lagoon in the Nyali coral garden, which includes hard-bottom substrate dominated by macroalgae and rubble with a low coral cover of < 10% (WRTI and KWS 2021). Due to the hard substrate, sediment resuspension in this area is low.

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable in shallow water (e.g. laying) have the potential to decrease the coral reef receptors within the Daraja Project AOI through temporary disturbance via increase in SSC and siltation.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation in shallow water.

*Operational Phase*

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- During route planning the subsea cable route was refined to avoid large densities of coral as far as possible. Moreover, the Daraja project route enters the lagoon slightly further south of the 'mlango' to reduce the likelihood of directly impacting coral on the outer fringing reef.
- In areas of reef which cannot be directly avoided with route planning, divers will hand lay the cable within the lagoon to avoid or minimise installation over coral.
- The subsea cable will be clamped in hard rock and coral areas to prevent movement.

***Sensitive Receptors***

Hard coral colonies, particularly any branching or massive coral species such as (Galaxea, Porites). Also, encrusting coral species (Montipora) and branching form species (Acropora).

This can impact associated reef species including crustaceans, small reef fish and mobile invertebrates that rely on coral and rubble for the habitat.

***Significance of Impact***

Coral reefs are sensitive to an increase in SSC and siltation effects, which are likely to cause smothering and reduce light availability. As the symbiotic algae (zooxanthellae) within coral tissues use light for photosynthesis which provides corals the energy for growth, calcification and reproduction. Increased turbidity reduces the light available for photosynthesis, while siltation can cover the coral surfaces. Therefore, coral reefs are considered to have a Medium sensitivity to temporary increases in SSC and siltation.

The magnitude can be considered to be Small given that the lagoon contains mainly hard substrata, these substrates do not produce an increase in SSC and subsequent siltation effects when the subsea cable is laid. The subsea cable will also be laid on these surfaces by a diver assisted method.

Based on the determination of a Small magnitude, and Medium sensitivity, effects on temporary habitat disturbance via increase in SSC and siltation is considered to be **Minor**.

TABLE 10-15 SUMMARY OF THE IMPACT ASSESSMENT FOR TEMPORARY DISTURBANCE VIA INCREASE IN SSC AND SILTATION ON CORAL REEFS

| **Type of Impact** | | |
|---|---|---|
| Direct (Coral Reefs: Temporary Disturbance via Increase in SSC and Siltation), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact from diver-assisted subsea cable laying near coral reefs. |
| Duration | Short-term | It will occur during the installation phase and be temporary |
| Scale | 100 m | Direct sediment deposition and elevated turbidity usually remain within a 100 m of the disturbance area |
| Frequency | Short term | Impact, once it has occurred, will be short-term. |
| Likelihood | Unlikely | Impact is unlikely due to the hard substrata. |
| **Magnitude** | | |
| Small magnitude due to the hard-bottom substrate in the Nyali coral garden and the assisted hand-laying of the subsea cable means that sediment resuspension is minimal. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| Medium sensitivity to the coral reef area due to temporary increases in SSC and siltation. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

### 10.2.1.2 IMPACTS ON SEAGRASS

**Temporary Habitat Disturbance or Loss**

***Description of Environmental Baseline***

Inside the Nyali lagoon, the average seagrass cover ranges from 33% to 74% averaging out at 59% (WRTI, 2025). The species composition depends on depth, with *Thalassodendron ciliatum* dominating intertidal zones and patchy species like *Halodule*, *Syringodium* and *Cymodocea* found in the shallower waters. Seagrass in this region has been previously disturbed due to overgrazing by sea urchins but have demonstrated their ability to recover over recent years (Uku *et al.,* 2020).

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable in shallow water have the potential to decrease the seagrass receptors within the Daraja Project AOI through habitat disturbance or loss.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation in shallow water.

*Operational Phase*

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- During route planning the subsea cable route will be refined to avoid large densities of seagrass meadows as far as possible.

***Sensitive Receptors***

The seagrass meadows provide vital ecosystems services such as carbon sequestration, sediment stabilisation and providing a nursery and foraging habitat for a wide range of fish and elasmobranch species and also critically endangered species of turtles such as Hawksbill turtles (*Eretmochyles imbricata*).

***Significance of Impact***

The laying of the subsea cable directly over the seagrass meadows will result in direct habitat disturbance through physical contact and potential uprooting of seagrass. Seagrasses have a high ecological value due to the ecosystem services provided. However, they are thought to be resilient and able to recover fast after disturbances such as the impact of grazing sea urchins in the area (Uku *et al.,* 2020). Therefore, the seagrass sensitivity is assessed as Medium.

The laying and burial of the subsea cable will result in disturbance to the seagrass in the Nyali lagoon. At the same time, the area of the habitat disturbed by burial of the subsea cable will be proportional to the length of the subsea cable route together with the footprint of the method used for installation. Therefore, the amount of the habitat being disturbed will be small when compared to the rest of the available habitat in the region. Moreover, further route planning along the proposed subsea cable route can help avoid any large densities of seagrass beds where possible. Thus, the magnitude of the habitat disturbance is Small.

Based on the determination of a Small magnitude, and Medium sensitivity, effects on temporary habitat disturbance or loss is considered to be **Minor**.

TABLE 10-16 SUMMARY OF THE IMPACT ASSESSMENT FOR TEMPORARY HABITAT DISTRUBANCE OR LOSS ON SEAGRASS

| **Type of Impact** | | |
|---|---|---|
| Direct (Seagrasses: Temporary Habitat Disturbance or Loss), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact is primarily within the immediate vicinity of the subsea cable corridor. |
| Duration | Short-term | It will occur during the installation phase. The seagrass recovery can begin after installation has taken place. |

| | | |
|---|---|---|
| Scale | 100 m | The habitat disturbance is spatially limited which is confined to the installation footprint. |
| Frequency | Short term | Impact, once it has occurred, will be short-term. |
| Likelihood | Likely | Impact is Likely. |
| **Magnitude** | | |
| Small magnitude as the habitat disturbances from cable installation is limited to a small area and the overall impact on seagrass is minimal when compared to the wider habitat. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| The seagrass beds play a key role in ecosystem services in MMNR, however, they are resilient to disturbances and are able to recover quickly. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

#### 10.2.1.3 IMPACTS ON SOFT-BOTTOM SUBSTRATES

**Temporary Disturbance to Soft Bottom Substrates (Habitat Loss and Increased SSC/Siltation)**

***Description of Environmental Baseline***

The soft bottom substrate in the MMNR is mainly made of clean coralline sand (WRTI, 2025). The sandy substrate provides an important habitat for a range of microbial and interstitial flora and fauna that play critical roles in nutrient cycling and sediment stability. Within the MMNR there is a partially protected no-take zone which means certain benthic species such as sea cucumbers are protected.

The planned installation of the subsea cable on the seabed involves burial of the cable from the 15 m water depth contour out to 1,000 m water depth contour with a target burial depth of 2 m. While, in waters shallower than 15 m the cable is laid on the seabed, which at this depth is typically composed of hard substrate.

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable (e.g. ploughing and laying) have the potential to disturb the soft bottom substrates within the Study Area through physical removal and alteration of the habitat.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works in shallow water and deep waters.

*Operational Phase*

- Operations and repair activities for the subsea cable.

***Mitigation Measures***

- The route survey will assess the seabed to select a route which maximises subsea cable burial.
- The sea-plough used for subsea cable burial will measure approximately 10.8 m in length, 4.8 m in height, and 6.0 m in width. It has been designed to minimise seabed disturbance; however, the burial process will still result in narrow trench, consistent with the plough share's width (20 cm).

***Sensitive Receptors***

Of particular sensitivity are the benthic communities associated with softbottom substrates, such as sea cucumbers (*Holothuroidea*) that are abundant within the coralline sand.

***Significance of Impact***

As the Daraja Project activities involve the burial and laying of the subsea cable within the soft bottom substrate, it will lead to a temporary disturbance of the benthic habitat and species in the MMNR. This disturbance will not only occur from the installation but also from the pre-clearance of any obstruction along the seabed. Sea cucumbers (Holothuridae) are an important part of this ecosystem with key roles in nutrient recycling and sediment processing. However, these species are not threated by overfishing in the MMNR due to the partial no-take practices and are likely to be resilient to a small amount of physical disturbance, especially when the impacts are temporary and cover a small spatial area. Ploughing or jetting of the sediment is likely to cause a temporary increase in suspended sediment concentrations within the vicinity of the subsea cable corridor. Thus, the plume may reduce the water clarity and settle on the seabed, which leads to a short-term smothering of benthic organisms. This particularly affects suspension feeders such as Holothurians. However, the dynamic conditions in soft bottom substrates associated with high energy wave movement suggest that populations of holothurians are likely to be exposed to small increase in SSC. Therefore, the sensitivity of the soft bottom substrates is considered Low.

The laying and burial of the subsea cable will result in disturbance to the habitat available to benthic fauna within the MMNR. While the area of the habitat disturbed by the burials of the subsea cable will be proportional to the length of the subsea cable route together with footprint of the method used for installation (taken to be 6 m wide for the sea plough). Therefore, the amount of the habitat being disturbed will be small when compared to the rest of the available habitat in the region. In shallow waters, there is unlikely to be an increase in SSC due to the hard bottom substratum. Benthic faunal species that live in this habitat are likely accustomed to the already dynamic conditions of the soft-bottom substrates, so the populations are likely resilient over the short-term. Thus, the magnitude of the impact is assessed as Small.

Based on the determination of a Small magnitude, and Low sensitivity, effects of temporary habitat disturbance to soft bottom substrates is considered to be **Not Significant**.

TABLE 10-17 SUMMARY OF IMPACT ASSESSMENT FOR TEMPORARY HABITAT DISTURBANCE OR LOSS ON SOFT BOTTOM SUBSTRATES

| **Type of Impact** | | |
|---|---|---|
| Direct ( Temporary Disturbance to Soft Bottom Substrates [Habitat Loss and Increased SSC/Siltation]), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact is limited to be no greater than the narrow footprint of the plough (6 m wide) |
| Duration | Short-term | It will occur during the installation phase and is expected to recover over time. |
| Scale | 6 m wide and 511 km long | The habitat disturbance is narrow and linear in form, relative to the wider benthic habitat. |
| Frequency | Short term | Impact, once it has occurred, will be short-term. |
| Likelihood | Likely | Impact is Likely. |
| **Magnitude** | | |
| Small magnitude related to the small spatial area compared to the rest of the habitat in the region. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

### 10.2.1.4 IMPACTS ON MANGROVE FORESTS

**Description of Environmental Baseline**

The mangrove forests along the Kenyan coastline are an important intertidal habitat which provide carbon storage, coastal protection and habitat for marine species. Within the Mombasa County, mangroves make up 6% of Kenya's cover of mangroves with the key areas in Tudor, Mwache, and Mtwapa Creeks.

**Proposed Project Activities**

The proposed activities associated with installation of the subsea cable (e.g. ploughing and laying) have the potential to disturb mangrove forest receptors due to the disturbance from the installation operations.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation works in shallow water.

***Operational Phase***

- Operation and repair activities for subsea cable.

**Sensitive Receptors**

- Mangrove forests

**Significance of Impact**

Mangrove habitats were identified in the baseline studies, although the nearest mangrove forest is located 2.7 km away from Nyali beach where the proposed subsea cable landing site and construction / installation activities will take place. Given there is no physical overlap with mangrove forests and the lack of proximity to the site through hydrological connectivity, the potential impacts to mangrove forest receptors as a result of work associated with the installation, operation and repair and decommissioning of the Daraja Project is **Not Significant**, and mangrove forests, therefore have been **Scoped Out** of the assessment.

#### 10.2.1.5 IMPACTS ON SANDY BEACHES

**Habitat Disturbance or Loss of Marine Turtle Nesting Sites**

***Description of Environmental Baseline***

As described in **Section 8.2.2.5**, Nayli Beach is characterised by white coral sand of marine origin. Nesting marine turtles, specifically the green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*) and olive ridley sea turtle (*Lepidochelys olivacea*) occur on this coastline. Nyali beach, which is intersected by the proposed subsea cable route, recorded eight (8) nests between April and August 2020 (WRTI, 2021). Furthermore, previous nesting surveys also indicate that nests have been identified at Nyali within proximity of the proposed BMH MBA location. A safe turtle hatchery has been established by the Early Birds Banda Project approximately 500 m south of the proposed BMH MBA. Nesting is increasingly affected due to increased anthropogenic pressures such as coastal development and artificial light on the beach.

***Proposed Project Activities***

Construction / installation of the BMH MBA and the subsea cable landing will require excavation and construction vehicles accessing Nyali beach. This is likely to temporarily impact the beach morphology with the potential to disturb existing or potential turtle nesting sites.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works close to and on the beach.
- Construction of the BMH MBA.

*Operational Phase*

- Artificial light or human activity near the BMH MBA.

***Mitigation Measures***

- Operations in the nearshore (i.e. PLSE and onshore subsea cable landing) will be performed during daylight hours, in order to minimise disturbance and reduce artificial light onto the beach.
- Restore beach to pre-installation conditions.
- Prior to the construction / installation on the beach and during the installation activities turtle monitoring and translocation in agreeance with KWS will be undertaken.

***Sensitive Receptors***

The sandy beach habitat at Nyali is used by marine turtles for nesting where eggs are laid in the peak nesting season. Removal of the sandy beach habitat might have direct consequences on turtle nesting sites available in the region.

***Significance of Impact***

The pre-installation and construction activities associated with the BMH MBA on the sandy beach include beach access, trenching and use of machinery which may lead to disturbance of turtle nesting sites. Nyali beach is of high ecological value and is one of the few remaining nesting grounds in the region that support critically endangered and vulnerable species of marine turtles. Nesting beaches have a high ecological value and play a crucial role in the survival and reproduction of marine turtles, as such the receptor sensitivity is considered Medium.

The BMH MBA construction / installation activities will be temporary and there will be a small area of disturbance in relation to the rest of Nyali beach. Moreover, the operations will occur during daylight hours which will avoid the need for artificial lighting during night-time operations which may affect turtle nesting activity. To ensure no new nesting sites are impacted, turtle nest monitoring will be carried out prior to the installation of the BMH MBA. Turtle monitoring will be undertaken prior to construction works on the beach and during installation activities. If nests are identified along the proposed subsea cable route, translocation will be undertaken in agreement with KWS. Therefore, with these mitigation measures the magnitude of the impact is assessed as Small.

Based on the determination of a Small magnitude, and Medium sensitivity, effects on temporary habitat disturbance or loss is considered to be Moderate. However, with mitigations in place, the significance of potential impact can be reduced to **Minor**.

TABLE 10-18 SUMMARY OF IMPACT ASSESSMENT FOR HABITAT DISTURBANCE OR LOSS ON SANDY BEACHES

| **Type of Impact** | | |
|---|---|---|
| Direct (Sandy Beaches: Habitat Disturbance or Loss), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | The impact is spatially limited to the area of the beach where the BMH MBA is constructed. |
| Duration | Short-term | It will occur during the construction phase on the BMH MBA |
| Scale | <100 $m^2$ | It will have cover a small spatial area of the beach relative to nesting habitat available. |
| Frequency | Short term | Impact, once it has occurred, will be short-term. |
| Likelihood | Likely | Impact is Likely. |
| **Magnitude** | | |

| |
|---|
| Small magnitude as the area disturbed by the BMH MBA is small, also mitigation measures will limit working to daylight hours, reducing intensity and spatial extent of the impact. |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** |
| **Medium Sensitivity** |
| Marine turtles are highly sensitive during nesting, particularly to physical disturbance and light. |
| **Significance (Post-Mitigation)** |
| **Minor** |

#### 10.2.1.6 IMPACTS ON COASTAL VEGETATION

**Temporary Habitat Disturbance or Loss**

***Description of Environmental Baseline***

The location of the BMH MBA is along a public access road at Nyali beach which is a highly disturbed area with significant anthropogenic pressure. Substrate consists of sandy soil on a gentle slope from the high-tide line to the road. There is not much vegetation along the route, which is limited to patches of coastal riparian vegetation (*Ipomoea pes-caprae*). Moreover, there are two (2) mature coconut trees in close proximity to the BMH MBA, as well as a hedge along the Costa Rica restaurant boundary. Other than these features the subsea cable route running to the beach is unvegetated.

***Proposed Project Activities***

Construction of the BMH MBA and installation of the subsea cable landing on the beach will require excavation and construction vehicles accessing Nyali beach, which may impact the coastal vegetation along the access road. When the Costa Rica restaurant is temporarily dismantled the hedge will likely need to be cut back to ground level to allow for the installation trench and excavator access to the beach.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works on the beach.
- Construction of the BMH MBA.

*Operational Phase*

- If repair of the cable is required at the BMH MBA.

***Mitigation Measures***

- Restore beach to pre-installation conditions.

***Sensitive Receptors***

The coastal vegetation is sparse along the access road, but it does include *Ipomoea pes-caprae* that are important for dune and beach stabilisation. While the two coconut trees are in close proximity to the planned the BMH MBA.

***Significance of Impact***

The area around the access road is sparsely populated with coastal vegetation and there are only two (2) coconut trees in close proximity to the BMH MBA. As an access road the area is already disturbed by anthropogenic activity reducing the ecological value. Based on this the sensitivity of the coastal vegetation to temporary habitat disturbance or loss is considered Low.

The planned spatial area of the BMH MBA is small and avoids the two (2) coconut trees along the access road. Which reduces the overall impact of the work done in the area. Furthermore, mitigation measures mean that the beach will be restored to pre-construction / installation conditions once the work is completed. Thus, the magnitude of the effect is deemed to be Small.

Based on the determination of a Small magnitude, and Low sensitivity, effects of temporary habitat disturbance or loss is considered to be **Not Significant**.

TABLE 10-19 SUMMARY OF IMPACT ASSESSMENT FOR TEMPORARY HABITAT DISTURABANCE OR LOSS ON COASTAL VEGETATION

| **Type of Impact** | | |
|---|---|---|
| Direct (Coastal Vegetation: Temporary Habitat Disturbance or Loss), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | The impact is spatially limited to the area of the beach where the BMH MBA is constructed. |
| Duration | Short-term | It will occur during the construction / installation phase with restoration occurring post construction/ installation |
| Scale | Small | Impact is limited to a small area around the BMH MBA avoiding the sensitive features |
| Frequency | Short term | Impact, once it has occurred, will be short-term. |
| Likelihood | Likely | Impact is Likely. |
| **Magnitude** | | |
| Small magnitude related to the high volume of marine traffic in the region and mobile nature of the operation. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

## 10.2.2 IMPACTS ON MARINE SPECIES COMPOSITION

### 10.2.2.1 IMPACTS ON BENTHIC FAUNA

**Temporary Disturbance to Benthic Fauna (Habitat Loss and Increased SSC/Siltation)**

***Description of Environmental Baseline***

The Kenyan TS and EEZ consists primarily of soft sediment habitats, likely containing fine silts and clays to medium sands, depending on the depth and the difference in hydrodynamic exposure. As reported in **Section 8.2.3.1**, a study by Mohamed *et al.* (2018) recorded a range of microbenthic taxa. The most dominant groups were Amphipoda (27%), Polychaeta (22%) followed by Ostracoda at 12%, followed by Tanaidacea and Nematoda. Typical macrofauna communities of soft-sediment environments. Moreover, the Meiobenthic community were dominated by Nematoda and Copepoda species with other taxa such a Polychaeta, Amphipoda and Gastrotricha also present.

The planned installation of the subsea cable on the seabed involves burial of the subsea cable from the 15 m water depth contour out to 1,000 m water depth contour with a target burial depth of 2 m. In waters shallower than 15 m the subsea cable is planned to be laid on the seabed in areas of hard substrate and buried 0.5-1 m in areas of soft sediment overlaying hard substrate.

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable (e.g. burial and surface laying) have the potential to disturb the habitat of benthic fauna within the Study Area through physical removal and alteration of the habitat.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works in shallow water and deep waters.

*Operational Phase*

- Operations and repair activities for the subsea cable.

***Mitigation Measures***

- The route survey assessed the seabed to select areas that are best suited to subsea cable burial.
- The sea-plough used for subsea cable burial will measure approximately 10.8 m in length, 4.8 m in height, and 6.0 m in width. The four (4) skid pads it runs on are designed to minimise seabed disturbance by distributing the weight of the plough. The burial process will therefore result in low level of disturbance consistent with the plough share's width.

***Sensitive Receptors***

The typical sensitive receptors of benthic fauna include sessile or tube-dwelling polychaetes and suspension feeders such as bivalves and ascidians. These groups are typically more vulnerable to smothering or habitat disruption from the increased suspended sediments and deposition.

***Significance of Impact***

As the Daraja Project activities involve the ploughing and laying of the subsea cable within the seabed substrate, it will lead to a temporary disturbance of the benthic habitat and species in the Kenyan TS and EEZ. This disturbance will not only occur from the installation but also from the pre-clearance of any obstruction along the seabed. The benthic community is made up of soft sediment benthos and dominated by resilient opportunistic taxa such as Amphipoda, Polycaheta, Nematoda and Copepoda (Mohamed *et al.,* 2018), which are often well-adapted to dynamic environments and will rapidly recover from the physical disturbance. Ploughing of the sediment is likely to cause a temporary increase in suspended sediment concentrations within the vicinity of the subsea cable corridor. Thus, the plume may reduce the water clarity and settle on the seabed, leading to a short-term smothering of benthic organisms. This particularly affects suspension feeders and surface-swelling infauna. As described in **Section 8.2.3.1** the benthic fauna off the Kenyan Mombasa coastline is dominated by tolerant taxa such as polychaetes, amphipods, and nematodes. Which are well adapted to the soft-sediment dynamics and capable of rapid recolonisation. Therefore, the sensitivity of the benthic fauna is considered Low.

The laying and burial of the subsea cable will result in disturbance to the habitat available to benthic fauna. While the area of the habitat disturbed by the burial of the subsea cable will be proportional to the length of the subsea cable route together with the footprint of the plough used for installation, taken to be 6 m wide. Therefore, the amount of habitat being disturbed will be small when compared to the rest of the available habitat in the region. In shallow waters, there is unlikely to be an increase in SSC due to the hard bottom substratum. However, there is likely to be limited resuspension associated with the ROV / diver burial through any areas of soft sediments. Benthic faunal species that live in this habitat are likely accustomed to the already dynamic conditions of the soft-bottom habitats, so the populations are likely resilient over the short-term. Thus, the magnitude of the impact is assessed as Small.

Based on the determination of a Small magnitude, and Low sensitivity, effects of temporary habitat disturbance to benthic fauna(Habitat Loss and Increased SSC/Siltation) is considered to be **Not Significant**.

TABLE 10-20 SUMMARY OF IMPACT ASSESSMENT FOR TEMPORARY HABITAT DISTURBANCE OR LOSS ON BENTHIC FAUNA

| **Type of Impact** | | |
|---|---|---|
| Direct (Benthic Fauna: Temporary Habitat Disturbance or Loss), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact is limited to the narrow footprint of the plough (6 m wide) |
| Duration | Short-term | It will occur during the installation phase and is expected to recover over time. |
| Scale | 6 m wide and 511 km long | The habitat disturbance is narrow and linear in form, relative to the wider benthic habitat. |

| | | |
|---|---|---|
| Frequency | Short term | Impact, once it has occurred, will be short-term. |
| Likelihood | Likely | Impact is Likely. |
| **Magnitude** | | |
| Small magnitude related to the small spatial area compared to the rest of the habitat in the region. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

### 10.2.2.2 IMPACTS ON BONY FISHES AND ELASMOBRANCHS

**Habitat Disturbance and Loss**

***Description of Baseline Environment***

The planned installation of the subsea cable on the seabed involves burial of the subsea cable from the 15 m water depth contour out to 1,000 m water depth contour with a target burial depth of 2 m. In waters shallower than 15 m the subsea cable will be laid on the seabed and where possible buried to between 0.5-1 m which at this depth is typically composed of hard substrate overlain within the sandy gravel.

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable (e.g. burial and laying) have the potential to disturb the habitat of bony fishes and elasmobranchs within the Study Area through physical removal and alteration of the habitat.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works in shallow and deep water.

*Operational Phase*

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- The route survey will ensure a selection of the seabed that provides good conditions for burial of the subsea cable.
- The sea-plough used for subsea cable burial will measure approximately 10.8 m in length, 4.8 m in height, and 6.0 m in width. It has been designed to minimise seabed disturbance by distributing the plough weight over four (4) skid pads.

***Sensitive Receptors***

Demersal fish species – greater dependence on the seabed, therefore lower tolerance of disturbance than elasmobranch, pelagic and migratory fish species

***Significance of Impact***

The laying and burial of the subsea cable will result in disturbance to the habitat available to fish and elasmobranch species. The area of habitat disturbed by burial of the subsea cable will be proportional to the length of the subsea cable route together with the footprint of the plough used for installation taken to be 6 m wide. Additionally in the shallow waters, ROV or diver burial method may be used to bury the subsea cable through any areas of soft sediments. Therefore, the amount of the habitat being disturbed will be small when compared to the rest of the available habitat in the region. Thus, the magnitude of habitat disturbance is Small.

As already highlighted most elasmobranch, pelagic and migratory fish species are not likely to be affected by the temporary disturbance to the seabed as they are able to relocate or avoid these disturbance events, so the sensitivity of this group is likely to Low. Conversely, demersal fish species are likely to have a much lower tolerance of disturbance as they have a greater dependency on the seabed. There is a large amount of habitat available in the surrounding area so when compared with the narrow (6 m wide) and linear (511 km in length along the subsea cable route within the Kenyan waters) cable corridor, as well as in the shallow waters area where the subsea cable may be buried in soft sediments in the lagoon, installation activities may impact individuals of demersal species but are unlikely to impact at a population level.

Based on the determination of a Small magnitude, and Low sensitivity, effects of habitat disturbance on fish and elasmobranch receptors is considered to be **Not Significant**.

TABLE 10-21 SUMMARY OF IMPACT ASSESSMENT FOR HABITAT DISTURBANCE ON BONY FISHES AND ELASMOBRANCHS

| **Type of Impact** | | |
|---|---|---|
| Direct (Bony Fish and Elasmobranchs: Habitat Disturbance), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact is limited to the narrow footprint of the plough (6 m wide) |
| Duration | Short-term | It will occur during the installation phase and is expected to recover over time. |
| Scale | 6 m wide and 511 km long | The habitat disturbance is narrow and linear in form, relative to the wider benthic habitat. |
| Frequency | Short term | Impact, once it has occurred, will be short-term. |
| Likelihood | Likely | Impact is Likely. |
| **Magnitude** | | |
| Small Magnitude related to the small spatial area compared to the rest of the habitat in the region. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |

**Not Significant**

**Temporary disturbance via increase in SSC and Siltation**

***Description of the Baseline Environment***

Kenyan waters are characterised by soft-bottom sediment continental shelf habitat. The fish communities within this habitat tend to be demersal fish and elasmobranch species which utilise the seabed for foraging, shelter, and spawning.

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable (e.g. ploughing and laying) have the potential to decrease the fish and elasmobranch receptors within the Study Area through resuspension of sediment, which will cause an increase in temporary SSC.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works in shallow and deep water.

*Operational Phase*

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- The sea-plough used for subsea cable burial will measure approximately 10.8 m in length, 4.8 m in height, and 6.0 m in width. It has been designed to minimise seabed disturbance; however, the burial process will still result in a narrow trench that is consistent with the plough share's width, in addition to the impact of the sled's skids as they move across the seabed.

***Sensitive Receptors***

Demersal fish species have a greater dependence on the seabed, therefore lower tolerance of disturbance than elasmobranch, pelagic and migratory fish species.

***Significance of Impact***

The installation of the subsea cable on the seabed may cause a temporary increase in SSC and siltation during the placement and burial of the subsea cable, thus, impacting fish and elasmobranch species on the seabed.

The Kenyan TS and EEZ are mainly made up of a soft-bottom sediment so the fish and elasmobranch species on this surface layer may be impacted by smothering from resuspended sediments. The laying of the subsea cable in shallow waters is likely to cause a small resuspension in soft sediments (i.e. 0.5-1 m of sandy gravel layer) due to the hard bottom substratum. However, there is likely to be limited resuspension associated with the 6 m plough passing through soft sediments. Fish and elasmobranch species that live in this habitat may be accustomed to the already dynamic conditions of the soft-bottom habitats, so the populations are likely resilient. Moreover, the area disturbed by the subsea cable burial is small when compared to the rest of the habitat. Thus, the magnitude of the impact is Small.

The key impacts that the SSC plume can have on fish and elasmobranch receptors is the reduction of visibility which can inhabit hunting behaviours and also the clogging of gills and breathing organs as well as smothering of eggs and larvae. However, most fish species are highly mobile and have the ability to avoid suspended sediment plumes. Therefore, the sensitivity of fish and elasmobranch species has been assessed a Low.

Based on the determination of a Small magnitude and Low sensitivity, effects of temporary disturbance via increase in SSC and siltation on bony fish and elasmobranch species are considered to be **Not Significant.**

TABLE 10-22 SUMMARY OF IMPACT ASSESSMENT FOR SMOTHERING DUE TO SUSPENDED SEDIMENT ON BONY FISH AND ELASMOBRANCHS

| **Type of Impact** | | |
|---|---|---|
| Direct (Bony Fish and Elasmobranchs: Smothering due to suspended sediment plume), Negative impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact from the suspended sediment plume are spatially limited within a few hundred meters of the trench. |
| Duration | Short-term | Sediment plume will dissipate within a few hours or days. |
| Scale | 100 m | Direct sediment deposition and elevated turbidity usually remain within a 100 m of the disturbance area |
| Frequency | Short term | Occurs only during the active burial operations |
| Likelihood | Likely | Sediment suspension is routine and the expected outcome of the cable burial. |
| **Magnitude** | | |
| Small Magnitude due to relatively small area of the habitat that is disturbed by subsea cable burial. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

### Underwater Noise and Vibration

#### *Description of the Baseline Environment*

The installation vessel utilised in Kenyan waters will produces a continuous sound which is likely to be detected by fish and elasmobranchs species. The fish species most sensitive to underwater noise (those with a swim bladder) such as certain species of Grouper or Snapper, will be used to determine the worst-case scenario. **Table 8-3** shows that fish with a swim bladder can tolerate exposure to 170 dB for 48 hours before recoverable injuries will occur (Popper *et al.,* 2014). The receptor groups below are typically capable of relocating away from

the source of noise, which minimises exposure to the noise. However, fish eggs and larvae are stationary and are susceptible to local effects.

***Proposed Project Activities***

The noise associated with the proposed subsea cable installation activities (e.g. ploughing and surface laying) have the potential to disturb fish and elasmobranch receptors due to either displacement or direct harm.

Additional noise is generated by burial tools at or close to the seabed. The sound generated by the burial tools is comparable to that of a small dredging operation. It includes a low-energy localised sonar on the plough to identify obstructions in front of it.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works in shallow and deep water.

*Operational Phase*

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- Project vessels will travel at slow speeds (between 0.5 and 4 knots, depending on the installation method). Reducing ship speed can be the most effective way of reducing underwater noise.
- The cable-lay vessel and shore-end barge will be maintained according to the IMO Guidelines (2014) to reduce underwater noise.
- Propeller polishing done properly will remove marine fouling and vastly reduce surface roughness, helping to reduce propeller cavitation.
- Maintaining a smooth underwater hull surface and smooth paintwork may also improve a ship's energy efficiency by reducing the ship's resistance and propeller load. Hence, it will help to reduce underwater noise emanating from the ship.
- The installation vessels will be equipped with fixed pitch propellers with propeller guards to avoid propeller strikes on marine fauna.

***Sensitive Receptors***

Fish and elasmobranch species vary with their sensitivity to underwater noise. The most sensitive group to low-frequency (continuous) noise is fish with swim bladders involved in hearing, such as certain species of Grouper or Snapper.

***Significance of Impact***

Operation of the cable has no noise emission in the marine or coastal environment.

The underwater noise and vibration produced by the installation activities and associated with the subsea cable have the potential to disturb the fish and elasmobranch species. Noise sources include the installation vessel and subsea cable burial equipment. These sources of noise are non-impulsive and are expected to be consistent with other vessel-related noise within the region. Non-impulsive or continuous sound, even for fish with high hearing sensitivity that is very close to the sound-generating activity, are at a low risk of injury and mortality (Popper *et al.* 2014). Therefore, vessel activity represents a short term and localised

increase in existing background levels. Thus, the magnitude of underwater noise and vibration is determined to be Small.

The underwater noise and vibration produced by these installation activities will not be loud enough or prolonged enough to cause mortality or potential injury to even the most sensitive fish and elasmobranch receptors. The most sensitive receptor group to underwater noise impacts is fish with a swim bladder, they would need to be exposed to 170 dB of vessel related noise for a continuous 48-hour period before potential for recoverable injury occurs (Popper *et al.,* 2014). The mobility of these species and the mobile nature of subsea cable installation activities mean that this period of exposure is not realistic. Thus, the sensitivity of all receptor groups to underwater noise is determined to be Low.

Therefore, based on the determination of a Small magnitude and Low sensitivity, effects of underwater noise and vibration on fish and elasmobranch species are considered **Not Significant**.

TABLE 10-23 SUMMARY OF IMPACT ASSESSMENT FOR UNDERWATER NOISE AND VIBRATION ON FISHES AND ELASMOBRANCHS

| **Type of Impact** | | |
|---|---|---|
| Direct (Bony Fish and Elasmobranchs: Smothering due to suspended sediment plume), Negative impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact only has the potential to impact within a few hundred meters of the vessel |
| Duration | Short-term | The impact will be short term during the installation process. |
| Scale | 100 m | Impact may occur within 100 m of the vessel. |
| Frequency | Short term | The impact, once it occurred, will be short-term. |
| Likelihood | Likely | Impact is likely to occur if fish and elasmobranchs are in close proximity to the vessel |
| **Magnitude** | | |
| Small Magnitude related to the high volume of marine traffic in the region and mobile nature of the operation. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

### 10.2.2.3 IMPACTS ON MARINE MAMMALS

**Underwater Noise and Vibration**

***Description of Baseline Environment***

The installation vessel utilised in Kenyan waters will produce a continuous sound which is likely to be detected by marine mammals in the region. However, there is likely already a moderate level of background noise in the region due to vessel traffic of shipping lanes and fishing activity.

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable (e.g. ploughing and laying) have the potential to disturb the marine mammal receptors due to the underwater noise and vibration generated by the installation vessel and associated machinery.

Additional noise is generated by burial tools at or close to the seabed. The sound generated by the burial tools is comparable to that of a small dredging operation. It includes a low-energy localised sonar on the plough to identify obstructions in front of it.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works in shallow and deep water.

*Operational Phase*

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- Project vessels will travel at slow speeds (between 0.5 knots and 4 knots), depending on the installation method. Reducing ship speed can be the most effective way of reducing underwater noise.
- The cable-lay vessel and shore-end barge will be maintained according to the IMO Guidelines (2014) to reduce underwater noise.
- Propeller polishing done properly will remove marine fouling and vastly reduce surface roughness, helping to reduce propeller cavitation.
- Maintaining a smooth underwater hull surface and smooth paintwork may also improve a ship's energy efficiency by reducing the ship's resistance and propeller load. Hence, it will help to reduce underwater noise emanating from the ship.
- The installation vessels will be equipped with fixed pitch propellers with propeller guards to avoid propeller strikes on marine fauna.
- Avoid offshore installation works during the megafauna migration season (August to October) at the Kenyan Coast (if possible).

***Sensitive Receptors***

- Toothed whales (Odontocetes) – use echolocation as their primary sensory modality
- Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) – rely on echolocation and other acoustic signals for navigation, prey detection and communication

***Significance of Impact***

Operation of the subsea cable has no noise emission and does not vibrate in the marine or coastal environment.

Marine mammals which are dependent on echolocation such as the Indo-Pacific bottlenose dolphin rely on this as their primary sensory modality. Significant exposure to continuous sound can impact on the ability to communicate, navigate and hunt (Todd *et al.,* 2015). Therefore, the sensitivity of marine mammals to underwater noise and vibration is Medium.

The offshore area within the Kenyan waters is characterised by a high baseline of vessel traffic, including commercial shipping, fishing, and port-related activity. Studies have shown that impulsive noise produced by ships during route survey can cause behavioral disruption, and discomfort to certain sea species. The installation of the subsea cable will introduce temporary underwater noise from vessel engines and subsea ploughing equipment, predominantly within low-frequency ranges that overlap with the hearing sensitivity of baleen whales such as Humpback whales. While behavioural responses may occur at close range, the installation vessel will move slowly (approximately 2-4 knots) and noise exposure will be transient and localised. Given the already elevated ambient noise levels in the area and the short-term nature of the works, the magnitude of impact from underwater noise and vibration on marine mammals in the Kenyan waters is considered Small.

Due to a Medium sensitivity and Small magnitude, underwater noise and vibration are considered to have a **Minor** significant effect on marine mammals.

TABLE 10-24 SUMMARY OF IMPACT ASSESSMENT FOR UNDERWATER NOISE AND VIBRATION ON MARINE MAMMALS

| **Type of Impact** | | |
|---|---|---|
| Indirect (Marine Mammals: Underwater noise and vibration), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact only has the potential to impact within a few hundred meters of the vessel |
| Duration | Short-term | The potential impact will be short term during the installation process. |
| Scale | 100 m | Impact may occur within 100 m of the vessel. |
| Frequency | Short term | The impact, once it occurred, will be short-term. |
| Likelihood | Likely | Impact is likely to occur if marine mammals are in close proximity to the vessel. |
| **Magnitude** | | |
| Small Magnitude related to the high volume of marine traffic in the region and mobile nature of the operation. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor.** | | |
| **Medium Sensitivity.** | | |

| |
|---|
| Marine mammals present along the Kenyan coastline, including species reliant on echolocation, are sensitive to low-frequency underwater noise. However, the impacts are not critical and would be reversible. |
| **Significance** |
| **Minor** |

#### 10.2.2.4 IMPACTS ON MARINE TURTLES

**Underwater noise and vibration**

***Description of Baseline Environment***

The installation vessel utilised in the Kenyan waters will produce a continuous sound which is likely to be detected by marine turtles in the region as they are able to detect low-frequency stimuli in the range of 50-1,600 Hz. However, there is likely already a moderate level of background noise in the region of the Kenyan waters due to vessel traffic of shipping lanes and fishing activity.

***Proposed Project Activities***

The proposed activities associated with installation of the subsea cable (e.g. ploughing and laying) have the potential to disturb the marine turtle receptors due to the underwater noise and vibration generated by the installation vessel and associated machinery.

*Pre-Installation, Installation and BMH MBA Construction Phase*

- Subsea cable installation works in shallow and deep water.

*Operational Phase*

- Operation and repair activities for the subsea cable.

***Mitigation Measures***

- Project vessels will travel at slow speeds (between 0.5 knots and 4 knots), depending on the installation method. Reducing ship speed can be the most effective way of reducing underwater noise.
- The cable-lay vessel and shore-end barge will be maintained according to the IMO Guidelines (2014) to reduce underwater noise.
- Propeller polishing done properly will remove marine fouling and vastly reduce surface roughness, helping to reduce propeller cavitation.
- Maintaining a smooth underwater hull surface and smooth paintwork may also improve a ship's energy efficiency by reducing the ship's resistance and propeller load. Hence, it will help to reduce underwater noise emanating from the ship.
- The installation vessels will be equipped with fixed pitch propellers with propeller guards to avoid propeller strikes on marine fauna.

***Sensitive Receptors***

- Green turtles (*Chelonia mydas*) – listed as endangered according to IUCN

- Hawksbill turtles (*Eretmochyles imbricata*) – listed as critically endangered according to IUCN

***Significance of Impact***

Operation of the cable has no noise emission in the marine or coastal environment.

There is currently limited information on the potential impacts of underwater sound on turtles or the significance of hearing for turtles, although they are able to detect and respond to acoustic stimuli (Bartol and Ketten 2006; Lavender *et al.,* 2014). Low-frequency acoustic stimuli have been detected by turtles in the range of 50 to 1,600 Hz for green turtles with their maximum sensitivity to frequencies between 200 and 400 Hz (Piniak *et al.,* 2016). While loggerhead turtles are able to hear between a range of 50 and 1,500 Hz (Lavender *et al.,* 2012).

There is no direct evidence that continuous sound may cause injury to turtles (Popper *et al.,* 2014). So, the risk of injury to marine turtles due to underwater noise is Negligible. However, the underwater noise produced by the installation vessel movements may result in behavioural responses in turtles. The underwater sounds impact thresholds for turtles, indicate that there is a high risk of behavioural response when the turtles are close to a continuous sound, and a moderate risk at intermediate distances (hundreds of metres). Thus, any avoidance or behavioural responses by turtles are only likely to occur close the vessel. Marine turtles are considered to be slightly adaptable, tolerant, and able to recover within a short period of time. Therefore, their sensitivity to noise and vibration is considered Medium.

The offshore area in the Kenyan waters has a high baseline of ship activity due to being a busy area for a range of different vessels including fishing, recreational and cargo vessels accessing the port (**Section 8.3.6**). Studies have however shown that impulsive noise produced by ships during route survey can cause behavioral disruption, and discomfort to certain sea species. However, there is likely to be a temporary increase in noise and vibration created by the installation vessel. The impact is likely to be localised only a few hundred metres from the vessel and reversible, with no risk of fatality to marine turtles. Therefore, the magnitude of impact from underwater noise and vibration is Small.

Due to a Medium sensitivity and Small magnitude, underwater noise and vibration are considered to represent a **Minor** significant effect.

TABLE 10-25 SUMMARY OF IMPACT ASSESSMENT FOR UNDERWATER NOISE AND VIBRATION ON MARINE TURTLES

| **Type of Impact** | | |
|---|---|---|
| Indirect (Marine Turtles: Underwater Noise and Vibration), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | Impact only has the potential to impact within a few hundred meters of the vessel |
| Duration | Short-term | The impact has the potential will be short term during the installation process. |

| | | |
|---|---|---|
| Scale | 100 m | Impact may occur within 100 m of the vessel. |
| Frequency | Short term | The impact, once it occurred, will be short-term. |
| Likelihood | Likely | Impact is likely to occur if marine turtles are in close proximity to the vessel |
| **Magnitude** | | |
| Small magnitude related to the high volume of marine traffic in Kenyan waters, short duration of the operation and mobile nature of the operation. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| Marine turtles along the Kenyan coastline are endangered/critically endangered species and are sensitive to low-frequency noise, however, the impacts are not critical and reversible. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

### 10.2.2.5 IMPACTS ON BIRDS

**Description of Baseline Environment**

There are no designated IBAs within the MMNR and within the proximity of the Daraja Project within the Kenyan TS and EEZ. The nearest one is located 20 km north of the Kaya Waa Ecoforest as described in **Section 8.2.3.5**. However, there are migratory shorebirds and seabirds that frequently use the coastline along Mombasa for foraging and resting.

**Proposed Project Activities**

The proposed activities associated with installation of the subsea cable (e.g. ploughing and laying) have the potential to disturb the bird receptors due to the visual disturbance from the installation vessel operations.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation in shallow water and deep water.

***Operational Phase***

- Operation and repair activities for the subsea cable.

**Sensitive Receptors**

The installation of the subsea cable and the activities associated with it may potentially impact bird receptors in the following way:

- Visual Disturbance from the Vessel

**Significance of Impact**

Operation of the subsea cable has no noise or light emission in the marine or coastal environment.

The installation vessel will have night-time operational lighting whilst holding stations on DP, the potential impacts of this would be similar to cargo ships and other large vessels in the

region which are common in Kenyan waters. Work in the nearshore area (i.e. PLSE and onshore subsea cable landing) will be limited to daylight hours. The potential impact will be localised and temporary. Therefore, the potential impacts to bird receptors as a result of work associated with the installation, operation and repair of the Daraja Project is **Not Significant**, and birds, therefore have been **Scoped Out** of the assessment.

## 10.3 SOCIO-ECONOMIC ENVIRONMENT

### 10.3.1 IMPACTS ON ADMINISTRATIVE STRUCTURE AND POPULATION DYNAMICS

The Daraja Project will not result in any significant or permanent changes to the administrative structure and population dynamics in the Mombasa area. Therefore, this aspect has been **Scoped Out** of the assessment.

### 10.3.2 IMPACTS ON LAND USES

**Description of Baseline Environment**

Nyali Beach area is an urban area with mixed land uses including high-income residential areas, commercial businesses such as shopping malls and office spaces. There is also a heavy military presence in the area due to the close proximity of army barracks which provides a heightened sense of security. Within the Daraja Project AOI, boat operators offer tourist recreational activities, temporary living structures have been set up for Nyali BMU fishermen, and there are eateries.

**Project Activities**

The proposed activities associated with installation of the subsea cable at the landing site and BMH MBA construction / installation have the potential to impact land use on Nyali Beach.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation in shallow water.
- Construction of the BMH MBA.

***Operational Phase***

- Operation and repair activities for the subsea cable.

**Mitigation Measures**

- Installation activities on the beach, including construction of the BMH MBA, will be short-term and any disruption will be of limited duration.
- Access to the Nyali Beach area will be kept available to the greatest extent practicable
- A 2-week notice period should be provided to surrounding businesses, traders and hotels, alerting them to the planned duration and schedule of installation work. The local community and beach users should be informed of the planned installation activities through newspaper adverts, public notices or other similar means.
- The BMH MBA installation activities should be scheduled to avoid peak holiday periods (i.e. annually between December to February and July to August), if possible.

- Project will obtain Development Permissions, TOLs and Excavation Permits from Mombasa County for the proposed work.

**Significance of Impacts**

The Daraja Project will not result in any permanent impacts to the land use in Mombasa because the majority of the proposed subsea cable route is a marine component. The BMH MBA landing point on Nyali Beach may result in the relocation of the Costa Rica restaurant which is a temporary structure that is currently located along the proposed subsea cable route towards the proposed BMH MBA.

Given the Daraja Project's short duration and at a local scale on Nayli Beach, the potential impact is considered reversable because the constructed area will be reinstated to a condition similar to or better than its condition prior to construction. The impact magnitude will be Small, and the receptor sensitivity will be Medium. With the appropriate mitigation measures in place, land use impacts are expected to be **Minor** in significance.

TABLE 10-26 SUMMARY OF IMPACT ASSESSMENT OF LAND USES

| **Type of Impact** | | |
|---|---|---|
| Direct (Land Use), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | The extent of the impact on land use at Nyali Beach will be local, mainly affecting beachgoers, vendors and businesses in Nyali Beach. |
| Duration | Short-term | Construction of BMH MBA is projected to be 14 days. |
| Scale | 500 m | The scale of impact is small, with slight disruptions to daily life, and potential negative impacts to livelihoods. |
| Frequency | Once off | When construction / installation is concluded the access road will be backfilled and restored to its original state and the displaced café will also resume business. |
| Likelihood | Likely | Temporary displacement will occur for a limited period during the construction phase to allow installation activities to occur. |
| **Magnitude** | | |
| The magnitude of land use impacts is considered Small due to the extensive area affected and the severity of disruptions | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| The businesses and residential areas along Nyali Beach are moderately sensitive before mitigation due to their critical role in supporting the tourism industry which provides livelihoods for a large portion of the population. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

## 10.3.3 IMPACTS ON ECONOMY AND EMPLOYMENT

### 10.3.3.1 DESCRIPTION OF THE BASELINE ENVIRONMENT

A summary is provided below of relevant baseline conditions that potentially influence economy and employment impacts:

- In Mombasa County 44.2% of the population was employed, 11% were seeking work and 41% were not economically active.
- Economic activity in the social AOI is dominated by shipping and porting. Other economic activities include manufacturing and processing, cement manufacturing and oil refinery. Limestone mining also occurs in the region.

#### 10.3.3.2 PROPOSED PROJECT ACTIVITIES

The proposed activities associated with the installation of the subsea cable are expected to generate positive impacts within the local and regional economy through the creation of direct employment opportunities (e.g. possible temporary employment opportunities through local contractors for site preparation and during BMH MBA construction) and indirect employment opportunities (e.g. longer-term benefit at the national level, thus indirectly promoting job growth).

Note DOSHS advised that all Daraja Project Kenyan workers should be registered with DOSHS. And the local BMH MBA contractor is required to have a DOSHS Registration in Mombasa.

**Pre-Installation, Installation and BMH MBA Construction Phase**

- Subsea cable installation in shallow water.
- Construction of the BMH MBA.

**Operational Phase**

- Operation of the subsea cable

#### 10.3.3.3 MITIGATION MEASURES

- No mitigation measures required.

#### 10.3.3.4 SIGNIFICANCE OF IMPACT

In the construction / installation phase on Nyali Beach, employment creation is considered have a **Minor** positive impact significance, given that the receptor sensitivity is Medium as there may be skilled / semi-skilled employment opportunity benefits locally associated with the Daraja Project. While the magnitude of impact is Small. The ongoing operation of the Daraja Project will contribute to enhanced data connectivity and improved internet access, supporting wider employment opportunities on a national scale; however, this long-term benefit is not assessed further for the purposes of this ESIA.

TABLE 10-27 SUMMARY OF IMPACT ASSESSMENT OF DIRECT AND INDIRECT EMPLOYMENT OPPORTUNITIES

| **Type of Impact** | | |
|---|---|---|
| Direct and Indirect Employment, Positive Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Small | The extent of the impact of employment opportunities is limited as the Daraja Project may source local skill / semi-skilled workers from the Mombasa County. |

| | | |
|---|---|---|
| Duration | Short-term | The employment opportunities associated with the Daraja Project will last for the duration of construction / installation, which is projected to be 14 days. |
| Scale | Small Scale | The scale of impact is small, with positive impacts to livelihoods. |
| Frequency | Short term | Workers will only be required for the duration of construction / installation of the BMH MBA. Once the Daraja Project is operational, it is not anticipated that any works will be required on Nyali Beach. |
| Likelihood | Likely | These employment opportunities may occur during the construction / installation phase. |
| **Magnitude** | | |
| The magnitude of employment opportunities impacts is considered to be Small due to the the limited area of works on Nyali Beach. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| The receptor sensitivity is Medium due to its role in supporting livelihoods. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

## 10.3.4 IMPACTS ON TOURISM AND RECREATION

### 10.3.4.1 DESCRIPTION OF BASELINE ENVIRONMENT

Tourism activities are prevalent along Nyali Beach, with a number of hotels and boat operators present, peaking between December and March. Recreational activities in the Daraja Project's AOI include swimming, snorkelling, scuba diving, boating, sunbathing, beach sports/games, and camel riding.

Nearshore in the Nyali area of the MMNR there are also some patch reefs which are used extensively for tourism, science and fishing. The outer reefs start from the crest / reef flat, then extend from a water depth of 9 to 25 m until sloping off into deeper waters (30 to 200 m).

### 10.3.4.2 PROPOSED PROJECT ACTIVITIES

The proposed activities associated with the installation of the subsea cable are expected to generate both potential positive and negative impacts within the local and regional tourism and recreational industry.

**Pre-Installation, Installation and BMH MBA Construction Phase**

- Subsea cable installation in shallow water.
- Construction of the BMH MBA.

**Operational Phase**

- None

### 10.3.4.3 MITIGATION MEASURES

A notification will be provided to stakeholders from the local community who use the affected areas recreationally to raise awareness of potential impacts including noise, dust, worker influx, and equipment blocking the landscape.

- A grievance mechanism will be established so that individuals who have concerns or complaints about the activities can communicate directly with the Daraja Project.
- Signs will be in place around work fronts and construction sites advising tourists of the risks of trespassing.
- Good industry practices will be employed to minimise dust and air quality impacts and ensure appropriate management of any waste produced.

#### 10.3.4.4 SIGNIFICANCE OF IMPACT

Nyali Beach provides opportunities for recreation and tourism. The installation of the Daraja project may cause some disruption to recreational and tourism activities; however, any disruption would be temporary and over a small area. Access to the beach will not be restricted; however, there will be some limitations to access where the installation will be taking place for health and safety purposes. The magnitude of the impact would be Small, and the sensitivity of the receptors would be Medium. The significance of the impact of the Daraja Project's installation / construction activities on the landscape and aesthetics is assessed to be **Minor**.

TABLE 10-28 SUMMARY OF IMPACT ASSESSMENT OF TOURISM AND RECREATION

| **Type of Impact** | | |
|---|---|---|
| Direct (Tourism and Recreation), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | The extent of the Daraja Project's potential impact on tourism recreation is local because workers who require accommodation will be accommodated in hotels and inns in and around Nyali Beach. |
| Duration | Short-term | This potential impact will last for the duration of construction which is projected to be ~2 weeks. |
| Scale | Small | The scale of potential impact is small given the limited area and short works duration. |
| Frequency | Short term | Tourism and recreation will only be affected during construction / installation of the BMH MBA. Once the Daraja Project is operational, it is not anticipated that any works will be required on Nyali Beach. |
| Likelihood | Likely | Some disruptions to tourism and recreational activities may occur during construction / installation of the BMH MBA and installation of the subsea cable on the landing site at Nyali Beach. |
| **Magnitude** | | |
| The magnitude of impacts on the tourism and recreational activities are considered Small due to the limited location and duration of works. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| Nyali Beach beachgoers and traders are moderately sensitive before mitigation due to their critical role in supporting the tourism industry which provides livelihoods for the local population. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

## 10.3.5 IMPACTS ON FISHERIES

### 10.3.5.1 DESCRIPTION OF BASELINE ENVIRONMENT

Commercial fisheries and artisanal fishing is an integral part the livelihoods of coastal communities in and around Nyali Beach. The peak season for fishing and tourism are concurrent, occurring from December to March.

Commercial fishing activities in Mombasa tend to occur in deeper waters; local subsistence fishing activities tend to occur in shallow waters. Fishing is not allowed in the MMNP, which is in the vicinity of the Daraja Project AOI.

### 10.3.5.2 PROPOSED PROJECT ACTIVITIES

The proposed activities associated with installation of the subsea cable (e.g. ploughing and laying) and the movement of associated vessels, including ROV and diver installation within the lagoon, have the potential to disturb fishing grounds utilised by both artisanal fishermen and commercial fisheries in the Daraja Project AOI. As well as the physical presence of vessels, disturbance of sediments due to installation activities can impact on artisanal fishing activities in the lagoon and shallow nearshore waters (refer to Water Quality impacts in **Section 10.1.3.4**).

**Pre-Installation, Installation and BMH MBA Construction Phase**

- Subsea cable installation in shallow water and deep water.

**Operational Phase**

- Operation and repair activities for the subsea cable.

### 10.3.5.3 MITIGATION MEASURES

- During installation, the Daraja Project will avoid sensitive seabed features as much as possible. The installation schedule should take into account the critical breeding and spawning periods from January to March and September to November, peaking in October, and minimise temporal overlap as far as possible.
- The use of a sea plough and surface lay techniques will be used to minimise impacts to benthic habitats which support fish species. Within the lagoon installation will be undertaken by ROV and divers to allow careful positioning of the cable. Potential disruption to fishing activity in the lagoon from sediment dispersion will be for a short period only.
- KMA should be given one (1) month notice ahead of all installation activities, so that formal maritime notifications can be published.
- Early engagement and communication should take place with local ports authorities, naval command, touristic boat companies and fishermen in the area (local BMUs), including discussion of avoidance, management and mitigation measures to limit impacts on local sea users.
- Work is only restricted around the installation in the MMNR to protect divers in the water. Normal fishing activity can occur outside the safety buffer zone.
- Engagement with the State Department of Fisheries should take place to further define avoidance and mitigation requirements as necessary.

#### 10.3.5.4 SIGNIFICANCE OF IMPACTS

Note there is evidence from fisheries on the West African coast that fish populations are changing due to warming ocean temperatures which leads to effects including de-oxygenation, that is causing depletion of biodiversity in low latitudes and increase in biodiversity at higher latitudes as ocean dwellers are not accustomed to significant changes in temperature, unlike land creatures, and are therefore less able to cope with even the small increases in average ocean temperatures (Scales, 2024).

It is anticipated that any disruption to fishing will occur during the installation phase within the shallow waters and within the MMNR, from ROV / diver burial through areas of soft sediments and seagrasses. The significance of the impact on fishers is Major during installation owing to the reliance on fishing in the community and the likelihood of disruption either by restricted access or disruption to the seabed. The magnitude of potential impact is Small due to the short-term nature of the potential impacts. With mitigation measures in place, this risk reduces to **Minor**. With natural habitat restoration following installation, this impact will be short-term. The receptor sensitivity of fisheries and artisanal fishers from local communities is Medium.

TABLE 10-29 SUMMARY OF IMPACT ASSESSMENT OF FISHERIES

| **Type of Impact** | | |
|---|---|---|
| Direct (Fisheries), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | The extent of the Daraja Project's potential impact on fisheries is local because disturbances to normal fishing activities will be limited to the direct Daraja Project AOI. |
| Duration | Short-term | This potential impact will last for the duration of installation which is projected to be ~2 weeks. |
| Scale | Small | The scale of potential impact is small given the limited area and short works duration. |
| Frequency | Short term | Fisheries and artisanal fishermen will only be affected during installation activity. |
| Likelihood | Likely | Some disruptions to fishing activities may occur during installation of the BMH MBA and installation of the subsea cable on the landing site at Nyali Beach. |
| **Magnitude** | | |
| The impact magnitude is considered Small due to the size of the area affected and the severity of disruptions. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| The receptor sensitivity is medium due to its critical role in providing livelihoods and boosting the local economy. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

## 10.3.6 IMPACTS ON SHIPPING AND NAVIGATION

### 10.3.6.1 DESCRIPTION OF BASELINE ENVIRONMENT

Mombasa is a major trade centre to the Port of Mombasa which is a major contributor to the Kenyan economy, with the shipping and port activities accounting for approximately 15% of the regional economy.

The Port of Mombasa is a major source of employment in the area, attracting labour not only within the region, but also from other parts of the country and it also serves neighbouring inland countries like Uganda, the Democratic Republic of Congo, Southern Sudan, and Rwanda.

### 10.3.6.2 PROPOSED PROJECT ACTIVITIES

The proposed subsea cable will potentially cross an area with relatively high ship traffic but avoids the busiest corridor at the port entrance, this will result in potential negative impacts.

**Pre-Installation, Installation and BMH MBA Construction Phase**

- Subsea cable installation in shallow water and deep water.

**Operational Phase**

- Operation and repair activities for the subsea cable.

### 10.3.6.3 MITIGATION MEASURES

- KMA will be given one (1) month notice ahead of all installation activities, so that formal maritime notifications can be published.
- Early engagement and communication should take place with local ports authorities, naval command, touristic boat companies and fishermen in the area (local BMUs), including discussion of avoidance, management and mitigation measures to limit impacts on local sea users.
- Engagement with the State Department of Fisheries will take place to further define avoidance and mitigation requirements as necessary.

### 10.3.6.4 SIGNIFICANCE OF IMPACT

The magnitude of impact will initially be Medium but reduces to Small after mitigation, the sensitivity rating is Medium. The significance of the disruption to shipping vessels around the Port of Mombasa will initially be Moderate. With the implementation of in-built mitigation measures, including early notification and coordination with maritime and fisheries groups, the significance of impacts from increased vessel traffic and temporary access restrictions will be **Minor**.

TABLE 10-30 SUMMARY OF IMPACT ASSESSMENT OF SHIPPING AND NAVIGATION

| **Type of Impact** | | |
|---|---|---|
| Direct (Shipping and Navigation), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Local | The extent of the Daraja Project's potential impact on shipping and navigation is local because disturbances to normal nautical activities will be limited to the Daraja Project AOI. |

| | | |
|---|---|---|
| Duration | Short-term | This potential impact will be for a short duration during installation within the Kenyan TS and EEZ. |
| Scale | Small | The scale of potential impact is small given the limited area and short works duration. |
| Frequency | Short term | Nautical activities will only be affected during the installation in Kenyan TS and EEZ. |
| Likelihood | Likely | Some disruptions to nautical activities may occur during installation in Kenyan TS and EEZ. |
| **Magnitude** | | |
| The impact magnitude is considered Medium due to the size of the area affected and the level of disruptions. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| The receptor sensitivity is Medium due to high levels of shipping in Kenyan waters and its critical role in providing livelihoods and boosting Kenyan economy. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

## 10.3.7 IMPACTS ON INFRASTRUCTURE (INCLUDING SUBMARINE CABLE INFRASTRUCTURE)

### 10.3.7.1 IMPACTS ON EXISTING SUBMARINE INFRASTRUCTURE

**Description of Baseline Environment**

The Nyali area in Mombasa is a key landing point for six (6) existing subsea cable systems which connect East Africa to Europe and are crucial for supporting the growing digital economy in Mombasa and surrounding countries.

**Proposed Project Activities**

The installation of the subsea components could negatively impact existing submarine cable infrastructure by causing physical damage and congestion around existing cable routes.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- Subsea cable installation in shallow water and deep water.

***Operational Phase***

- Operation and repair activities for the subsea cable.

**Mitigation Measures**

- Ploughing will not take place 500 m from the existing subsea cables.
- Notify owners prior to crossing of in-service subsea cables and establish crossing agreements with asset owners.

**Significance of Impact**

The Daraja Project will cross 19 in-service cables within Kenyan waters. Where the route crosses the in-service fibre optic cables, ploughing will be stopped up to 500 m before the intersection and the subsea cable will be temporarily surface laid, to a point up to 500 m beyond the crossing. Following surface lay, the subsea cable will be buried by an ROV or by

divers in shallow water. For all in-service cables, ASN will notify the cable owners prior to installation.

The magnitude of this impact will be Small, and the receptor sensitivity will be Medium after mitigation measures have been implemented. The impact significance of the installation of the Daraja Project will be initially Moderate but will decrease to **Minor** with the implementation the appropriate mitigation measures.

TABLE 10-31 SUMMARY OF IMPACT ASSESSMENT OF EXISTING SUBMARINE INFRASTRUCTURE

| **Type of Impact** | | |
|---|---|---|
| Direct (Existing Submarine Infrastructure), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Small | The extent of the Daraja Project's potential impact on existing submarine cables will be limited to the direct Daraja Project AOI. |
| Duration | Short-term | This potential impact will be for a short duration during installation within the Kenyan TS and EEZ. |
| Scale | Small | The scale of potential impact is small given the limited area and short works duration. |
| Frequency | Short term | Existing submarine cables will only be affected during the installation in Kenyan TS and EEZ. |
| Likelihood | Unlikely | Some disruptions to existing submarine cables may occur during installation in Kenyan TS and EEZ. |
| **Magnitude** | | |
| The magnitude on existing submarine cable infrastructure is considered Small due to the size of the affected area. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Medium Sensitivity** | | |
| Existing submarine cable infrastructure is moderately sensitive due to its critical role in supporting subsea cable operations and its vulnerability to damage. | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

### 10.3.7.2 IMPACTS ON DIGITAL CONNECTIVITY

**Description of Baseline Environment**

The Nyali area in Mombasa is a key landing point for six (6) existing subsea cable systems which connect East Africa to Europe and are crucial for supporting the growing digital economy in Mombasa and surrounding countries.

**Proposed Project Activities**

The installation of the Daraja Project will lead to better digital connectivity and other indirect benefits in the operational phase.

***Pre-Installation, Installation and BMH MBA Construction Phase***

- None

***Operational Phase***

- Operation and repair activities for the subsea cable.

**Mitigation Measures**

As no negative impacts are expected, no mitigation measures for the installation and operations phase are required.

**Significance of Impact**

The Daraja Project will lead to an improvement in the reliability and accessibility of internet connectivity to the Daraja Project AOI during the operational phase. Impacts are anticipated to result in long-term potential positive impacts of a Medium magnitude and the receptor sensitivity is Low. Therefore, there will be **Minor** positive significance at the local and regional levels.

TABLE 10-32 SUMMARY OF IMPACT ASSESSMENT OF BENEFITS FROM DIGITAL CONNECTIVITY

| **Type of Impact** | | |
|---|---|---|
| Direct (Digital connectivity), Positive Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Large | The extent of this potential positive impact will be large because digital connectivity will be improved in and beyond the Daraja Project AOI. |
| Duration | Permanent | This potential impact will be permanent and will take effect when the Daraja Project goes live in 2026. |
| Scale | Large Scale | The scale of the potential impact is large, with significant improvements to daily life, businesses and educational institutions, indirectly contributing to economic growth. |
| Frequency | Permanent | Internet accessibility and reliability will improve permanently once the Daraja Project goes live in 2026. |
| Likelihood | Very Likely | Internet accessibility and reliability will improve once the Daraja Project goes live in 2026. |
| **Magnitude** | | |
| The magnitude of digital connectivity impacts is considered Medium due to the extensive area affected and the indirect long-term economic benefits. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Minor** | | |

## 10.3.8 IMPACTS ON COMMUNITY HEALTH AND SAFETY

### 10.3.8.1 DESCRIPTION OF BASELINE ENVIRONMENT

The healthcare system in Nyali and the wider Mombasa region is relatively developed compared to other counties in Kenya and continues to improve through coordinated efforts by National and county governments.

Mombasa County, in collaboration with the Ministry of Health, is working to digitise healthcare services and enhance community-based health initiatives. A substantial KES 4.75 billion

(approximately USD 36.8 million) from the county budget has been dedicated to health sector development.

This includes building new facilities like the Kongowea Level 4 Hospital, upgrading existing ones such as Likoni Sub-county Hospital, and expanding mental health services.

#### 10.3.8.2 PROPOSED PROJECT ACTIVITIES

The presence of the Daraja Project could affect the H&S and security of the communities in the Daraja Project AOI as a result of worker-community interactions, community-security interactions, including the risk of accidents and injuries associated with construction / installation activities.

**Pre-Installation, Installation and BMH MBA Construction Phase**

- Subsea cable installation in shallow water.
- Construction of BMH MBA.

**Operational Phase**

- Operation and repair activities for the subsea cable.

#### 10.3.8.3 MITIGATION MEASURES

- Regular vehicle movements to and from site are not expected as no spoil should need to be removed and the subsea cable will be delivered to site by the vessel. (Only exception is if the BMH MBA is constructed on site then concrete deliveries would be required).
- Access to the construction / installation area shall be controlled through measures such as temporary fencing and signage.
- Controlled access to the work area for public safety during shore crossing installation activities, but no beach closures. Access will be controlled through a number of measures, including red tape, temporary fencing, signage, and advisory staff.
- All Daraja Project Kenyan workers should be registered with DOSHS.
- The local BMH contractors is required to have a DOSHS Registration in Mombasa.
- Terrestrial contractor personnel shall be briefed prior to installation activities on the sociocultural norms and sensitivities of the neighbouring communities in order to increase sensitivity to local norms and customs and to provide awareness of appropriate and acceptable behaviours and govern worker interactions with the local communities.
- A grievance mechanism shall be developed and implemented.
- Except for areas secured by fencing or shoring, all active installation areas shall be demarcated with high-visibility tape to reduce the risk of accidents involving pedestrians and vehicles.
- All open trenches and excavated areas shall be shored and backfilled as soon as possible after the installation has been completed.
- Access to open trenches and excavated areas shall be secured to prevent pedestrians or vehicles from falling in.
- Maintain adequate emergency response procedures and first aid resources to minimise the impacts of incidents.

- NtMs will be issued to warn vessels of the buffer around the installation vessels to avoid interaction with the cable being laid.
- Use of banks man to watch for pedestrians if machinery is moving around or to and from site.

#### 10.3.8.4 SIGNIFICANCE OF IMPACT

Construction / installation of the BMH MBA on Nyali Beach and the subsea cable landing both have the potential for interactions with the local community, and therefore potential impacts on community H&S. Use of construction equipment (e.g. an excavator for trenching and subsea cable pulling) represents a potential safety hazard for beachgoers in the vicinity of work. Therefore sensitivity of receptor is Medium.

Construction / installation of the BMH MBA on Nyali Beach and the subsea cable landing will be completed by trained local personnel. All Kenyan works need to be registered with DOSHS and subtractors registered with DOSHS to ensure compliance with Kenyan H&S legislation. Potential impacts to H&S could be irreversible if they occur.

When machinery is moving to or from the site or excavators are moving around within the site, personnel will be used to keep a watch that no pedestrians are at risk.

There is some risk of disease transmission associated with the presence of national and international workers; however, the small number of staff and short duration of work limit the Small magnitude of this potential impact.

Any fishing, recreation or tourist vessel could interact with the subsea cable as it is being laid from the rear of a vessel. Resulting in damage to subsea cable, the vessel or capsizing of the vessel. Potential impacts to H&S could be irreversible if they occur.

With mitigation measures, the significance of the potential impact is therefore assessed as **Minor**.

TABLE 10-33 SUMMARY OF COMMUNITY HEALTH AND SAFETY

| **Type of Impact** | | |
|---|---|---|
| Direct (Community H&S), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Small | The extent of community H&S risk is small given that the area is localised. |
| Duration | Short-term | Community H&S associated with the Daraja Project will last for the duration of construction / installation, which is projected to be 21 days on the beach and 40 days at sea. |
| Scale | Small Scale | The scale of impact is small given that the area is localised. |
| Frequency | Short term | Workers will only be required for the duration of construction / installation of the BMH MBA. Once the Daraja Project is operational, it is not anticipated that any further works will be required on Nyali Beach. |
| Likelihood | Likely | Potential impacts on community H&S may occur during the construction / installation phase. |
| **Magnitude** | | |
| Small magnitude given the limited staff and short duration of work. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |

| Medium Sensitivity |
| --- |
| The community on Nyali Beach is moderately sensitive as a receptor given that the use of construction equipment (e.g. an excavator for trenching and subsea cable pulling) may pose a potential safety hazard for beachgoers in the vicinity of work, and that there is some risk of disease transmission associated with the presence of national and international workers. |
| **Significance (Post-Mitigation)** |
| **Minor** |

## 10.3.9 IMPACTS ON CULTURAL HERITAGE

### 10.3.9.1 DESCRIPTION OF BASELINE ENVIRONMENT

Mombasa is historically significant as a centre of Arab trade in ivory and slaves which dates back from the sixteen to eighteenth century. There are some historical buildings which were previously utilised for trade such as the Fort Jesus, the Old Town and Jumba la Mtwana, these are in central Mombasa and are not visible from the Daraja Project footprint.

The NMK has located more than 30 shipwrecks in the Indian Ocean, some dating to 500 years ago. All shipwrecks found underwater have been declared properties of the Kenyan government. The shipwrecks are protected as underwater museums to be preserved for future generations.

### 10.3.9.2 PROPOSED PROJECT ACTIVITIES

The proposed activities associated with the installation of the subsea cable have the potential to result in negative impacts to both terrestrial and submarine cultural heritage.

**Pre-Installation, Installation and BMH MBA Construction Phase**

- Subsea cable installation in shallow water and deep water.
- Construction of the BMH MBA.

**Operational Phase**

- Operation and repair activities for the subsea cable.

### 10.3.9.3 MITIGATION MEASURES

- A cable route survey has been carried out to identify and avoid marine cultural heritage during route planning.
- In the event that an unknown or unrecorded shipwreck is encountered during the installation of the subsea cable, the NMK must be notified immediately. If the wreck will be impacted by the subsea cable laying, all work must cease until the NMK has assessed the significance of the site and a decision has been taken as to how to deal with it.

### 10.3.9.4 SIGNIFICANCE OF IMPACT

As a CRS has been completed on either side of the proposed route unknown or unrecorded shipwrecks are not expected.

The impacts to terrestrial cultural heritage during construction / installation and operation will have a direct, negative impact. The duration will be permanent as it relates to the loss of pre-colonial and colonial archaeology. The risk to such archaeological sites and material posed by the subsea cable route arises from their physical disturbance, damage and possible destruction

during the excavation of the terrestrial cable trench. The extent of the impact will be local, limited to the Daraja Project footprint. The magnitude of the potential impact will be Small, and the impact significance will be Moderate.

The impact on submarine archaeology and palaeontology can be classified as direct and negative. The extent will be localised, and the duration will be short-term, for the duration of subsea cable laying activities. The magnitude of the impact is Small, and the sensitivity is Low considering the lack of known heritage resources along the subsea cable route. The significance of this potential impact and residual impact is assessed as **Not Significant**.

TABLE 10-34 SUMMARY OF IMPACT ASSESSMENT OF CULTURAL HERITAGE

| **Type of Impact** | | |
|---|---|---|
| Direct (Cultural heritage), Negative Impact | | |
| **Rating of Impacts** | | |
| **Characteristic** | **Designation** | **Summary of Reasoning** |
| Extent | Small | The extent of the Daraja Project's potential impact on cultural heritage is local as installation works will be limited to Nyali Beach and the marine cable route. |
| Duration | Short-term | This potential impact will last for the duration of construction / installation of the subsea cable and BMH MBA. |
| Scale | Small | The scale of potential impact is small given the limited area and short works duration. |
| Frequency | Short term | Cultural heritage will only be potentially affected during construction / installation of the BMH MBA. Once the Daraja Project is operational, it is not anticipated that any works will be required on Nyali Beach. |
| Likelihood | Unlikely | The impact to cultural heritage is highly unlikely because excavations will be shallow and there are no known artifacts on Nyali beach. |
| **Magnitude** | | |
| The magnitude of cultural heritage impacts is considered Small due to the size of area directly affected. | | |
| **Sensitivity/Vulnerability/Importance of the Resource/Receptor** | | |
| **Low Sensitivity** | | |
| **Significance (Post-Mitigation)** | | |
| **Not Significant** | | |

## 10.4 UNPLANNED EVENTS

The implementation of the Daraja Project activities could result in potential impacts from accidents or unplanned events which are discussed below. The likelihood (probability) of each event occurring is discussed for each case, and the impact of an unplanned event is therefore evaluated in terms of risk, which includes both consequence of the event and the probability of occurrence, and significance of the impact.

### 10.4.1 VESSEL STRIKES

The operation of installation vessels poses a collision risk for marine mammals and marine turtles because they are surface-breathing organisms. Slow moving whales are particularly vulnerable; however small cetaceans and marine turtles can also be impacted. The nearshore waters within and adjacent to the Daraja Project AOI are frequented by humpback whales, blue whales, green sea turtle, and Hawksbill sea turtle for breeding and nesting.

During the installation phase of the Daraja Project the main installation vessel will be towing a plough at a speed of approximately 0.5 knots which means there is little risk of vessel strike injury or mortality to marine mammals or marine turtles during subsea cable installation and operation and repair phases. Collisions are therefore unlikely to occur and not known of in the industry. Therefore, the potential impact from vessel strikes is of Small magnitude and Medium sensitivity, therefore is assessed to be of **Minor** significance.

### 10.4.2 ENTANGLEMENT OF FAUNA IN THE SUBSEA CABLE

The PLGR will remove debris from the seabed reducing the risk to marine fauna and is of Minor positive significance.

Entanglements are highly unlikely to occur during the installation or operation of the cable. There have been no recorded entanglement incidents during subsea telecommunication cable installation since the 1950s; this is largely due to modern installation practices (to which the project and installation will adhere to) and the slow movement of the vessel (Wood and Carter, 2008).

As the presence of the subsea cable on the seabed results in some potential for interaction with other sea users (e.g. entanglement with fishing gear, anchors or other equipment used in sea-bottom activities) the subsea cable will be buried below the seabed in up to 1,000 m water depth, wherever seabed conditions allow. Where the subsea cable is buried it removes any risk of fauna entanglement.

Due to the inbuilt mitigation, the risk of entanglement is of Negligible magnitude and Medium sensitivity, therefore is assessed to be of **Not Significant**.

### 10.4.3 HYDROCARBON, CHEMICALS, OTHER LIQUID WASTE

The use of vessels and equipment during the installation and operation and repair phases of the Daraja Project could lead to the accidental discharge of potential pollutants such as chemicals, hydraulic liquids and hydrocarbons to the environment on land and at sea. The release of such pollutants could occur from a variety of scenarios; however, equipment failure would be the most likely cause of such an event. Many of the compounds in petroleum products have been known to smother organisms, lower fertility and cause disease in aquatic organisms (National Research Council, 2003). Hydrocarbons are incorporated into sediments through attachment to fine-grained particles, sinking and deposition in low turbulence areas. Due to differential uptake and elimination rates, filter-feeders, particularly mussels, can bio-accumulate organic (hydrocarbons) contaminants (Birkeland et al., 1976).

Equipment failure and accidental release cannot be completely avoided on land or at sea, and the removal of these chemicals from vessels or land-based equipment during the construction of the BMH MBA is not an option due to the operating requirements of the vessels and equipment. Open deck drainage onboard vessels are an essential safety feature, therefore a spill is considered unlikely to occur, but spills are known of in the industry.

In the unlikely event of onshore spills at the BMH MBA during both construction / installation, the impact will be minimised by using drip trays and spill kits to contain any spills. All spills of fuels, oils or other hazardous substances shall be immediately cleaned up and measures taken to remediate the spill. Additionally, the necessary tools and materials, including absorbent material, shovels and bags will be readily available at the BMH MBA construction site to immediately clean up spills or drips. Any waste material resulting from cleaning up spills or

leaks will be contained in sealed bags and removed by a certified waste contractor for appropriate disposal based on the nature of the material.

Due to the relatively small size of the Daraja Project and its operations, it is anticipated that any impacts from potential hydrocarbon or chemical spillage would be low, temporary, and localised.

An Emergency Spill Response Plan will be implemented by the installation contractors to minimise the risks of contamination of the marine and onshore environment. The plan will note that all vessels associated with subsea cable installation will comply with MARPOL 73/78 regulations. Additionally, safety measures outlined in the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 and MARPOL 73/78 will be adopted by Daraja Project vessels, as relevant to their size and class, to serve as an inherent mitigation measure to reduce the risk of discharges to the marine environment and address safeguards such as emergency responses to spill events. The plan will also note the immediate clean-up of spills onshore and all fuel storage facilities will be bunded to contain spills.

The implementation of these management measures and the fact that the potential impacts associated with the discharge of hydrocarbons and chemicals would be low implies that the risk of a spill is considered to be ALARP.

Potential hydrocarbon, chemical and other liquid spills and pollution during installation of the subsea cable and associated terrestrial infrastructure are deemed of Medium magnitude within the immediate vicinity of the onshore installation area on Nyali Beach or on the vessel, with impacts persisting over the short- to long-term. Impacts of pollution and accidental spills would be direct, indirect and cumulative.

With the adequate mitigations in place, the sensitivity of the impact is Low, therefore significance of pollution and accidental hydrocarbon, chemical and other liquid spills during the installation activities is assessed to be of **Minor**.

### 10.4.4 EXISTING BELOW GROUND INFRASTRUCTURE

As part of the CRS existing sewage, power and water infrastructure was mapped and where required the route was amended to avoid this infrastructure. Before breaking ground, a check will be made that no new infrastructure has been installed.

If new infrastructure is identified the asset owner would be contacted to confirm the attributes of the asset and the route slightly amended to avoid it.

Given the above, the sensitivity of the impact is Low, and magnitude of Small, therefore significance of impact on existing below ground infrastructure is assessed to be of **Not Significant**.

### 10.4.5 OCCUPATIONAL HEALTH AND SAFETY RISKS

Activities associated with the installation phase of the Daraja Project such as subsea cable laying operations offshore and construction of the BMH MBA at Nyali Beach, could have potential impacts on human H&S as a result of accidents and unplanned events. The greatest risks are typically associated with specialised equipment on the vessel and man overboard risks. All personnel would be required to have the appropriate trainings (including first aid training), certificates, and health screenings to safely work in the offshore and onshore environments, as required. Daily operation tasks would also be carefully planned and

monitored, and the appropriate health and safety regulations would be implemented and maintained for the entire duration of the installation / construction phase.

Installation activities would also require divers to install the nearshore subsea cable which would pose additional safety risks. All divers will be adequately trained with approved diving qualifications and a valid certificate documenting their medical fitness to dive. All diving activities will be carried out in accordance with proper safety protocols and will be closely supervised by qualified individuals. The risk of injury occurring during diving is unlikely but known of in the industry.

The magnitude of the potential impact could range from Large (one or more lost-work injuries, including permanently disabling injuries) to Negligible (minor injury). With mitigations in place, the overall sensitivity is Low, therefore the overall significance of the impact of the Daraja Project's installation / construction and operation and repair activities on occupational H&S is assessed to range from **Moderate to Not Significant** depending on the outcome of the incident.

## 10.5 CUMULATIVE IMPACTS

A cumulative impact is one that arises as a result of a potential impact from the Daraja Project interacting with an impact from another activity to create an additional impact (ERM, 2013).

How the potential impacts and effects are assessed is strongly influenced by the status of the other activities (i.e. already in existence, approved or proposed) and how much data is available to characterise the magnitude of their impacts. Activities already in existence, such as installed offshore cables or existing onshore developments, are considered as part of the existing baseline and do not form part of the cumulative assessment.

At the time of reporting, there are no known offshore projects to be constructed / installed at the same time as the Daraja Project. There is an unknown structure to the right of the BMH MBA location currently under construction, further detail of its cumulative impact with the Daraja Project can be found in **Section 10.5.2.3**.

### 10.5.1 IDENTIFICATION AND SCREENING OF POTENTIAL CUMULATIVE IMPACTS

The potential for cumulative environmental and social interactions caused by the Daraja Project in combination with other relevant activities were identified as:

- GHG emissions from the Daraja Project vessels operating offshore and construction vehicles operating onshore and their contribution to climate change in combination with other vessels and industries in the region;
- Noise/disturbance from Daraja Project vessels operating offshore and installation activities onshore and the cumulative potential for increased disturbance to either social or environmental receptors;
- Construction of an unknown structure to the right of the BMH MBA leading to cumulative impacts to land use; and
- Physical presence of the subsea cable offshore and terrestrial infrastructure onshore leading to cumulative impacts to access; either due to restrictions on fishing or access to land.

### 10.5.2 EVALUATION OF POTENTIAL CUMULATIVE IMPACTS

Planned and reasonably foreseeable future developments with the potential to result in cumulative impacts due to spatial and temporal overlap with the Daraja Project activities include both marine and onshore developments. No other offshore developments in the foreseeable future which would result in potential cumulative impacts with installation and operation of the subsea cable have been identified. The interaction of the subsea cable installation with existing (i.e. baseline) fishing and shipping activity offshore is already considered as part of the impact assessment.

The onshore installation / construction will be short term. There is currently one (1) unknown terrestrial structure in the Daraja Project AOI that may result in cumulative impacts with the installation / construction of the BMH MBA.

The potential cumulative impacts likely to arise from the Daraja Project in combination with the above-mentioned developments and activities are described below.

#### 10.5.2.1 GREEN HOUSE GAS EMISSIONS

The GHG emissions from Daraja Project activities during installation will contribute to the total GHG emissions by offshore and onshore development activities in Kenya, which may have an impact on climate change. However, the potential impact is not expected to be significant. The addition of the Daraja Project activities' GHG emissions to the cumulative levels of GHG in the Daraja Project AOI will be **Not Significant.**

#### 10.5.2.2 NOISE AND DISTURBANCE

Noise and disturbance from both offshore and onshore installation / construction activities will be short term and low level. No planned activities or developments have been identified which would lead to cumulative noise or disturbance impacts beyond those assessed in the Impact Assessment. The addition of the Daraja Project activities to the cumulative levels of noise in the Daraja Project AOI will be **Not Significant.**

#### 10.5.2.3 UNKNOWN STRUCTURE CONSTRUCTION

There is an unknown structure to the right of the proposed BMH MBA location which appeared to be under construction. The subsea cable route does not transect this structure to access the BMH MBA. Additionally, the access road to the beach will be kept open for pedestrians during installation. Given the short construction duration of the BMH MBA and no activities required during the operation of the subsea cable, the cumulative impact in the Daraja Project AOI will be **Not Significant.**

#### 10.5.2.4 PHYSICAL PRESENCE

The subsea cable will be buried as far as possible in the TS therefore there is no potential for cumulative impacts with other developments offshore due to physical presence of the subsea cable. The BMH MBA will be constructed in a small area on Nyali Beach and once completed it will be underground, therefore there will be no overground land use up-take. Given the small physical footprint of the BMH MBA, the addition of Daraja Project activities to the cumulative physical footprint in the Daraja Project AOI will be of **Not Significant.**

### 10.5.3 OPTIONS FOR CUMULATIVE IMPACTS

Proposed mitigation measures for the subsea installation activities as identified in the impact assessment above are adequate to mitigate any potential cumulative impacts from adjacent and overlapping activities. No further mitigation measures are proposed.

## 10.6 SUMMARY OF IMPACT ASSESSMENT

The following sections present a summary of the Impact Assessment conducted. **Table 10-35** presents the assessed potential impacts from planned activities and unplanned events (excluding those which have been scoped out).

TABLE 10-35 IMPACT ASSESSMENT SUMMARY

| Receptor | Significance of Potential Impact (Post-mitigation) |
|---|---|
| Physical Environment (Planned Events) | |
| River flooding | **Not Significant (Negative)** |
| Tsunami | **Not Significant (Negative)** |
| Extreme heat | **Minor (Negative)** |
| Earthquake | **Not Significant (Negative)** |
| Coastal flooding / sea level rise | **Not Significant (Negative)** |
| Benthic Profile | **Not Significant (Negative)** |
| Marine physical processes (currents, tides and tidal streams) | **Not Significant (Negative)** |
| Water quality | **Minor (Negative)** |
| Beach erosion and scour | **Minor (Negative)** |
| Biological Environment (Planned Events) | |
| Coral reefs | **Minor (Negative)** |
| Seagrass | **Minor (Negative)** |
| Soft-bottom substrate | **Not Significant (Negative)** |
| Sandy beaches | **Minor (Negative)** |
| Coastal vegetation | **Not Significant (Negative)** |
| Benthic fauna | **Not Significant (Negative)** |
| Bony fish and elasmobranch | **Not Significant (Negative)** |
| Marine mammals | **Minor (Negative)** |
| Marine turtles | **Minor (Negative)** |
| Socio-economic (Planned Events) | |
| Land use | **Minor (Negative)** |
| Economy and employment | **Minor (Positive)** |
| Tourism and recreation | **Not Significant (Negative)** |

| Receptor | Significance of Potential Impact (Post-mitigation) |
|---|---|
| Fisheries | **Minor (Negative)** |
| Shipping and navigation | **Minor (Negative)** |
| Existing submarine cable infrastructure | **Minor (Negative)** |
| Benefits from digital connectivity | **Minor (Positive)** |
| Community H&S | **Not Significant (Negative)** |
| Cultural heritage | **Not Significant (Negative)** |
| Unplanned Events | |
| Vessel strikes | **Minor (Negative)** |
| Entanglement of fauna in the subsea cable | **Not Significant (Negative)** |
| Hydrocarbon, chemicals, other liquid waste | **Minor (Negative)** |
| Existing below ground infrastructure | **Not Significant (Negative)** |
| Occupational H&S risks | **Moderate to Not Significant (Negative)** |
| Cumulative | |
| GHG emissions | **Not Significant (Negative)** |
| Noise and disturbance | **Not Significant (Negative)** |
| Unknown structure construction | **Not Significant (Negative)** |
| Physical presence | **Not Significant (Negative)** |

# 11. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This Chapter presents the framework Environmental and Social Management Plan (ESMP) for the Daraja Project. The ESMP provides a description of how the mitigation measures will be incorporated into the project design and subsequently implemented throughout the duration of the subsea cable installation (including pre-installation), operation and repair phases. The assessment has shown that if the recommended control measures and additional mitigation measures are implemented, no impacts are predicted to occur as a result of the Daraja Project which would be of any more than Minor significance, with the majority of potential impacts from the Daraja Project assessed as being Not Significant.

The framework outlined in this ESMP (Action Plan) identifies actions required, assigns responsibilities and sets timings for completion. The plan will be incorporated into the overall environmental and social management of the Daraja Project and the relevant requirements into the corresponding contract agreements (e.g. with vessel contractors). The ESMP will act as a "live" document to track progress through to completion of the installation activities. The ESMP also provides a mechanism for monitoring environmental performance and instigating follow-up action as required. The mitigation measures and the parties responsible for their implementation are summarised below and presented in **Table 11-1**.

This framework ESMP is designed to serve as the connection between the mitigation and management measures identified in this ESIA Report and the execution of the installation activities with the following main objectives:

- Providing the mechanism for compliance with the Project Proponent's Health, Safety, and Environment (HSE) policies, management system and procedures, and international law and standards; providing the mechanism so that all proposed mitigation measures identified for potentially adverse impacts are implemented;
- Providing a framework for mitigating impacts that may be unforeseen or unidentified;
- Evaluating effectiveness of mitigation measures and, if required, modify them or include new mitigation/preventive measures;
- Establishing a monitoring programme and record-keeping protocols;
- Ensuring that health, safety, social and environmental issues are integrated into the business risk management and decision-making process;
- Rationalising and streamlining health, social and environmental activities throughout the lifetime of the project to add value and efficiency;
- Encouraging and achieving the highest environmental performance and response from all employees and contractors;
- Providing the standards for overall planning, operation and review; and
- Enabling management to establish environmental priorities.

## 11.1 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN COMMITMENTS REGISTER

This section details the specific management commitments to be implemented to prevent, minimise or manage significant negative impacts and optimise and maximise any potential benefits of the Daraja Project. These commitments are presented for the two (2) main project phases; Pre-installation and Installation, and Operation and Repair. Mitigation measures

associated with the eventual decommissioning of the subsea cable will be assessed closer to the time under a separate process, given that the timing and method of decommissioning are unlikely to be known for a number of years (25+).

This framework ESMP Commitments Register (**Table 11-1**) provides cross-referencing to the Daraja Project aspects and potential impacts in the ESIA Report, as well as setting out the timing, frequency and duration of the mitigation measures. The framework ESMP Commitments Register includes mitigation measures aimed at addressing potentially negative impacts as well as those aimed at preventing them from occurring, such as in the case of an emergency event. An estimated cost has been provided per aspect item for reference, inclusive for both the embedded and additional mitigation measures. These costs will continue to be refined closer to the time of implementing the Daraja Project.

**Table 11-1** is structured as follows:

- Project Phase;
- Aspects;
- Embedded Measures;
- Additional Mitigation;
- Responsibility;
- Timing, Frequency and Duration; and
- Estimated Cost (USD).

## TABLE 11-1 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN COMMITMENTS REGISTER

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| A) Pre-Installation Phase | General | • Notify relevant authorities of location and timing of the Daraja Project activities prior to commencement.<br>• Notify the public of location and timing of installation and of alternative beach access points if necessary.<br>• Relevant environmental authorisations and the approved ESMP should be made available onboard the installation vessel(s) and at the BMH MBA site.<br>• The environmental authorisations and the ESMP should be referenced within the contractor's contract and a copy of the document provided to contractors prior to installation works. | • None | Safaricom Plc and installation contractor(s) | Prior to commencement of installation and throughout installation activities | $ 500.00 |
| | Coastal zone / Nearshore, Offshore / seabed / habitats | • Use the results of the CRS to avoid sensitive benthic habitats along the route, as far as reasonably practicable. | • Plan the installation activities required for the subsea cable installation activities to occur concurrently as far as reasonably practicable, in order to minimise the disturbance duration in the coastal and nearshore zone. | Installation contractor(s) and vessel operator | Prior to marine installation | $ 1,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | Occupational and Community H&S | • A H&S policy will be applied throughout the Daraja Project and across all project contractors.<br>• Abide by all national occupational H&S regulations.<br>• Provision of suitable Personal Protective Equipment (PPE), training and safety checks. | • Appropriate notifications, signage and barriers in place prior to onshore works.<br>• Implementation of HSE procedures specific to the relevant tasks.<br>• Equipment repair according to manufacturers' schedule | Safaricom Plc and installation contractor(s) | Prior to commencement of installation | $ 1,000.00 |
| B1) Installation Phase<br>B2) Operations and Repair | General | • Compliance with EMCA 1999 (amended 2015), relating to environmental protection in Kenya.<br>• Contracted installation personnel to be aware of the Daraja Project's ESMP and to comply with legislation. | • None | Vessel operator / contractor(s) | Prior to installation | $ 300.00 |
| | Physical Environment: Climate Risk and Vulnerability (**Section 10.1.1**) | • Site selection avoids flood-prone zones.<br>• Emergency response planning are incorporated into the design.<br>• Cable burial and use of articulated pipes in vulnerable nearshore areas.<br>• Emergency preparedness protocols developed in coordination with local authorities, and Emergency response plans for rapid recovery. | • Contractors shall be required to use equipment and vehicles that are in good working order and are well maintained.<br>• Seismic risk assessments and consideration of natural hazards inform route optimisation. | Vessel operator / onshore contractor(s) | Prior to and throughout installation activity | $ 14,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | • Avoidance of high-risk coastal zones through route planning.<br>• Provision of shaded rest areas and hydration stations.<br>• Flexible subsea cable design and burial techniques to accommodate seabed shifts.<br>• Setback and elevation of coastal infrastructure.<br>• Corrosion-resistant materials used in construction.<br>• Closely monitor the fuel consumption and associated GHG / CO2 emissions as part of initiative to reduce emissions.<br>• Route and transit logistics are optimised using AI to reduce fuel usage.<br>• ASN's Marine Fleet Manager has obtained the Green Marine Europe Program label which is a commitment to improve environmental performance beyond European and International regulations.<br>• Long-term monitoring and adaptive design principles applied.<br>• Vessel(s) for the Daraja Project must operate in compliance with MARPOL 73/78 regarding limits on SO2 and NOx emissions, the prohibition of ozone depleting substances and limit on sulphur content of fuel. | | | | |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | Physical Environment: Oceanography (**Section 10.1.3**) | • Route selection avoids outcropping bedrock and sensitive features.<br>• Natural seabed dynamic processes are expected to restore sediment morphology.<br>• Low-impact plough burial techniques used.<br>• The route survey allows for selection of seabed that provides good conditions for burial using a sea plough.<br>• Sea-ploughs used for subsea cable burial have been optimised by the industry to limit physical impacts to a narrow trench, minimising sediment disturbance and resuspension of sediments.<br>• Avoidance of steep slopes and sensitive geomorphological features through advanced route planning.<br>• Surface laying in areas with coral-hard ground or shallow sand where burial is not feasible.<br>• Use of articulated pipe and seabed pinning in high-energy surf zones where burial is not possible.<br>• Schedule beach trenching at low tide to reduce sediment dispersion.<br>• Use diver-assisted methods (e.g. handheld jetting) in | • Hazardous waste and debris recovered from the seabed during the PLGR activities should be stored onboard the vessel until it can be disposed at a suitably equipped port. | Vessel operator / contractor(s) | • Prior and throughout installation activities<br>• Weekly inspections of vessel logs | $ 20,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | sensitive areas to minimize disturbance.<br>• Restrict use of airlifting and jetting sledge to areas with coarser sediments and sufficient depth.<br>• Use of low-impact sea plough that minimises vertical mixing of water layers.<br>• Avoidance of any identified sensitive thermocline zones where feasible.<br>• Vessel(s) for the Daraja Project shall be required to meet the requirements of MARPOL 73/78, which includes requirements to avoid and minimise the discharge of harmful substances to the marine environment.<br>• Develop and implement Offshore WMP. Waste management during the Daraja Project activities will comply with applicable Kenyan legislation and MARPOL 73/78.<br>• Ballast water managed per BWM Convention.<br>• Advanced route planning to avoid steep slopes and sensitive geomorphological features. | | | | |
| | Physical Environment: Geology and Physiography (**Section 10.1.4**) | • Use of DP systems by the PLSE barge and main-lay vessel to minimise seabed disturbance.<br>• Cable burial where feasible to reduce exposure and potential for geological disturbance.Avoidance of sensitive geological features | None | Onshore contractor(s) | Prior to installation and throughout installation activities | $ 1,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | (e.g. rocky outcrops, steep slopes) through route optimisation informed by CRS. | | | | |
| | Physical Environment: Beach Erosion and Scour (**Section 10.1.5**) | • Cable route planning avoids areas of high erosion risk and sensitive habitats.<br>• Use of articulated pipe and seabed clamps in surf zones to prevent lateral movement and scour.<br>• PLIB for cable stability and minimise subsea cable exposure.<br>• Burial of cable to maintain existing sediment dynamics.<br>• Beach restoration post-installation to original contours to maintain natural sediment dynamics.<br>• Monitoring and adaptive management during operation to detect and respond to erosion or scour risks.<br>• No sediments shall be removed from the beach (other than as excess waste material) or material sourced from locations away from the beach so that restoration is as natural as possible.<br>• Use the results of the CRS to avoid sensitive benthic habitats along the route, as far as reasonably practicable.<br>• The level of disturbance of the seabed is limited by the subsea cable installation techniques, | None | Onshore contractor(s) | Throughout installation activities | $ 15,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | including use of a cable plough to simultaneously trench and bury the subsea cable.<br>• The subsea cable ploughing technique and jetting shall ensure that disturbed sediments can infill the trench wherever possible.<br>• The subsea cable will be buried as far as possible to avoid changes in physical processes. | | | | |
| | Physical Environment: Seascape, Visual and Light Pollution (**Section 10.1.6**) | • The BMH MBA will be underground with an access port flush with ground level.<br>• Short period of time the vessels are present in Kenyan waters<br>• One of many vessels present as near the shipping lane for the port. | • Community members shall be adequately informed prior to the installation activities about the pending disruptions through an appropriate mechanism such as a resident's committee, local newspapers and/or signage.<br>• A designated member of project personnel shall be available during installation activities onshore to answer questions, receive and resolve grievances and monitor installation activities.<br>• The contractors shall maintain the site neat and orderly during installation onshore with due | Vessel operator / onshore contractor(s) | Throughout installation activities | $ 10,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | | regard to removal of waste and clean-up of litter. | | | |
| | Physical Environment: Air Quality (**Section 10.1.7**) | • Project vessels must operate in compliance with MARPOL 73/78 regarding limits on $SO_2$ and $NO_x$ emissions, the prohibition of ozone depleting substances and limit on sulphur content of fuel.<br>• Efficient, well-maintained engines and equipment on the beach.<br>• Closely monitor the fuel consumption and associated GHG / CO2 emissions as part of initiative to reduce emissions.<br>• Route and transit logistics are optimised using AI to reduce fuel usage.<br>• ASN's Marine Fleet Manager has obtained the Green Marine Europe Program label which is a commitment to improve environmental performance beyond European and International regulations. | • Good site practices and regular repair will be used to minimise dust and particulate emissions onshore from excavation spoil pits and avoid causing a nuisance to surrounding receptors.<br>• The deposition of mud and debris on local roads will be minimised by vehicle inspections. If mud and debris deposition is heavy on the wheels, the wheels should be brushed off.<br>• Contractors shall be required to use equipment and vehicles that are in good working order and are well maintained. | Vessel operator / onshore contractor(s) | Throughout installation activities | $ 10,000.00 |
| | Physical Environment: Ambient and Underwater | • Contractors shall use equipment that are in good working order and are well maintained.<br>• Standard vessel types with low noise profiles used. | Plan the subsea cable installation activities to occur concurrently as far as reasonably practicable, in order to | Vessel operator / onshore contractor(s) | Throughout installation activities | All of these activities are standard practice and the cost is part |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | Noise (**Section 10.1.8**) | • Route planning to avoid subsea cable spans and fix the subsea cable in high energy environments to prevent movement.<br>• Slow vessel speeds limit the level of underwater noise.<br>• Slow speed of the vessel (propeller turning speed) reduces the cavitation noise.<br>• Movement of vessels produces a non-impulsive or continuous sound which reduces risk of injury to marine fauna. | minimise the disturbance duration in the coastal and nearshore zone. | | | of the vessel costs. |
| | Biological Environment: Coastal / Nearshore Habitat (**Section 10.2.1**) | • Avoid large densities of coral and seagrass meadows where possible.<br>• Divers to supervise the lay of the subsea cable within the lagoon to minimise direct impact to coral in areas of reef which cannot be directly avoided.<br>• The subsea cable to be clamped in hard rock and coral areas.<br>• Lighting on the installation vessel will be minimised as far as reasonably practicable whilst ensuring compliance with the COLREGs Rule and general safe working practices.<br>• Restore beach to pre-construction / installation conditions to return habitat to pre-existing conditions.<br>• All vessel(s) of appropriate size and class will have a Ballast Water Management Plan and | • Prior to installation on site in the nearshore, determine the most effect subsea cable alignment within the MMNR.<br>• Plan the installation activities required for the subsea cable installation activities to occur concurrently as far as reasonably practicable, in order to minimise the disturbance duration in the coastal and nearshore zone.<br>• Nearshore subsea cable laying activities will be limited to daylight hours to limit impacts to | Onshore and vessel operator / contractor(s) | Prior and throughout installation | $ 13,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | adhere to the IMO Ballast Water Guidelines. All ballast movements will be recorded and ballast regulations in each country reviewed before discharging / renewing ballast water. Any ballast water renewal will be in deep mid-ocean water and as far away from the shore as possible outside of any TS boundaries. | nocturnal avian species and marine turtles that may be impacted by the presence of construction lights.<br>• Prior to the construction / installation on the beach and during the installation activities turtle monitoring and translocation in agreeance with KWS will be undertaken.<br>• Obtain a Marine Wayleave to work in the MMPR from KWS | | | |
| | Biological Environment: Marine Species Composition (**Section 10.2.2**) | • Select route on seabed that provides good conditions for burial of the subsea cable.<br>• Utilise sea-plough designed to minimise seabed disturbance.<br>• Project vessels will travel at slow speeds (between 0.5 and 4 knots), depending on the installation method.<br>• The cable-lay vessel and shore-end barge will be maintained according to the IMO Guidelines (2014) to reduce underwater noise.<br>• Propeller polishing done properly will remove marine fouling and vastly reduce surface roughness, helping to reduce propeller cavitation. | • Plan the installation activities required for the subsea cable installation activities to occur concurrently as far as reasonably practicable, in order to minimise the disturbance duration in the coastal and nearshore zone.<br>• Crew members stationed onboard the installation vessel shall be hazard spotters including marine mammals and turtles. | Onshore and vessel operator / contractor(s) | Throughout installation | $ 20,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | • Maintaining a smooth underwater hull surface and smooth paintwork may also improve a ship's energy efficiency by reducing the ship's resistance and propeller load.<br>• The installation vessels will be equipped with fixed pitch propellers with protection covers to avoid propeller strikes on marine fauna. | • Implement safety zones from sighted marine turtles or mammals will be implemented.<br>• Avoid offshore installation works during the megafauna migration season (August to October) at the Kenyan Coast (if possible). | | | |
| | Socio-Economic Environment: Land Use (**Section 10.3.2**) | • Access to the Nyali Beach area will be kept available to the greatest extent practicable<br>• A 2-week notice period will be provided to surrounding businesses, traders and hotels, alerting them to the planned duration and schedule of installation work. The local community and beach users should be informed of the planned installation activities through newspaper adverts, public notices or other similar means.<br>• Designated project personnel shall be available during installation activities at the landing site / BMH MBA to answer questions, receive and resolve grievances and monitor installation activities. | • Community members shall be adequately informed prior to the installation activities about any pending disruption through mechanisms such as a resident's committee, local newspapers and/or signage;<br>• Contractors shall maintain the site neat and orderly during installation onshore with due regard to removal of waste and clean-up of litter.<br>• The cable installation activities on the beach should be scheduled to avoid peak holiday periods | Onshore contractor(s) | Prior and throughout the project Installation | $ 4,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | | (i.e. annually between December to February and July to August), if possible.<br>• The Daraja Project will obtain Development Permissions, TOLs and Excavation Permits from Mombasa County for the proposed work. | | | |
| | Socio-Economic Environment: Economy and Employment (**Section 10.3.3**) | • Develop and implement the relevant management strategies and plans to comply with worker's rights in accordance with Kenyan law and international best practice. | None | Onshore contractor(s) | Prior to commencement of installation and throughout installation | All of these activities are standard practice and the cost is part of the company's operating costs |
| | Socio-Economic: Tourism and Recreation (**Section 10.3.4**) | • NtMs will be issued in advance of any project activities. | • Plan the subsea cable installation activities to occur concurrently as far as reasonably practicable, in order to minimise the disturbance duration in the coastal and nearshore zone.<br>• Relevant communications and project signage will be maintained on site at all times during works. | Onshore and vessel operator / contractor(s) | Prior to installation activities Weekly monitoring of vessel logs | $ 1,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | | • Notify stakeholders from the local community who use the affected areas recreationally to raise awareness of potential impacts including noise, dust, worker influx, and equipment blocking the landscape. | | | |
| | Socio-Economic Environment: Fisheries (**Section 10.3.5**) | • KMA should be given one (1) month notice ahead of all installation activities, so that formal maritime notifications can be published.<br>• Early engagement and communication should take place with local ports authorities, naval command, touristic boat companies and fishermen in the area (local BMUs), including discussion of avoidance, management and mitigation measures to limit impacts on local sea users.<br>• Engagement with the State Department of Fisheries should take place to further define avoidance and mitigation requirements as necessary.<br>• Vessel operators must adhere to International Maritime Law and safe practice guidelines, including those by UNCLOS, COLREGs Rule and International Convention for the Safety of Life | • As-laid information will be provided to the local and relevant Kenyan authorities.<br>• Each vessel for the Daraja Project will have an individual onboard who will be able to communicate with any fishing vessels or other navigators that are present in the vicinity of the proposed safety zone, ensuring that such vessels are able to alter their course in complete safety.<br>• During installation, the Daraja Project should avoid sensitive seabed features and schedule installation outside of critical | Vessel operator / contractor(s) | Prior and throughout the project Installation | $ 400.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | at Sea (SOLAS), and Kenyan regulations.<br>• NtMs and a navigational warning shall be issued to Mariners prior to installation giving notice of the proposed timeframes for subsea installation and an indication of the safety zone.<br>• Lighting on the installation vessel will be minimised as far as reasonably practicable whilst complying with COLREGs.<br>• The use of a sea plough and surface lay techniques will be used to minimise impacts to benthic habitats which support fish species. Within the lagoon installation will be undertaken by ROV and divers to allow careful positioning of the cable. Potential disruption to fishing activity in the lagoon from sediment dispersion will be for a short period only. | breeding and spawning periods as far as possible. The installation schedule should take into account the critical breeding and spawning periods from January to March and September to November, peaking in October, and minimise temporal overlap as far as possible.<br>• Work is only restricted around the installation in the MMNR to protect divers in the water. Normal fishing activity can occur outside the safety buffer zone. | | | |
| | Socio-Economic Environment: Shipping and Navigation (**Section 10.3.6**) | • KMA should be given one (1) month notice ahead of all installation activities, so that formal maritime notifications can be published.<br>• Early engagement and communication should take place with local ports authorities, naval command, touristic boat companies and fishermen in the area (local BMUs), including discussion of avoidance, management and | Plan the installation activities required for the subsea cable installation activities to occur concurrently as far as reasonably practicable, in order to minimise the disturbance duration in the coastal and nearshore zone. | Vessel operator / contractor(s) | • Prior to marine installation activities<br>• Weekly monitoring of vessel logs | $ 200.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | mitigation measures to limit impacts on local sea users.<br>• Engagement with the State Department of Fisheries will take place to further define avoidance and mitigation requirements as necessary.<br>• NtMs and a navigational warning will be issued to communicate the location of the installation safety zone, via the relevant Kenyan Authority. | | | | |
| | Socio-Economic Environment: Infrastructure (**Section 10.3.7**) | • Ploughing will not take place 500 m from the existing subsea cables.<br>• Notify in-service subsea cables asset owners prior to crossing. | None | Vessel operator / contractor(s) | During pre-installation and installation | $ 4,000.00 |
| | Socio-Economic Environment: Community Health and Safety (**Section 10.3.8**) | • Access to the landing site and BMH MBA shall be controlled through measures such as temporary fencing and signage.<br>• Controlled access to the work area for public safety during shore crossing installation activities, but no beach closures.<br>• Access will be controlled through a number of measures, including red tape, temporary fencing, signage, and advisory staff.<br>• All Kenyan works to be registered with DOSHS | • Terrestrial contractor personnel shall be briefed prior to installation activities on the sociocultural norms and sensitivities of the neighbouring communities in order to increase sensitivity to local norms and customs and to provide awareness of appropriate and acceptable behaviours and govern worker | Onshore and vessel operator / contractor(s) | Prior to commencement of installation and throughout installation | $ 9,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | • Local BMH contractors is required to have a DOSHS Registration in Mombasa<br>• NtMs will be issued to warn vessels of the buffer around the installation vessels to avoid interaction with the subsea cable being laid.<br>• Use of banks man to watch for pedestrians if machinery is moving around or to and from site. | interactions with the local communities.<br>• A grievance mechanism shall be developed and implemented.<br>• Except for areas secured by fencing or shoring, all active installation areas shall be demarcated with high-visibility tape to reduce the risk of accidents involving pedestrians and vehicles.<br>• All open trenches and excavated areas shall be shored and backfilled as soon as possible after the installation has been completed.<br>• Access to open trenches and excavated areas shall be secured to prevent pedestrians or vehicles from falling in.<br>• Maintain adequate emergency response procedures and first aid resources to minimise the impacts of incidents | | | |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | | • Regular vehicle movements to and from site are not expected as no spoil should need to be removed and the subsea cable will be delivered to site by the vessel. (Only exception is if the BMH MBA is constructed on site then concrete deliveries would be required) | | | |
| | Socio-Economic Environment: Cultural Heritage (**Section 10.3.9**) | • CRS identified cultural heritage features like shipwrecks, and the route was amended to provide sufficient buffer to protect these features. | • In the event that an unrecorded shipwreck is encountered during subsea cable installation offshore, or any heritage objects are identified, the NMK must be notified and a decision taken on how to avoid or minimise impacts.<br>• Beach installation activity must stop if any archaeological material is encountered, and the area must be cordoned off.<br>• A suitably qualified archaeologist must be engaged to assess | Onshore and vessel operator / contractor(s) | During pre-installation and installation | All of these activities are standard practice and the cost is part of the installation risk costs. |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | | the significance of any unexpected find in consultation with the NMK.<br>• Under no circumstances may any archaeological material be destroyed or removed from site unless under direction of the archaeologist and with approval from the relevant authorities. | | | |
| | Unplanned Events | • Appropriate waste containment facilities shall be included on the vessel and be managed to avoid overflow or accidental release to the environment.<br>• No waste materials shall be disposed of overboard; all non-biodegradable and hazardous wastes will be collected, stored, processed and disposed of in accordance with the vessel's Garbage/WMP as required under Regulation 9 of MARPOL 73/78 Annex V.<br>• Hazardous wastes shall be separated, labelled and retained in appropriately controlled storage areas.<br>• All recyclable and general wastes shall be collected in labelled, covered bins (and compacted where possible). | • Keep heavy vehicle traffic associated with installation in the coastal zone to a minimum.<br>• Restrict vehicles to clearly demarcated access routes and installation areas only.<br>• For equipment maintained in the field, oils and lubricants must be contained and correctly disposed of off-site.<br>• Maintain vehicles and equipment to ensure that no oils, diesel, fuel or hydraulic fluids are spilled. | Onshore and vessel operator / contractor(s) | • During pre-installation and installation<br>• Daily inspection onshore during installation by the onshore contractor<br>• When required offshore | $ 10,000.00 |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | • Modern, appropriately equipped installation vessel will be used which complies with relevant MARPOL 73/78 and IMO requirements for drainage systems, effluent treatment and materials storage.<br>• Measures to avoid collisions will be in place in accordance with COLREGs and good industry practice, including notifications, lighting and signage.<br>• Spill response equipment located on board.<br>• Oil spill response will be executed in accordance with the vessel's Shipboard Oil Pollution Emergency Plan (SOPEP), as specified under MARPOL 73/78.<br>• Access to the landing site and BMH BMA area shall be controlled through measures such as temporary fencing and signage.<br>• Appropriate PPE shall be provided to all workers. Training and awareness on the use of PPE shall also be carried out as part of induction for workforce.<br>• A H&S policy shall be applied throughout the project and across all project contractors.<br>• The contractors shall abide by all national occupational H&S regulations.<br>  ◦ All divers must be suitably qualified and experienced | • There is to be no vehicle repair or refuelling on the beach.<br>• All onshore vehicles and offshore vessels should have a spill kit to ensure that all accidental spills can be cleaned up accordingly.<br>• Compliance of contracted installation personnel with relevant legislation and the ESMP, pollution control measures and minimising installation impacts to the intertidal habitat and associated communities.<br>• An Emergency Response Plan will be implemented by the installation contractors to minimise the risks of contamination of the marine environment. The plan will note that all vessels associated with subsea cable installation will | | | |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | and adhere to ASN policy for safe diving, which includes:<br>◦ Reporting to and following the instructions of the Diving Supervisor.<br>◦ Holding original diving training and medical examination certificates which shall be valid for at least 3 months beyond the scheduled date of demobilisation.<br>◦ Informing the diving supervisor if there is any reason why they cannot dive.<br>◦ Checking the diving equipment is working correctly and is suitable for the planned dive.<br>◦ Confirming that they fully understand the dive plan, operating and emergency procedures (including rope/line signals), first aid arrangements, risk assessment and method of work and are competent to carry out the planned task.<br>◦ Report any medical problems or symptoms that they experience during or after the dive and any equipment faults, other potential hazards, near misses or accidents | comply with the COLREGs regulations, not least ensuring that control measures and Shipboard Oil Pollution Emergency Plans are in place on all relevant vessels (based on size and class) prior to the commencement of work.<br>• NtM will be issued in advance of offshore activity to make other sea users aware of the vessel and activities being undertaken.<br>• Non-emergency works onshore shall be limited to the daytime.<br>• Safety training focused on operational procedures, emergency procedures and safe working practices, information on specific hazards and first aid shall be provided.<br>• Appropriate notifications, signage | | | |

| Project Phase | Aspect | Embedded Measures | Additional Mitigation | Responsibility | Timing / Frequency / Duration of measure | Estimated Cost (USD) |
|---|---|---|---|---|---|---|
| | | ◦ Updating logbooks on regular basis and present it for signing by the diving supervisor. | and barriers during onshore works.<br>• Implementation of HSE procedures specific to the relevant tasks. Daily toolbox talks prior to commencement of installation activities shall be implemented.<br>• All personnel would be required to have the appropriate trainings (including first aid training), certificates, and health screenings to safely work in the offshore and onshore environment.<br>• Equipment repair according to manufacturers' schedule. | | | |

# 12. CONCLUSIONS AND RECOMMENDATIONS

## 12.1 CONCLUSIONS

The ESIA study of the Daraja Project Kenya has been conducted in accordance with the requirements of the of EMCA 1999 (amended 2015) and the EIA Regulations 2003 (amended 2022).

The ESIA study comprises a number of key steps, including: desktop review, scoping, baseline information gathering, stakeholder engagement and public consultation, potential impact identification and evaluation, development of mitigation measures and ESMP, and report writing and disclosure.

The ESIA study is aimed at allowing informed decision-making and environmental accountability, and to assist in achieving environmentally sound operation throughout the life cycle of the Daraja Project.

Consistent with the regulatory standards, the environmental status and the socio-economic aspects of the Daraja Project's AOI have been carefully assessed using universally accepted methodologies. The evaluation of potential impacts has identified both positive and negative interactions with the receiving physical, biological and socio-economic environment.

This ESIA Report has considered the effects of the Daraja Project on physical, biological and socio-economic receptors as identified in the baseline chapter (**Chapter 8**). Embedded measures have been incorporated into the Daraja Project's design to avoid and minimise potential impacts on these receptors, including the careful routing of the subsea cable to avoid or minimise interaction with sensitive receptors.

Generally, subsea cable installation activities result in temporary and localised effects. Once installed, the footprint of the subsea cable is very small (in comparison to pipelines, power cables or trawl dredges for example) and the operation of subsea cables does not have any significant ongoing environmental and / or social impacts. The ESIA Report has concluded that there is some potential for limited environmental impacts to sensitive habitats and fauna during installation, although appropriate mitigation has been proposed in order to minimise these impacts.

The assessment has concluded that with the mitigation measures in place (embedded or additional), the planned activities are predicted to only have negative residual impacts of **Minor Significance** post mitigation, with the remainder being assessed as **Not Significant**. For unplanned events the impacts have been reduced to a level that is **ALARP**.

## 12.2 RECOMMENDATIONS

The Project Proponent shall ensure that the Daraja Project is developed and operated in an environmentally sustainable manner by properly managing the processes / activities that may bring about disturbances to the environment through the implementation of the recommended mitigation measures and the ESMP.

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