

# **Technical Appendix 3.1: NBIA Scoping Report**

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**Bugesera Airport Company Limited**

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# **NEW BUGESERA INTERNATIONAL AIRPORT TERMS OF REFERENCE/SCOPING REPORT**

## NEW BUGESERA INTERNATIONAL AIRPORT TERMS OF REFERENCE/SCOPING REPORT

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### Appendix 1

New Bugesera International Airport Layout

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## ABBREVIATIONS

Abbreviation	Definition
AADT	Annual Average Daily Traffic
ACV	Airport Design Management: Airport Consulting Vienna
AEDT	Aviation Environmental Design Tool
AES	Audio encounter surveys
AOI	Area of Influence
AF	Associated Facility
AFC	Africa Finance Corporation
APU	Auxiliary power unit
BAC	Bugesera Airport Company Limited
BAT	Best available techniques
BTC Rwanda	Belgian Development Agency
CAPEX	Capital expenditure
CBD	Convention on Biological Diversity
CBO	Community-Based Organisation
CERC	Cambridge Environmental Research Consultants
CH <sub>4</sub>	Methane
CHSS	Community Health, Safety and Security
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
dB	Decibel
DEFRA	Department for Environment, Food and Rural Affairs
E&S	Environmental and Social
EDPRS	Economic Development Poverty Reduction Strategy
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EPC Contractor	Engineering, Procurement and Construction Contractor
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESSP	Energy Sector Strategic Plan
ETL	Electricity transmission lines
FAA	Federal Aviation Authority
FI	Financial Intermediary
GA	General Aviation
GDP	Gross Domestic Product

Abbreviation	Definition
GHGs	Greenhouse gases
GIIP	Good International Industry Practice
GIS	Geographic Information System
GOR	Government of Rwanda
GPS	Global Positioning System
GSE	Ground Service Equipment
H <sub>2</sub> S	Hydrogen sulphide
ha	Hectares
hrs	Hours
IATA	International Air Transport Association
IBA	Important Bird/Biodiversity Area
ICAA	International Civil Aviation Authority
ICAO	International Civil Aviation Organisation
ICOMOS	International Council on Monuments and Sites
IFC	International Finance Corporation
IFC PS	International Finance Corporation Performance Standards
ILS	Instrument Landing System
INMR	Institute of National Museum of Rwanda
ITCZ	Intertropical Convergence Zone
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
KfW	German Development Bank
kg	Kilogram(s)
KGL	Kigali International Airport
km	kilometres
LRP	Livelihood Restoration Plan
LTO	Landing and Take-Off
m	Meter(s)
m <sup>3</sup>	Cubic metres
MAP	Million annual passengers
masl	Metres above sea level
mbgl	Meters below ground level
MINIFRA	Ministry of Infrastructure
MINIRENA	Ministry of Natural Resources
Mota-Engil	Mota-Engil Engenharia e Construcao
MTOW	Maximum take-off weight
NBIA	New Bugesera International Airport
N <sub>2</sub> O	Nitrous oxide

<b>Abbreviation</b>	<b>Definition</b>
NEWPLAN	NEWPLAN Limited
NGO	Non-Governmental Organisation
NO <sub>x</sub>	Nitrogen oxides
NSGRP	National Strategy for Growth and Reduction of Poverty
OD	Operational Directive
PAPs	Project Affected Persons
PET	Polyethylene terephthalate
pH	Potential Hydrogen
PM <sub>10</sub> and PM <sub>2.5</sub>	Particulate matter
POP	Persistent Organic Pollutants
PPE	Protective Personal Equipment
PPP	public-private partnership
PPT	PowerPoint
PS	Performance Standard
PSDH	Project for Sustainable Development of Heathrow
Ramboll Environ	Ramboll Environ UK Limited
RAP	Resettlement Action Plan
RCAA	Rwanda Civil Aviation Authority
RDB	Rwanda Development Board
REMA	Rwanda Environment Management Authority
RESA	Runway End Safety Area
RFF	Rescue and Firefighting
RFFS	Rescue and Firefighting Services
RL	Red List of Threatened Species
RLMUA	Rwanda Land Management and Use Authority
RTDA	Rwanda Transport Development Agency
RURA	Rwanda Utilities Regulatory Authority
SEA	Strategic Environmental Assessment
SEP	Stakeholder Engagement Plan
SPIU	Single Project Implementation Unit
SO <sub>2</sub>	Sulphur dioxide
T	Time period
t	Tonne(s)
ToR	Terms of Reference
TRL	Technology readiness level
TSP	Total Suspended Particulates
UK	United Kingdom
US EDMS model	United States Emissions and Dispersion Modelling System

Abbreviation	Definition
USCS	Unified Soil Classification System
VES	Visual encounter surveys
VOCs	Volatile Organic Compounds
WHO	World Health Organisation

# 1. INTRODUCTION

## 1.1 Background

The Bugesera Airport Company Limited (BAC) is a joint venture between Mota-Engil Engenharia e Construcao (Mota-Engil) and the Government of Rwanda (GOR). BAC intends to develop a new international airport within the Bugesera District, in the Eastern Province of Rwanda, referred to as New Bugesera International Airport (NBIA, the "Proposed Project" or "the Project"). The decision to construct the airport was influenced by the fact that the existing Kigali International Airport is unable to support the air travel needs of Rwanda in the near future due to the rapid development within the country.

NBIA is to be situated within the Rilima and Juru Sectors of the Bugesera District in the Eastern Province of Rwanda as shown in Figure 1-1. These main sectors are comprised of a number of smaller cells (villages). The airport will be approximately 23 km southwest of the city of Kigali, along the Kicukoro-Nyamamata-Nemba KK-15 Road, which connects Rwanda to Burundi. The Proposed Project will replace the existing civilian passenger capacity at Kigali International Airport (KGL), which will remain operational for military purposes. The airport is proposed to be constructed in five phases, the first of which is due to be finalised by 2020 to allow the airport to become operational. The final phase is due to be completed in 2045. The Proposed Project will be financed by BAC as well as International Lenders.

The Proposed Project Area comprises approximately 2,500 ha, which was previously used largely for subsistence farming. A future extend of approximately 1,500 ha will be established following the construction of the airport which will include Special Economic Zones, an entertainment area and theme park. This study does not take cognisance of the environmental and social impacts associated with the Aerotropolis.

The Proposed Project includes the development, construction and operation of the following structures and infrastructure:

- Airport and associated structures and infrastructure;
- Temporary 5 km water pipeline for the construction phase; and
- 14.5 km Expressway to link the airport to the national KK-15 Road.

There will also be Associated Facilities<sup>1</sup>, which include an existing quarry to the northeast of the Proposed Project for the supply of aggregates, upgrades to the quarry road, and infrastructure for the permanent supply of power and water for the operation phase. The construction of these utilities will be the responsibility of the GOR and separate environmental and social impact assessments will need to be undertaken in accordance with the relevant legislative and regulatory standards.

## 1.2 Previous and Currently Proposed Environmental and Social Impact Assessment Work

In 2010, a draft Environmental and Social Impact Assessment (ESIA) report<sup>2</sup> (hereafter referred to as the 'Draft ESIA (2010)') and a draft Resettlement Action Plan (RAP)<sup>3</sup> were prepared in relation to a previously proposed project for the development of a new international airport on the same site. The Draft ESIA (2010) and RAP (2010) were prepared in line with Rwandan legislative and regulatory standards, with some consideration to the International Finance Corporation (IFC) Performance Standards 2006, and submitted to the relevant Rwandan

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<sup>1</sup> As per the IFC PS1, associated Facilities are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.

<sup>2</sup> GIBB Africa, 2010. Proposed New Bugesera International Airport (NBIA) for Ministry of Infrastructure (MININFRA) Government of Rwanda

<sup>3</sup> Draft Environmental and Social Impact Assessment, 2010 and the Draft Resettlement Action Plan (Volumes 1 and 2), 2010

statutory authorities at the time. The project did not, however, proceed as originally envisaged and the documents were not formally approved.

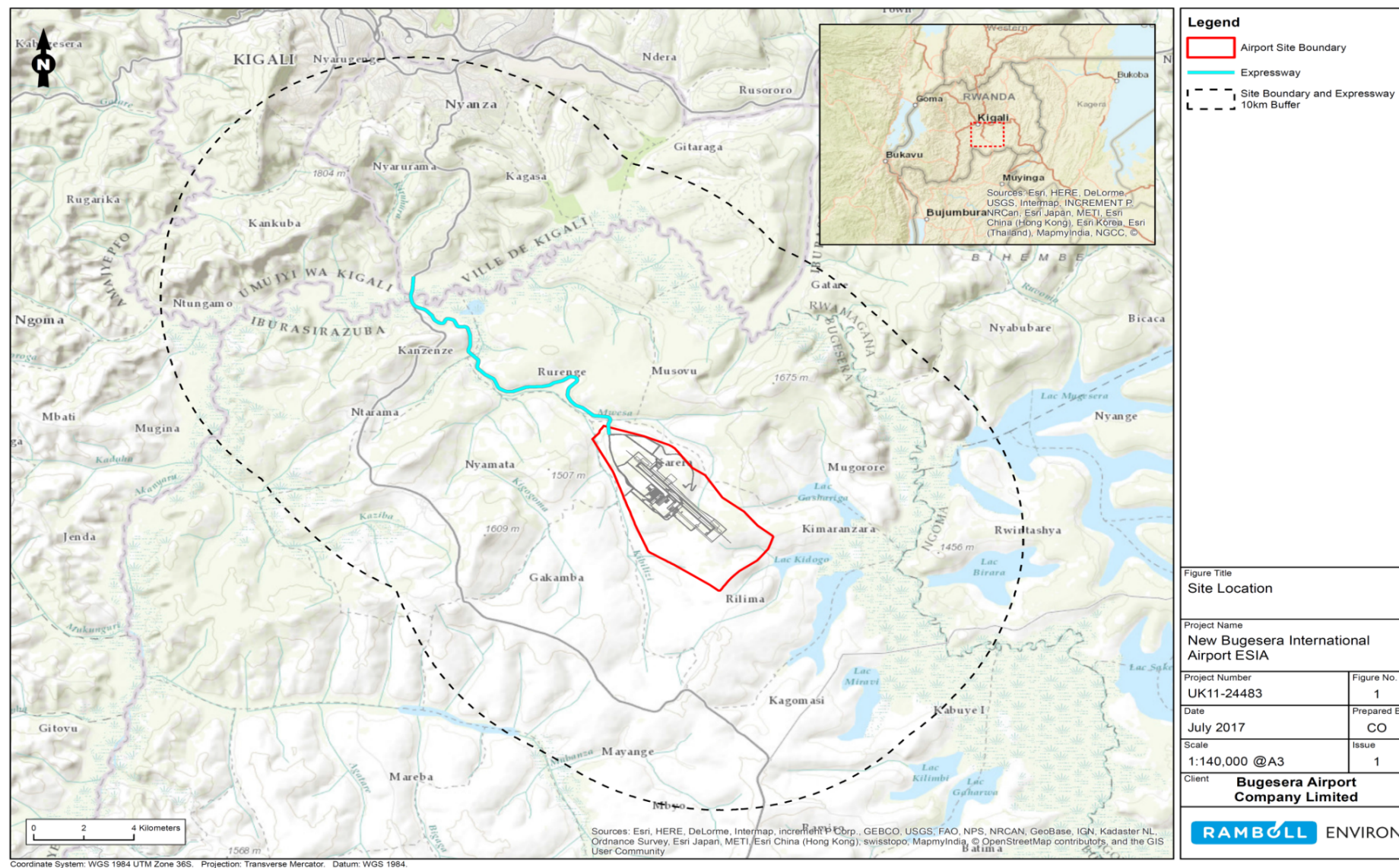


Figure 1-1: Site Location of the Proposed Project



In May 2017, Ramboll Environ UK Limited (Ramboll Environ) was commissioned to complete three tasks in relation to the revised Master Plan (Bugesera Greenfield Airport – Rwanda (Version 6), dated May 2017) for the currently Proposed Project. These tasks are as follows:

- **Task 1 – Gap Analysis, Environmental and Social Action Plan (ESAP) and Stakeholder Engagement Plan (SEP):** A Gap Analysis was to be undertaken of the Draft ESIA (2010) and RAP (2010) against Rwandan national legislative and regulatory standards and international financial institution standards and in light of amendments to the previously proposed project. Following on from the Gap Analysis, an ESAP was to be prepared setting out the actions and tasks that were required to meet national and international standards, and a Stakeholder Engagement Plan (SEP) was to be developed;
- **Task 2 – Baseline Surveys:** Baseline environmental and social surveys or studies were to be undertaken to fill identified gaps in the Draft ESIA (2010) and RAP (2010); and
- **Task 3 – Update Draft ESIA (2010) and RAP (2010):** The Draft ESIA (2010) and RAP (2010) were to be updated to cover the currently Proposed Project and ensure that these documents comply with national regulations and international standards.

During the Task 1 Gap Analysis, it was established that due to amendments made to the NBIA Master Plan, changes in the social and environmental baseline conditions due the lapse of time since the original survey work was undertaken in 2009/2010, and due to gaps in compliance with the new IFC Performance Standards 2012, the Draft ESIA (2010) and RAP (2010) could only serve as input to a new ESIA and RAP as part of a new application to the Rwandan environmental authorities and in fulfilment of International Lender standards.

### 1.3 Terms of Reference/Scoping Report

The Organic Law on Environmental Protection No. 04/2005 of 08/04/2005<sup>4</sup> (Section 3.3.3) requires that an Environmental Impact Assessment (EIA) must be conducted for major development projects, activities and programmes in the Republic of Rwanda. In addition, an ESIA (which goes further than an EIA and incorporates additional consideration of potential social impacts) is required to meet the IFC Performance Standards for a project of this nature. BAC has therefore committed to conducting an ESIA that will meet the requirements as detailed in Article 68 of the Organic Law as well as the IFC Performance Standards and other internal standards and conventions.

The Rwanda Environment Management Authority (REMA) is responsible for reviewing and approving EIAs/ESIAs (referred to as an ESIA in the remainder of this report) and associated documentation in relation to proposed projects. International Financial Institutions considering financing projects are responsible for establishing whether these documents meet the IFC Performance Standards.

As part of REMA's ESIA review process, an application setting out details with regard to a proposed project must be submitted. REMA then typically issues Terms of Reference (ToR) for the ESIA. Alternatively, a project sponsor or developer has the option to submit proposed ToR for the ESIA to REMA for their consideration. This document represents the proposed ToR for the NBIA ESIA that has been prepared for review and approval by REMA.

ToR are referred to as the Scope of an ESIA by International Financial Institutions and a Scoping Report is typically prepared to set out this scope. For the purposes of this report, the term Scoping Report has been adopted throughout the remainder of this document. The Scoping Report will be submitted to the potential International Lender Group, once identified, for their review and comment.

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<sup>4</sup> Republic of Rwanda, 2005. Organic Law No 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation and the Promotion of the Environment in Rwanda. Official Gazette of the Republic of Rwanda.

It should be noted that the Scoping Report is not intended to provide comprehensive and detailed information regarding the Proposed Project at this stage. It is a preliminary overview intended to: highlight potential environmental and social issues and impacts relating to the Proposed Project; outline the methodologies for assessing and avoiding or mitigating impacts; and form the basis for early engagement with relevant stakeholders. Further detail will be provided during the course of the full ESIA process.

This report is structured as follows:

- Section 1: Introduction;
- Section 2: Project Description;
- Section 3: Policy, Legal and Administrative Framework;
- Section 4: Analysis of Alternatives;
- Section 5: Stakeholder Engagement;
- Section 6: ESIA Methodology;
- Section 7: Baseline, Potential Impacts and Approach to Assessment and Mitigation; and
- Section 8: Area of Influence.

The following table summarises REMA's requirements when drafting a ToR and the associated sections where the requirements are contained within this Scoping Report.

Table 1-1: REMA Requirements	
REMA Requirements	Reference in this Scoping Report
<b>Introduction</b>	
Name of Developer	Section 1.15
Name of Project	Section 1.1
Project Description	Section 1 and Section 2
Alternatives Description	Section 4
Policies, Legislation and Regulations	Section 3
Environmental Concerns	Section 7
Environmental Management	Section 7
Project Planning and Design	Section 2, Section 2.4 and Section 6.3
Public Consultation	Section 5
EIA Team	Section 1.16

#### 1.4 Definition of Terms Used in the Report

For the purpose of this report, the following terms and definitions are used. Figure 1-2 provides an illustration of these areas.

- **Proposed Project Area:** The Proposed Project includes all structures and infrastructure associated with the Airport Area, Construction Camp, Expressway and temporary Water Pipeline during the construction phase. These are collectively referred to as the Proposed Project Area.
- **Airport Area and Airport Footprint:** The Airport Area, within the Proposed Project Area, will cover approximately 2,500 ha and the actual Airport Footprint will be approximately 360 ha within this. This Airport Footprint will comprise the runway, taxiways, aprons, helipads, terminals (presidential, passengers and general aviation), airplane hangars, cargo area,

vehicle parking areas, ground service equipment, airport maintenance areas, rescue and firefighting services, control tower, fuel farm and solid waste treatment facility.

Inhabitants and landowners within the Airport Area were expropriated from 2014 onwards and have been compensated and/or resettled offsite. This area is owned by the GOR and will be leased by BAC.

- **A Construction Camp** has been constructed within the Airport Area to the south of the Airport Footprint and comprises site offices, laboratories, changing rooms, first aid station, vehicle parking and maintenance sheds, fuel tank area and water treatment plant. Prior to a waste treatment plant being constructed, septic tank systems will be utilised across the camp area. The Construction Camp covers an area of approximately 9 ha. No worker accommodation will be provided for employees or contractors at the Construction Camp or within the Airport Area. A small number of foreign nationals will be housed temporarily offsite in a lodge complex (Gashora Lodge).
- **Expressway:** A new Expressway will be constructed to access NBIA. This route will be approximately 14.5 km in length from the north-western section of the Airport Area and link to the existing KK-15 Road providing direct access to Kigali. The Expressway will comprise a dual lane bitumen surfaced thoroughfare with a width of approximately 9 m. The overall road reserve will be 60 m.
- **Water Pipeline:** During the construction phase, a temporary aboveground 5 km Water Pipeline will be installed and will provide water during the construction activities from Lake Kidogo, located to the southeast of the Airport Area. Water from the pipeline will pass through a water treatment plant prior to being used onsite.
- **Quarry Road:** The Proposed Project will make use of an existing quarry located approximately 10 km northeast of the Airport Area. An 18 km unpaved road is currently being used by heavy vehicles that pass through Musovu Village. An existing alternative route has been identified that is earmarked to be widened and graded for use. The new access road will bypass part of Musovu Village and reduce the overall length of the route to 10 km. The unsurfaced road will need to be widened at some areas and will be the responsibility of BAC to maintain. The route will remain unsurfaced.

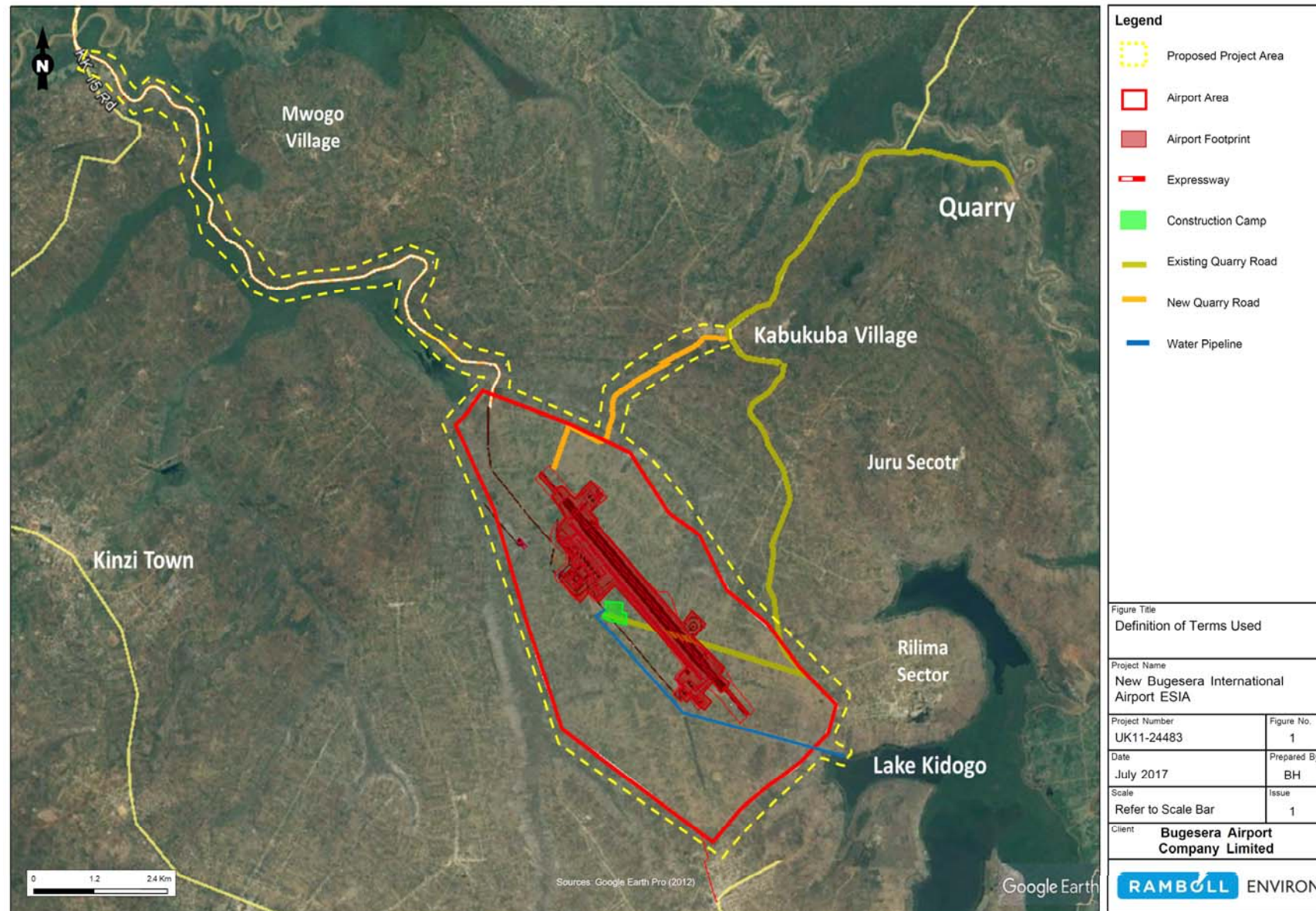


Figure 1-2: Terms of Use (Source: Google Earth Pro, 2012)

## 1.5 Project Proponent/Developer

The contact details for BAC are provided in Table 1-2.

<b>Table 1-2: Project Proponent/Developer Details</b>	
<b>Project Proponent Information</b>	<b>Details</b>
Project Applicant/ Developer	Bugesera Airport Company Limited
Company Registration Number	106575464
Contact Person	Mr Maciej Michalek
Postal Address	KG 415 Avenue, Gate N° 6, Gacuriro P.O Box 2179 Kigali Rwanda
Telephone	+250 781 447 482
Email	maciej.michalek@mota-engil.com

## 1.6 Environmental Impact Assessment Team

The Ramboll Group comprises a staff of 13,000 people in 300 offices in 35 countries. Within the Group, the Ramboll Environ network of environment and health experts includes more than 2,100 employees. Our Impact Assessment Services team, based in Africa, the Americas, Asia Pacific, Europe and the Middle East regions, has experience across a range of sectors, particularly in major infrastructure development, power, oil and gas, and mining, and is conversant in International Financial Institution standards.

Ramboll Environ is being supported by NEWPLAN Limited (NEWPLAN) who is recognised and authorised by REMA to undertake EIA/ESIA work in Rwanda and included on their list of approved consultants. NEWPLAN is a multidisciplinary engineering and consultancy established in 1995. The company's service areas include infrastructure, energy, oil and gas, architecture, environment and social, development, surveys and project management training. The company has 32 professional permanent employees and draws on a network of professionals within its various fields of operation.

Ramboll Environ and NEWPLAN contact details are provided in Table 1-3.

<b>Table 1-3: Environmental Impact Assessment Team</b>		
<b>Environmental Practitioner</b>	<b>Ramboll Environ</b>	<b>NEWPLAN</b>
Environmental Practitioner	Ramboll Environ UK Limited	NEWPLAN Limited
Company Registration Number	2331163	29560
Contact Person	Mrs. Denise Wright	Mr. Simon Muliisa
Postal Address	Artillery House 11-19 Artillery Row London SW1P 1RT United Kingdom	Ground Floor, Blue Star House Box 167 Kigali Rwanda
Telephone	+44 7850 655736	+250 787 313 211/ +256 793 852 832
Email	dwright@ramboll.com	smuliisa@newplan.ug

## 2. PROJECT DESCRIPTION

### 2.1 Project Location and Background

NBIA is to be situated within Rilima and Juru Sectors of the Bugesera District in the Eastern Province of Rwanda (Figure 1-1). The site is approximately 23 km southeast of the city of Kigali, along the Kicukoro-Nyamamata-Nemba highway (KK-15 Road), which connects Rwanda to Burundi.

The site is situated on a plateau that rises from approximately 1,400 m in the south, north and east to a maximum elevation of 1,437.5 m at the centre. The Proposed Project covers an area of approximately 2,500 ha, which was previously largely used for subsistence farming.

NBIA will become Rwanda's largest international airport, serving commercial flights destined to and from the greater Kigali metropolitan area and the wider country. When completed, it will become Rwanda's third international airport and the country's eighth airport overall. It will complement Kigali International Airport, which is now operating at maximum capacity.

The airport configuration has been driven by market demand and international standards (International Civil Aviation Organisation (ICAO), International Air Transport Association (IATA) and the Federal Aviation Authority (FAA)). The vision for the technical development is focused on a single roof concept, space optimisation, extension options, functionality and efficient operations, above average commercial space and optimised capital expenditure.

The airside configuration will initially consist of a single runway with space for a second runway to be reserved for the future. One parallel taxiway will be developed in order to improve the runway capacity and airside operations.

In summary, the Proposed Project will include, but not be limited to, the following key elements:

- A Runway (3,750 m in length by 45 m in width) and one parallel taxiway in order to improve runway capacity and the airside operations;
- A Passenger Terminal (29,900 m<sup>2</sup>) will comprise check-in counters, security check points, gates, passenger boarding bridges, immigration and emigration counters, and retail and commercial areas;
- Additional facilities will include:
  - Presidential Terminal;
  - General Aviation Terminal;
  - Cargo area;
  - Ground Service Equipment maintenance building;
  - Catering area;
  - Administrative area;
  - Access security;
  - Power distribution;
  - Waste management yard;
  - Fuel farm;
  - Aircraft Rescue and Firefighting building;
  - Air Traffic Control tower; and
  - Car parking.
- A 5 km water pipeline from Lake Kidogo and water treatment plant within the Airport Area to provide water for the construction phase; and



- 14.5 km Expressway to link the airport to the national KK-15 Road joining at the existing Nyabarongo Bridge.

Associated Facilities will include an existing quarry, improvements to the quarry road and the permanent supply of power and water.

## **2.2 Project Description**

Information on the various airport elements and Associated Facilities is included below. This is followed by sections on the airport development phasing and construction and operation activities (Sections 2.3, 2.4 and 2.5). The Project Description is based on the Master Plan documentation developed by Airport Design Management: Airport Consulting Vienna (ACV) (Version V6-00) dated May 2017.

### **2.2.1 Passenger Terminal**

The Passenger Terminal will be the main terminal for the airport and will comprise 22 check-in counters, six security check points, 10 gates, six passenger boarding bridges, 10 immigration counters for arrival and 10 emigration counters for departure. Approximately 4,700 m<sup>2</sup> of the terminal will be reserved for retail and commercial activities (shops, lounges, offices, etc.). The terminal will be 29,900 m<sup>2</sup> in Phase 1 and 39,400 m<sup>2</sup> by Phase 5.

### **2.2.2 General Aviation Terminal**

The General Aviation (GA) Terminal will be a one level building with elevated sections for administrative offices and technical rooms in the centre. The GA terminal will initially be 1,200m<sup>2</sup> in Phase 1.

### **2.2.3 Presidential Terminal**

The Presidential Terminal design is based on following aspects:

- The Presidential Terminal will be in a separate location to the Passenger Terminal and General Aviation Terminal;
- To assure a high level of security a separate access and additional security checkpoints are foreseen;
- The design layout foresees a two-story building; and
- Governmental requirements (i.e. security measures) will be incorporated in the conceptual design.

The Presidential Terminal will be 3,000 m<sup>2</sup> in Phase 1.

### **2.2.4 Runway**

The runway alignment has been determined based on the consideration of prevailing wind conditions, regional airspace, local obstacles and site geometry. Runway operational modes and assignments have been assessed based on airspace and runway capacity requirements and route mix. This informs the overall operational concept, passenger terminal location and airline assignment assumptions. Taxiway layouts have been developed to support proposed runway operational modes and optimise airfield efficiency, minimising taxi times and delays.

The runway will be 3,750 m long and 45 m wide. At the end of the runway, a stopway of 60 m will be installed. The runway shoulders will be 7.5 m wide and a Runway End Safety Area (RESA) of 180 m length and 160 m width will be provided at the end of the runway.

## 2.2.5 Airport Support Facility Requirements

Support areas will be required to accommodate a wide range of facilities, many of which are likely to be planned and delivered by third parties (such as aircraft maintenance, rescue and firefighting services, cargo, and catering facilities). The Master Plan for the support areas will provide a framework for the structured development of these areas, coordinated with the wider airport development plan. This will be refined over the concession period to suit the demands from third party operators.

### 2.2.5.1 Maintenance Repair and Overhaul

A Maintenance Repair and Overhaul facility will be constructed to service aircraft.

### 2.2.5.2 Rescue and Firefighting Services

The Rescue and Firefighting Services (RFFS) facilities will include:

- A Fire Station, including offices, garages and other complementary functional areas;
- A service bay for parking and maintenance of the minimum required three vehicles;
- A RFFS training area; and
- An additional water supply in case of emergency.

The building allocated for the firefighting services will be located next to the main Terminal Building. The edifice will accommodate the firefighting offices and facilities, and the service vehicles. A side service bay is also foreseen, for vehicle parking and maintenance.

### 2.2.5.3 Cargo

The cargo-facility will include the following main areas:

- Cargo Terminal, including customs, import and export, manipulation areas, storage for refrigerated goods, hazardous materials, animals, etc.; and
- Landside parking (trucks and employees).

### 2.2.5.4 Flight Catering

The catering facilities will consist of a facility where meals are prepared for inflight use. The building will be located in the service area, within the general terminal building, and include the following areas:

- Kitchen;
- Refrigeration areas;
- Storage areas; and
- Wash areas.

The facility will be able to handle up to 1,000,000 meals per year. An employee canteen may be integrated within the building to serve the terminal and other airport staff.

### 2.2.5.5 Fuel Farm

The Fuel Farm will be located at the eastern part of the airport and will include the following main areas:

- Landside access;
- Truck manoeuvring area;
- Storage tanks and surrounding security area;
- Technical facilities (e.g. pump stations, etc.);



- Airside manoeuvring area; and
- Airside fuelling station.

#### 2.2.5.6 Ground Service Equipment

The Ground Service Equipment (GSE) facility will be located in the service area. On the western side of the terminal, a dedicated GSE Fuelling Station is foreseen. The GSE services will include the following related activities:

- Passenger services;
- Load control;
- Ramp handling; and
- Aircraft servicing.

The GSE facility will also include servicing and repair of all vehicles and equipment used for the servicing of aircraft which consist of a number of special vehicles that are not roadworthy, i.e. are not allowed to use public roads and can therefore not be serviced outside the confined airport area unless trucked to and from the garage.

The main components of vehicle and GSE maintenance are:

- Vehicle and GSE parking and staging areas, both open and covered (shelters);
- Vehicle and GSE maintenance workshops, complete with special bays for equipment cleaning and painting;
- Large storage facility for spare parts and consumables (mainly oil, hydraulic fluid and grease); and
- Vehicle fuel station.

#### 2.2.5.7 Other Airport Maintenance Support Facilities

The facilities will include the following main areas:

- Open staging areas;
- Vehicle shelters and garages;
- Aircraft marshalling;
- Workshops;
- Stores; and
- Administration offices.

#### 2.2.5.8 Wastewater and Waste Management

A permanent wastewater treatment plant will be constructed on site as part of the construction contract.

A central waste collection and management area will be used for gathering, handling, sorting and storing of all solid waste generated on the airport. The waste will range from mowed grass to hazardous waste (e.g. motor oil).

#### 2.2.5.9 Permanent Electricity and Water Supply

According to BAC, the supply of electricity and water and for the operation phase of the airport will be sourced by the GOR. No information is currently available with regard to the sources or the date of installation of these services. Water will not be obtained from Lake Kidogo during operation.

#### 2.2.6 Expressway

BAC proposes to construct a new Expressway of approximately 14.5 km which will connect the airport to the national KK-15 Road joining at the existing Nyabarongo Bridge, which crosses the Akagera River. The road will be paved (bitumen) and is anticipated to be 9 m wide with the overall road reserve being 60 m wide, which will not be paved.

The Expressway will initially comprise two lanes (one in each direction) and in the future extended to include four lanes (two in each direction). The Expressway will be constructed in an area that is currently sparsely populated. The land uses of the proposed route comprise agriculture and wetland with some limited areas that are inhabited.

The Expressway will be designed and developed taking cognisance of safety aspects such as traffic lights, stop streets, speed humps, traffic calming zones, street lights, etc. The Expressway will also consider drainage and stormwater control during periods of high rainfall.

There are future plans to upgrade the existing surfaced KK-15 Road to Kigali, over a length of approximately 14.5 km. The existing road may be widened to accommodate increased traffic in the area.

### 2.3 Project Development Phasing

The Proposed Project will be constructed in five phases. The first phase is planned to be completed by 2020 and the final phase by 2045. Table 2-1 summarises the five phases associated with the Proposed Project and relevant information for each phase.

Appendix 1 includes the illustrations and Associated Facilities to be developed as part of the Airport Area. The illustrations include representations per phase of the project.

### 2.4 Construction Phase

#### 2.4.1 Airport Area

A construction schedule is provided in Figure 2-1. This provides a summary of the main construction activities up to 2020.

A Construction Camp has been constructed within the Airport Area to the south of the Airport Footprint and comprises site offices, laboratories, changing rooms, first aid station, vehicle parking and maintenance sheds, fuel tank area and water treatment plant. Prior to a waste treatment plant being constructed, septic tank systems will be utilised across the camp area. The Construction Camp covers an area of approximately 9 ha. No onsite accommodation is provided for any employees, contractors or subcontractors. Accommodation is only provided to a limited number of senior employees at the Gashora Lodge, located to the east of Lake Rumira, approximately 9 km southeast of the Construction Camp. The remainder of the employees live offsite in their own accommodation and are transported to the site by company vehicles. Approved caterers provide meals onsite.

As part of the site enabling works, and agreed by the GOR, the vegetation in the Airport Footprint has been cleared. This has been undertaken in accordance with guidance on biodiversity and chance finds in the event that items of cultural heritage value are encountered.

No surface water bodies requiring dewatering are present within the Airport Area; however, the south-eastern section of the runway crosses a non-perennial stream. According to BAC, no water has been reported in the stream.

Following the site vegetation clearance, the construction of the airport facilities and infrastructure will commence. The Construction Camp will be used as the base for the management and

coordination of these activities. All construction equipment will be maintained, refuelled and parked in designated, hardstanding areas within the Construction Camp.

The International Civil Aviation Authority (ICAA) and FAA recommend that the airport runway layout be orientated so that the usability factor of the airport is not less than 95%. Taking into consideration the wind direction (southeast) and to minimise earthworks (cut and fill), the runway was designed to run in a northwest/southeast direction to comply with ICAO and FAA standards.

Five borrow pits are proposed to obtain fill material and six spoil areas have been demarcated in the Airport Footprint. Approximately 9,000,000 m<sup>3</sup> of cut will be excavated and 7,000,000 m<sup>3</sup> will be filled in order to level the Airport Area. Additional cut material will be used for landscaping around the Airport Area. Refer to Figure 2-2 for a schematic representation of the areas identified for borrow pits and spoil areas.

A temporary asphalt plant will be constructed to the northwest of the Airport Area, which will be used during the construction phase of the Proposed Project. Similarly, concrete batching plants and mechanical plants will be developed to assist with construction activities.

Aggregate for the Proposed Project will be sourced from a quarry located 10 km northeast of the Construction Camp. The quarry is licensed by the Rwanda Development Board as well as by the Ministry of Natural Resources and has the capacity to produce 30,000 tonnes per annum of aggregate. Aggregate will be transported via the quarry road to the Airport Area.

<b>Table 2-1: Master Plan Development Phases</b>					
<b>Phase</b>	<b>Phase 1</b>	<b>Phase 2</b>	<b>Phase 3</b>	<b>Phase 4</b>	<b>Phase 5</b>
<b>Completion Year</b>	2020	2030	2035	2040	2045
<b>Million Annual Passengers</b>	1,77	2,52	3,42	4,48	5,72
<b>Design Peak Hour (Passengers)</b>	856	1,157	1,490	1,859	2,253
<b>Annual Cargo (Tons per Annum)</b>	13,803	19,542	27,626	39,434	56,416
<b>Projects per Phase</b>	Runway Taxiway Apron Terminal Presidential Terminal Airport Facilities Cargo Area Aircraft Maintenance Landside Roads Commercial Area Parking Area	Apron Terminal Airport Facilities Parking Areas	Apron Airport Facilities Cargo Area Office Area Hotel Aircraft Maintenance Parking Area	Taxiway Apron Terminal Airport Facilities Landside Roads Parking Area	Taxiway Apron Terminal Airport Facilities Cargo Area Parking Area

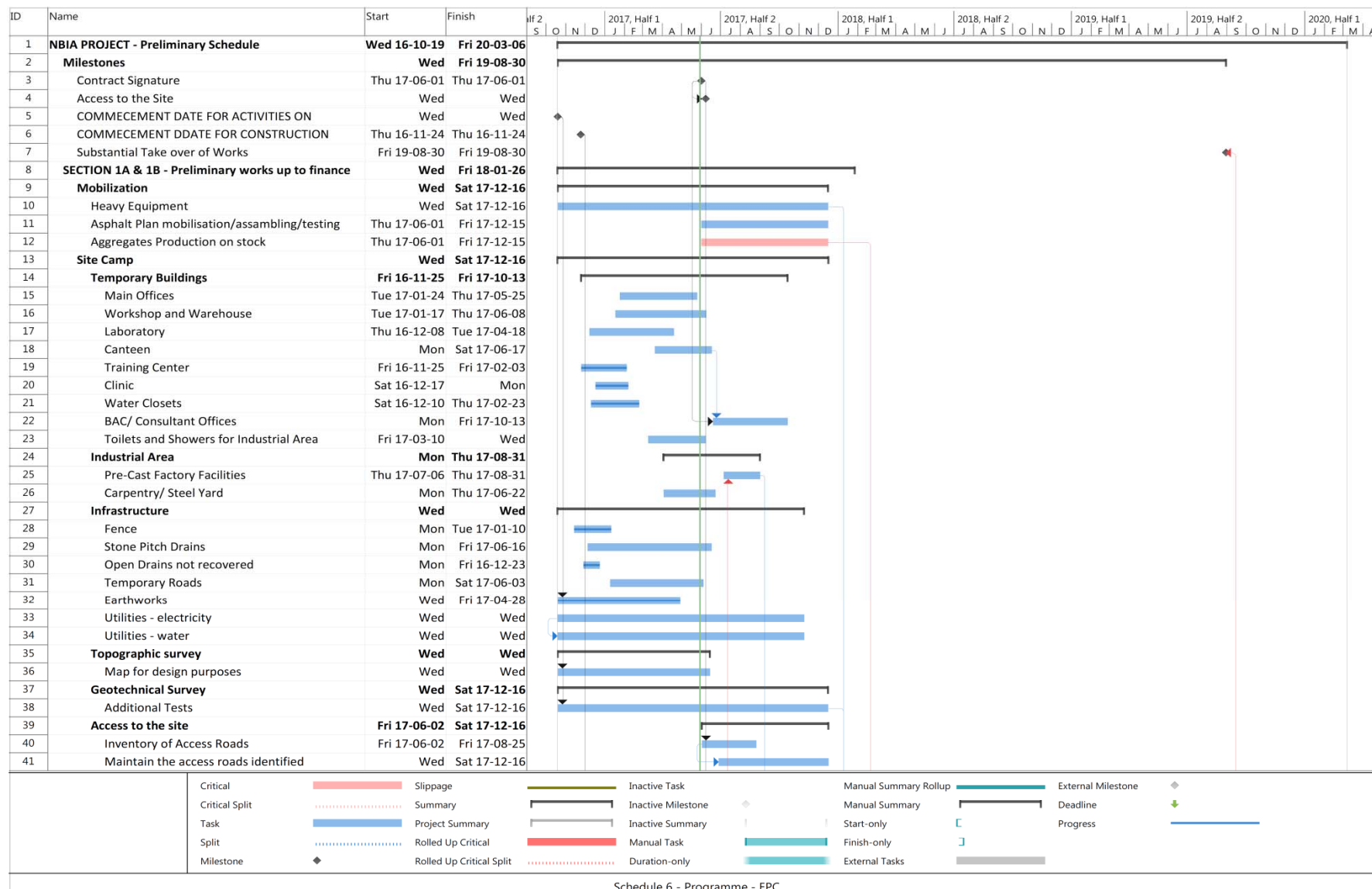
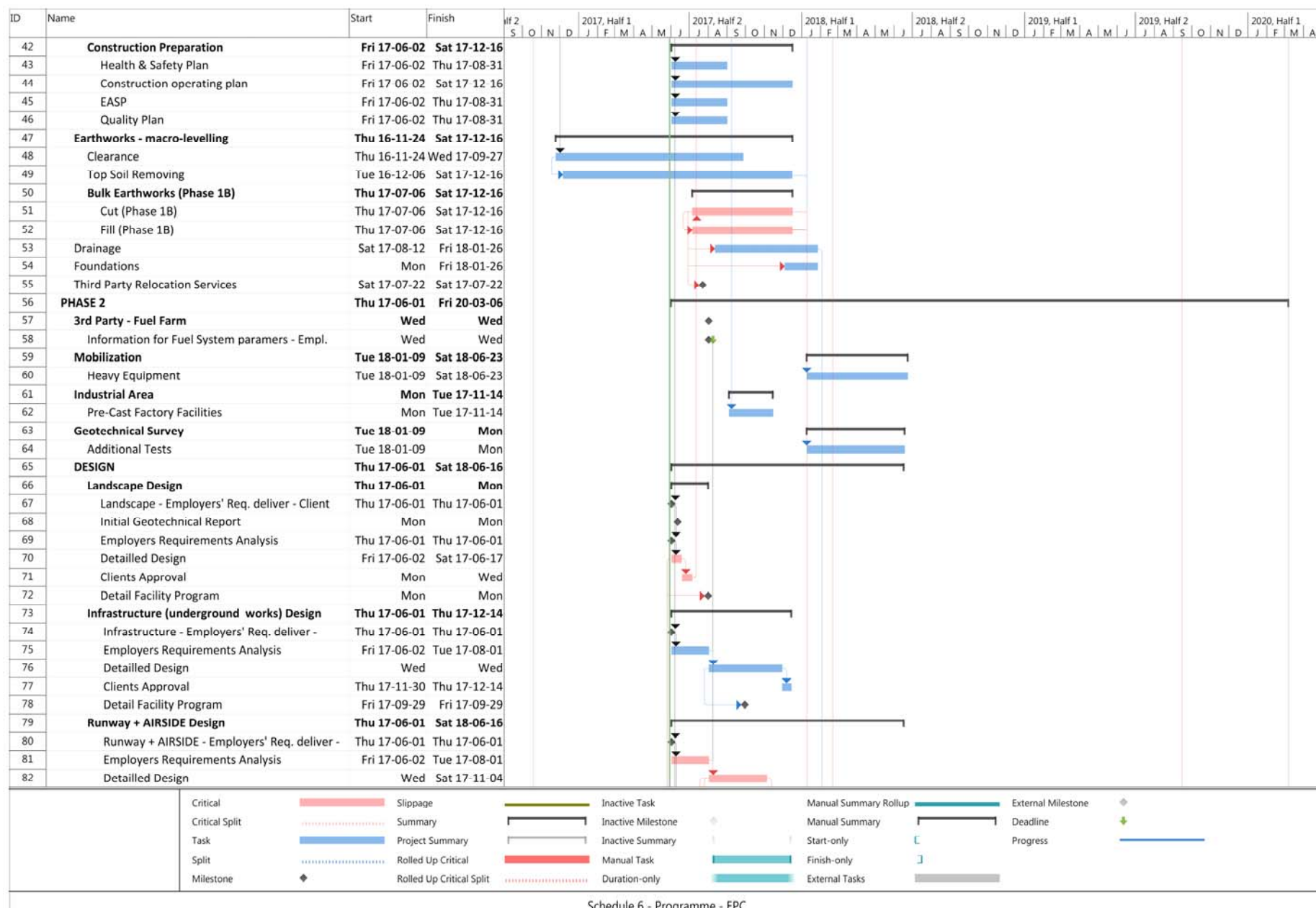
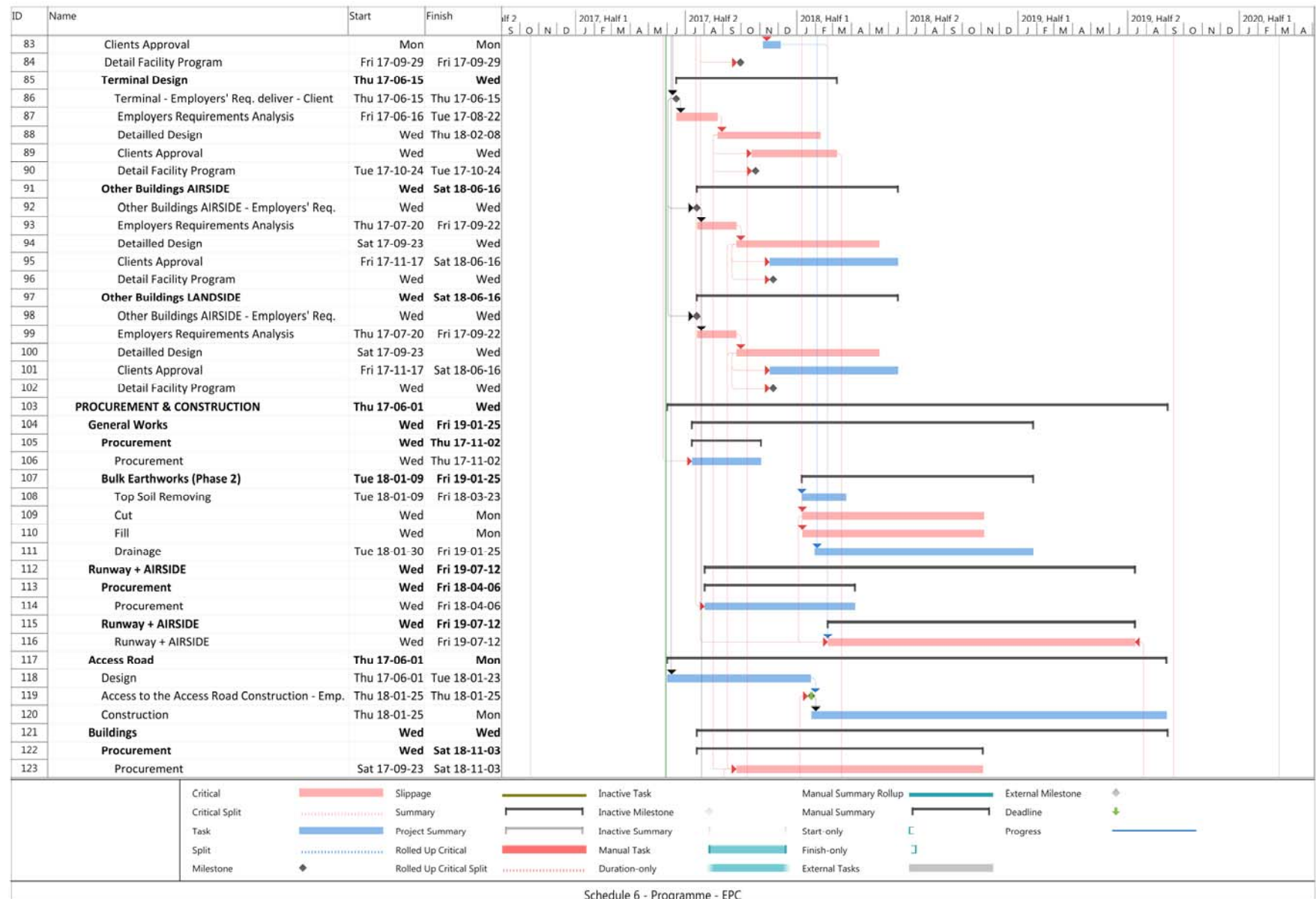
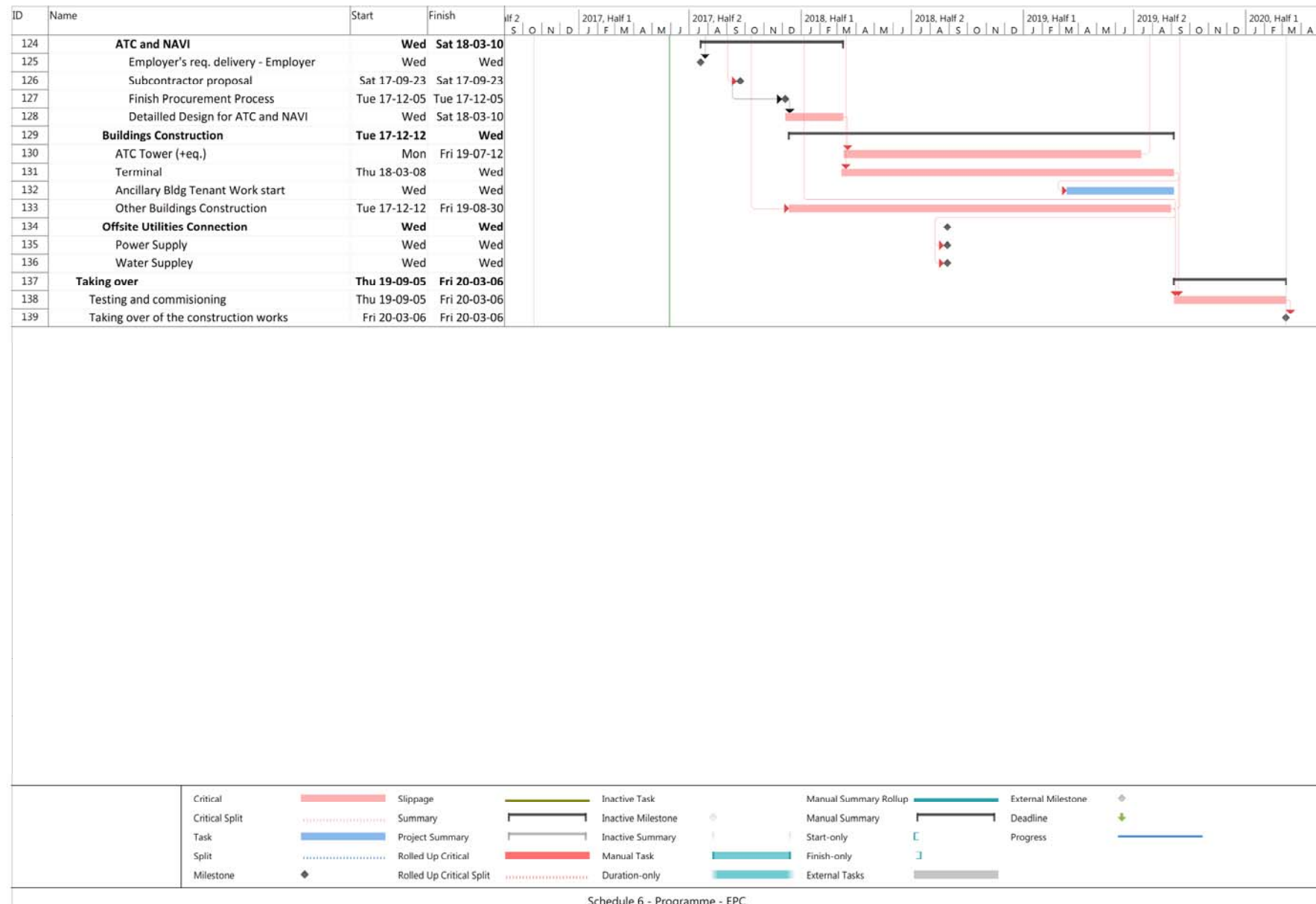


Figure 2-1: Construction Schedule









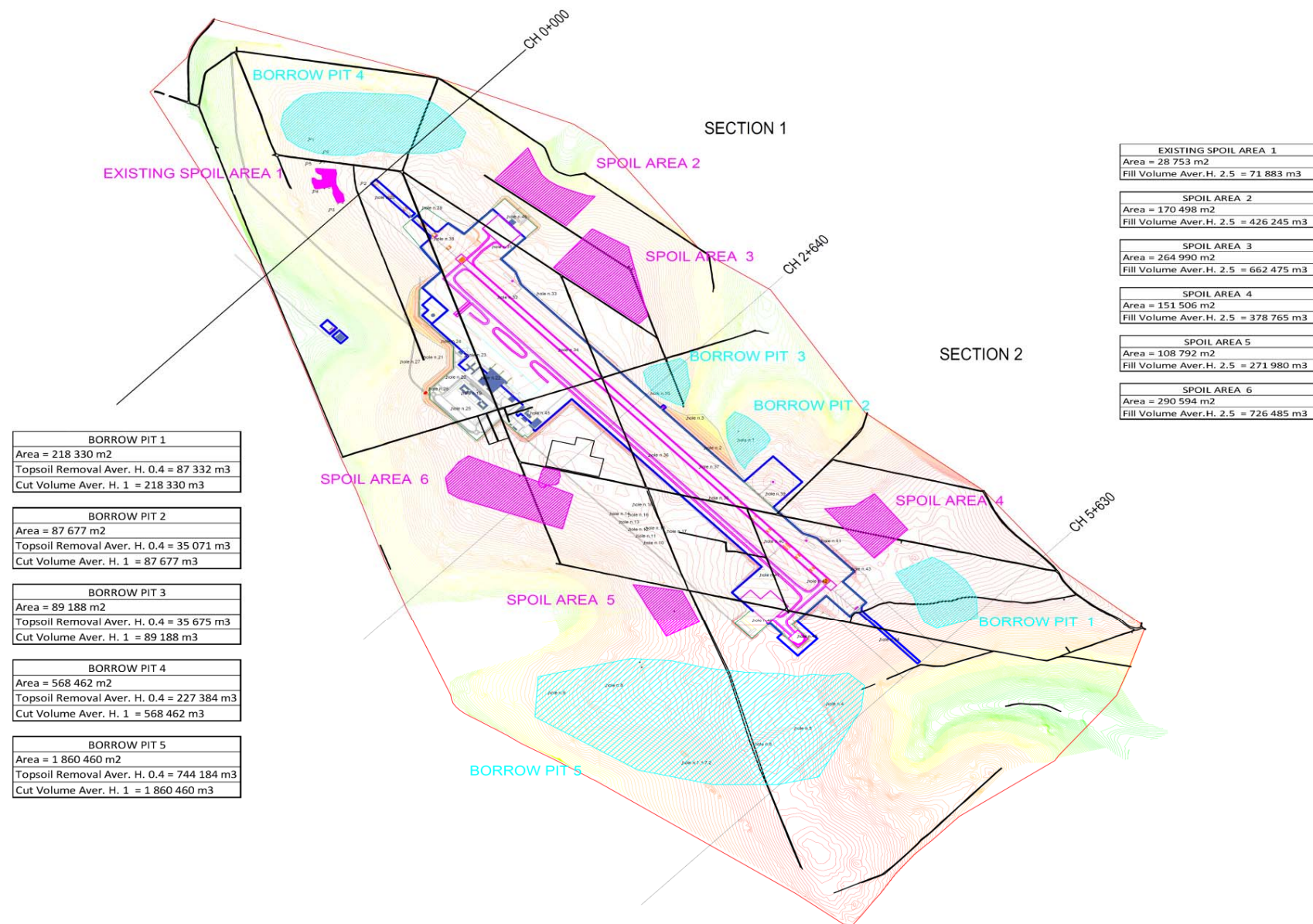


Figure 2-2: Illustration of Borrow Pits and Spoil Areas within the Airport Footprint

It is anticipated that approximately 600 m<sup>3</sup> of water per day will be required during the construction phase of the Proposed Project. The Water Pipeline will be laid along the embankments of a non-perennial river located to the southeast of the Airport Area and will provide water from Lake Kidogo to the Construction Camp. BAC will construct a water treatment plant to the north-western portion of the Construction Camp.

The land use along the Water Pipeline servitude largely comprises subsistence farming. No rural homesteads will be impacted by the pipeline route. No expropriation has commenced along the pipeline route; however, according to Ministry of Infrastructure (MININFRA), the area associated with the non-perennial river belongs to the GOR and therefore, minimal expropriation is anticipated.

Sanitary wastewater and solid waste will be collected onsite at designated areas and will be disposed of offsite to approved facilities.

During the construction phase, power will be generated onsite via a series of diesel-fuelled generators. Fuel will be delivered to the Construction Camp area and stored onsite.

#### 2.4.2 The Expressway

The route for the Expressway crosses subsistence farming land uses, rural homesteads, floodplains and dissects a wetland. Currently, no expropriation or resettlement activities have commenced for the Expressway. It is anticipated that the resettlement will be conducted by the GOR, on behalf of the MININFRA, following the completion and authorisation of the ESIA. A proposed route alignment is shown in Figure 2-3 and additional information will be included in the ESIA and ESMP documentation.

#### 2.4.3 Construction Environmental and Social Management Plans and Procedures

A Construction Environmental and Social Management Plan (ESMP) has been compiled and includes or makes reference to the Mota-Engil Safety, Health, environmental and Quality Policy and the internal integrated management system manual. It also makes specific reference to the following construction and onsite activities:

- Site Clearance/Excavations/Earthworks;
- Topsoil/Spoil Stockpiling and Management;
- Dust Control;
- Stormwater Management and Erosion Control;
- Concrete Batching/Asphalt Plants;
- Fuel and Hazardous Substance Handling and Control;
- Waste Management;
- Access Control and Traffic Management;
- Spills and Emergency Management;
- Chance Finds
- Biodiversity Fauna/Flora Procedures;
- Social and labour plans;
- Incident Register;
- Non-Conformance Checklist;
- Grievance Mechanism/Comments Procedure; and
- Environmental Induction and Training.

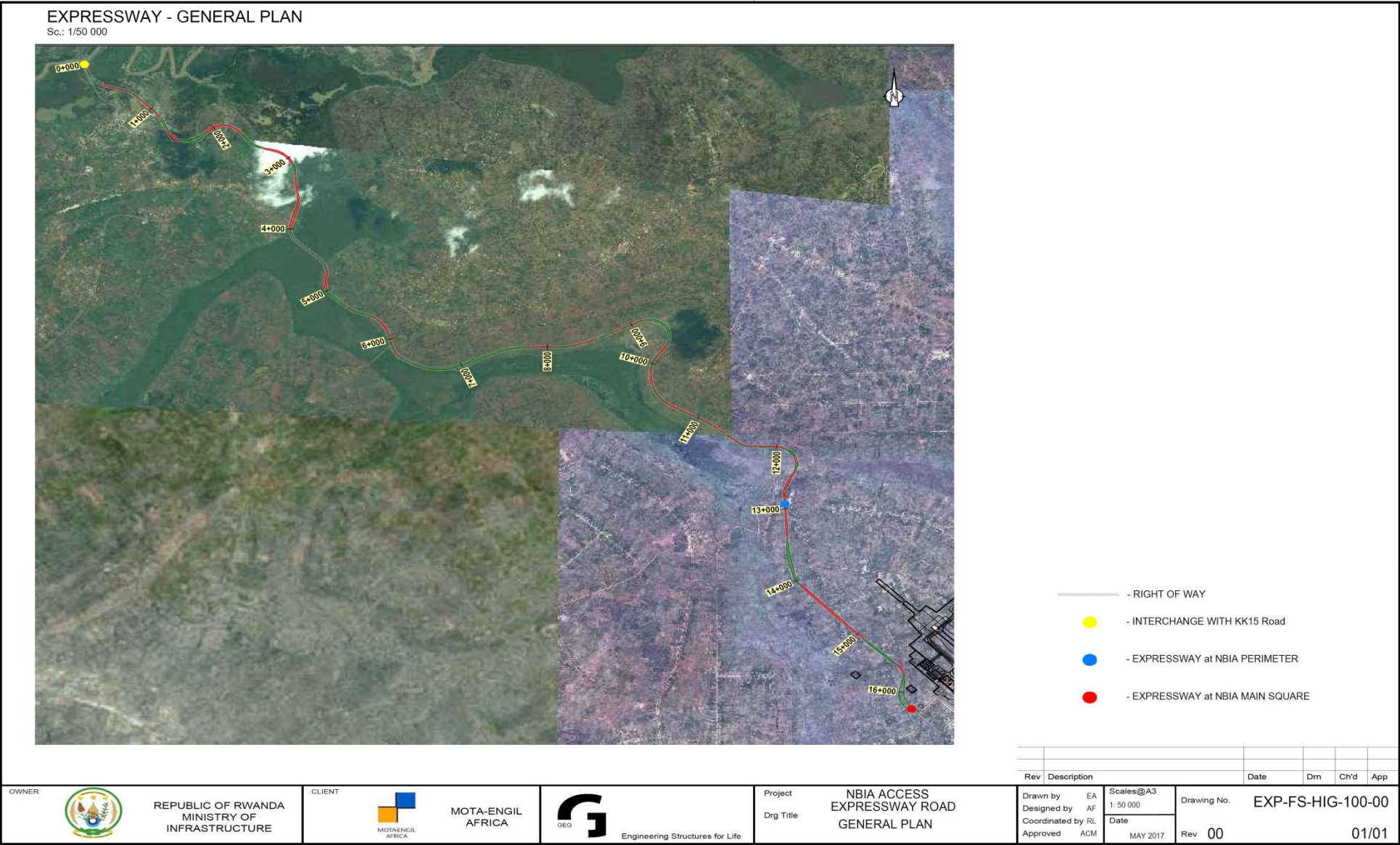


Figure 2-3: Expressway Route (Source: BAC, 2017)



#### 2.4.4 Health and Safety

Health and safety arrangements onsite during earthworks and construction will be the responsibility of the Engineering, Procurement and Construction (EPC) contractor. The EPC contractor will be required to undertake health and safety risk assessments and introduce control measures in accordance with national and international legislation and Good International Industry Practice (GIIP) for construction sites.

## 2.5 Operation Phase

The operational specifications of NBIA are set out in Table 2-1 with the phasing information.

As stated previously, the supply of electricity and water for the operation phase of the airport will be sourced by the GOR. Design information will be available for these services in advance of operation.

Support areas are required to accommodate a wide range of facilities, many of which are likely to be planned and delivered by third parties (such as cargo, aircraft maintenance and catering facilities). The Master Plan for the support areas is intended to provide a framework for the structured development of these areas, coordinated with the wider airport development plan. This will, however, need to be refined over the concession period to suit the demands from third party operators. The calculations are based on the figures defined by traffic forecast and are provided in Table 2-2.

<b>Table 2-2: Airport Support Facilities during the Life of the Project</b>					
<b>Phase</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Design Year</b>	<b>2020</b>	<b>2030</b>	<b>2035</b>	<b>2040</b>	<b>2045</b>
Design Capacity	1,77 MAP	2,52 MAP	3,42 MAP	4,48 MAP	5,72 MAP
Cargo Facilities	2,991 m <sup>2</sup>	4,234 m <sup>2</sup>	5,986 m <sup>2</sup>	8,544 m <sup>2</sup>	9,168 m <sup>2</sup>
Logistics Centre	1,035 m <sup>2</sup>	1,466 m <sup>2</sup>	2,072 m <sup>2</sup>	2,958 m <sup>2</sup>	4,231 m <sup>2</sup>
Catering	3,086 m <sup>2</sup>	3,510 m <sup>2</sup>	4,758 m <sup>2</sup>	6,244 m <sup>2</sup>	7,958 m <sup>2</sup>
GSE Garage	602 m <sup>2</sup>	812 m <sup>2</sup>	1,050 m <sup>2</sup>	1,302 m <sup>2</sup>	1,582 m <sup>2</sup>
GSE Station	1,596 m <sup>2</sup>	2,269 m <sup>2</sup>	3,075 m <sup>2</sup>	4,036 m <sup>2</sup>	5,144 m <sup>2</sup>
Airport Maintenance Garage	218 m <sup>2</sup>	293 m <sup>2</sup>	375 m <sup>2</sup>	465 m <sup>2</sup>	570 m <sup>2</sup>
Airport Maintenance Station	886 m <sup>2</sup>	1,261 m <sup>2</sup>	1,709 m <sup>2</sup>	2,242 m <sup>2</sup>	2,858 m <sup>2</sup>
Fuel Farm Storage Capacity	2,718 m <sup>3</sup>	4,996 m <sup>3</sup>	6,086 m <sup>3</sup>	7,301 m <sup>3</sup>	8,512 m <sup>3</sup>
Airport Administration	1,241 m <sup>2</sup>	1,765 m <sup>2</sup>	2,392 m <sup>2</sup>	3,139 m <sup>2</sup>	4,001 m <sup>2</sup>
Solid Waste Treatment	532 m <sup>2</sup>	756 m <sup>2</sup>	1,025 m <sup>2</sup>	1,345 m <sup>2</sup>	1,715 m <sup>2</sup>
Office Park	7,500 m <sup>2</sup>	12,500 m <sup>2</sup>	20,000 m <sup>2</sup>	22,500 m <sup>2</sup>	22,500 m <sup>2</sup>
Shopping Area	1,500 m <sup>2</sup>	2,500 m <sup>2</sup>	4,000 m <sup>2</sup>	4,000 m <sup>2</sup>	4,000 m <sup>2</sup>
Gas Station	2,500 m <sup>2</sup>	2,500 m <sup>2</sup>	2,500 m <sup>2</sup>	2,500 m <sup>2</sup>	2,500 m <sup>2</sup>

Parking areas and lots have been calculated and are summarised in Table 2-3.

<b>Table 2-3: Airport Parking Areas and Lots</b>					
<b>Phase</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Design Year</b>	<b>2020</b>	<b>2030</b>	<b>2035</b>	<b>2040</b>	<b>2045</b>
Short term	85 lots	121 lots	163 lots	214 lots	273 lots

<b>Table 2-3: Airport Parking Areas and Lots</b>					
Mid term	147 lots	209 lots	283 lots	371 lots	473 lots
Long term	284 lots	403 lots	546 lots	716 lots	913 lots
Employees	78 lots	82 lots	111 lots	147 lots	189 lots
Car rental	156 lots	222 lots	301 lots	394 lots	503 lots
Shopping area	200 lots	200 lots	400 lots	400 lots	400 lots
Office park (incl. hotel)	175 lots	263 lots	350 lots	350 lots	350 lots
Bus parking	9 lots	12 lots	17 lots	22 lots	28 lots
Taxi staging	17 lots	24 lots	35 lots	46 lots	53 lots

The following table summarises the estimated requirements for the main apron area. Calculations are based on the figures defined by the traffic forecast and benchmarks. The benchmarks are based on international standards and have been utilised in similar projects (Table 2-4).

<b>Table 2-4: Apron Area Requirements</b>					
<b>Phase</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Design Year</b>	<b>2020</b>	<b>2030</b>	<b>2035</b>	<b>2040</b>	<b>2045</b>
<b>Passenger Aircraft Position</b>					
Code C <sup>5</sup>	8	9	11	12	15
Code E <sup>6</sup>	2	3	3	4	4
Long Term Apron Positions	1	2	2	2	2
<b>Total</b>	<b>11</b>	<b>14</b>	<b>16</b>	<b>18</b>	<b>21</b>
<b>GA Aircraft Positions</b>					
Code A <sup>7</sup>	4	4	4	4	4
Code B <sup>8</sup>	1	1	1	1	1
Heli	6	6	6	6	6
<b>Total</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>11</b>

<sup>5</sup> Code C aircraft: Wingspan >24 m but <36 m, outer main gear wheel span > 6 m but < 9 m

<sup>6</sup> Code E aircraft: Wingspan > 52 m but < 65 m, outer main gear wheel span > 9 m but < 14 m

<sup>7</sup> Code A aircraft: Wingspan < 15 m, outer main gear wheel span < 4.5 m

<sup>8</sup> Code B aircraft: Wingspan > 15 m but < 24 m, outer main gear wheel span > 4.5 m but < 6 m

### 3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

#### 3.1 Environmental and Social Impact Assessment Framework

Rwanda has adopted environmental legislation, including environmental impact assessment procedures. According to the National Policy on Environment issued in 2003, Environmental Impact Assessments must be carried out prior to development of infrastructure projects. REMA was set up to implement this policy.

In April 2005, Rwanda adopted a legal framework in accordance with its National Policy on Environment, the Organic Law N° 04/2005 of 08/04/2005<sup>9</sup> determining the modalities of protection, conservation and promotion of environment in Rwanda. Article 67 of this law stipulates that *“Every project shall be subjected to an environmental impact assessment, before obtaining authorisation for its implementation. This applies to programmes and policies that may affect the environment. An order of the Minister having environment in his or her attributions shall determine the list of projects mentioned in this organic law”*.

More specifically, ESIA must be carried out for large scale infrastructure projects, such as the Proposed Project, and must outline the costs and benefits of the protection of related ecosystems. The ESIA must be submitted to the Rwanda Development Board (RDB). The Environmental Compliance and Cleaner Production Unit within RDB provides advice on EIA and ensures compliance as part of the investor facilitation.

#### 3.2 Policy Framework

##### 3.2.1 The Rwanda Environmental Policy, 2003

The objective of the Rwanda Environmental Policy<sup>10</sup> is to improve the people's wellbeing, the judicious utilisation of natural resources and the protection and rational management of ecosystems for sustainable and fair development. The policy aims to conserve, preserve and restore ecosystems and maintain ecological and systems functioning, particularly the conservation of national biological diversity; and to create awareness among the public to understand and appreciate the relationship between environment and development. Furthermore, the policy ensures the participation of individuals and the community in the activities for the improvement of environment with special attention to women and youth to be addressed through the stakeholder engagement plan.

The policy aims at a number of specific objectives, including:

- Improve the health and quality of life for every citizen and promote sustainable socio-economic development through rational management and utilisation of resources and environment;
- Integrate environmental aspects into all the development policies, in planning and in all activities carried out at the national, provincial and local levels, with the full participation of the population;
- Conserve, preserve and restore ecosystems and maintain the functioning of the ecological systems which support life, particularly the conservation of national biological diversity;
- Optimum utilisation of resources and the attainment of a sustainable level of consumption of resources;
- Create awareness among the public to understand and appreciate the relationship between environment and the development; and

<sup>9</sup> Republic of Rwanda, 2005. Organic Law No 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation and the Promotion of the Environment in Rwanda. Official Gazette of the Republic of Rwanda.

<sup>10</sup> Republic of Rwanda Ministry of Lands, Resettlement and Environment, 2003. Rwanda Environmental Policy.

- Ensure that the basic needs of today's population and those of future generations are met.

The Proposed Project must take cognisance of the National Environmental Policy and ensure that improved development and wellbeing of the citizens of Rwanda are considered, while including environmental aspects into the decision-making process.

### 3.2.2 The National Land Policy, 2004

The objective of the National Land Policy<sup>11</sup> is to establish a land tenure system that guarantees occupational security of land for all Rwandans and guides land reform initiatives that will establish good management with reasonable use of land. As a complement to the Constitution of Rwanda, the land policy and land law have been drafted to safeguard, protect and enforce land rights of woman and female orphans in different regions of the country.

As the Proposed Project will be utilising land for the development of structures and infrastructure, objectives of the National Land Policy must be considered and implemented during the ESIA process.

### 3.2.3 The Mining Policy, 2010

The aim of the Mining Policy is to optimise local extraction and processing of minerals and aggregates. The policy places emphasis on achieving conformity of key activities, including supporting and facilitating environmental plans for the protection and rehabilitation of damaged environments. This includes balancing of the protection of flora and fauna and the natural environment with the need of social and economic development.

Although the mining activities at the quarry are not perceived to be a primary activity of the Proposed Project, borrow pits will be utilised during pre-construction and construction activities. The Mining Policy must be implemented to ensure the protection and rehabilitation of the biophysical and socio-economic environments as well as the adequate management of borrow pits and quarries.

### 3.2.4 The National Energy Policy, 2015

This Energy Policy<sup>12</sup> has been developed to guide and influence decisions on the extraction, development and use of Rwanda's energy resources in a transparent and sustainable manner. The vision of the energy sector is to become one of Rwanda's most dynamic sectors and investment destinations. In addressing both demand and supply side issues across all key sub-sectors, this policy will contribute to realising the vision.

The Energy Policy and the Energy Sector Strategic Plan<sup>13</sup> (ESSP) are mutually reinforcing. Whereas the policy outlines a long term vision, provides high-level goals, and recommends clear and coordinated approaches for achieving that vision, the ESSP outlines targets and an implementation framework against which to measure progress towards the realisation of the policy. In this way, the policy can guide implementation strategies, while the ESSP outlines the priority strategies and actions that give practical thrust to the policy.

The overall goal of the policy is to ensure that all residents and industries can access energy products and services that are sufficient, reliable, affordable, and sustainable. Specific core global objectives of the energy policy include:

- Ensuring the availability of sufficient, reliable and affordable energy supplies for all Rwandans;

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11 Republic of Rwanda Ministry of Environment, Forests, Water and Mines, 2004. National Land Policy.

12 Republic of Rwanda Ministry of Infrastructure, 2015. Rwanda

13 Republic of Rwanda Ministry of Infrastructure, 2015. Energy Sector Strategic Plan.

- Creating an enabling environment for increased private sector participation in energy supply and service provision;
- Encouraging and incentivizing more rational, efficient use of energy in public institutions, and amongst industrial and household end-users;
- Ensuring the sustainability of energy exploration, extraction, supply, and consumption so as to prevent damage to the environment and habitats;
- Promoting safe, efficient, and competitive production, procurement, transportation, and distribution of energy;
- Developing the requisite institutional, organisational, and human capacity to increase accountability, transparency, national ownership and decentralized implementation capacity for sustainable energy service delivery.

As the Proposed Project will be relying on energy/ electricity during the construction and operation phases, cognisance must be taken of the requirements and objectives of the National Energy Policy.

### 3.2.5 The National Policy for Water Supply and Sanitation Services<sup>14</sup>, 2010

The overarching objectives of the water supply and sanitation sector is to ensure sustainable and affordable access to safe water, sanitation and waste management services for all, as a means of contributing to poverty reduction, public health, economic development and environmental protection. The specific objectives include:

- To raise rural water supply coverage to 85% by 2012 and 100% by 2020 by assisting the Districts to plan, design, finance and implement infrastructure projects;
- Ensure sustainable functionality of rural water supply infrastructure by developing effective management structures and well-regulated public-private partnership (PPP) arrangements;
- Ensure safe, reliable and affordable urban water supply services for all (100% service coverage by 2020) while strengthening the financial viability of the utility;
- To raise household sanitation coverage to 65% by 2012 and 100% by 2020, and promote hygiene behaviour change;
- To develop safe, well-regulated and affordable offsite sanitation services (sewerage and sludge collection, treatment reuse/ disposal) for densely populated areas;
- Implement integrated solid waste management in ways that are protective to human health and environment; and
- Develop the sector's institutional and capacity building framework.

The Proposed Project will need to take cognisance of these objectives in assisting 100% supply of potable water to citizens within the area by 2020.

### 3.2.6 The Rwanda Development Vision, 2020

Rwanda's Development Vision 2020 (hereafter referred to as 'Vision 2020') was launched in 2000 and *"seeks to fundamentally transform Rwanda into a middle income economy by the year 2020"* (Republic of Rwanda, 2000<sup>15</sup>). The programme goals include:

- Good governance;
- An efficient state;
- Skilled human capital, including education, health and information technology;

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<sup>14</sup> Republic of Rwanda Ministry of Infrastructure, 2010. National Policy and Strategy for Water Supply and Sanitation Services  
<sup>15</sup> Republic of Rwanda Ministry of Finance and Economic Planning, 2000. Rwanda Vision 2020.



- A vibrant private sector;
- Developing world-class physical infrastructure; and
- Modern agriculture and livestock management.

The Proposed Project complies with Vision 2020 as the airport will aid to world-class infrastructure and upskilling previously unskilled labour.

### 3.2.7 The Public Transport Policy of Rwanda<sup>16</sup>, 2012

One of the targets of the transport sector based on the Economic Development Poverty Reduction Strategy<sup>17</sup> (EDPRS) of Rwanda is to reduce constraints in transportation services in order to promote sustainable economic growth and contribute to poverty reduction. The main aim of the policy is therefore to reduce traffic congestion, energy use and pollution, thereby increasing mobility and accessibility of people and goods through the development of an appropriate public transportation system. This in turn will contribute more efficiently to the growth of the national economy, economic development and poverty reduction.

The specific objectives include the following:

- To assess the current traffic situation of the transport system (air and land transport) for Rwanda;
- To suggest a number of alternative integrated public transport development strategies to alleviate the most urgent problems related to operational management;
- To suggest an appropriate operations and management system for public transport;
- To recommend a comprehensive legal, regulatory and financial framework for the recommended public transportation system;
- To implement a Land Use Plan for Transit Orientated Development;
- To develop a standard mass transit system for the city of Kigali; and
- To adopt integrated traffic demand and private transport restraining strategies for urban public transport in general, and for the city of Kigali in particular.

The Proposed Project will need to take cognisance of the policy during the construction and development of the Expressway. Environmental, social and cultural heritage impacts will be assessed as part of the Proposed Project for NBIA and the Expressway.

### 3.2.8 The National Forestry Policy<sup>18</sup>, 2010

The overall goal of this policy is to promote the forestry sector as one of the bedrocks of the economy and national ecological balance for sustainable benefits to all segments of the society. The objectives of the policy include:

- To encourage the participation of the private sector to invest in the forest sector for poverty reduction, employment creation and improvement of livelihood through sustainable use, conservation and management of forests and trees;
- To contribute to sustainable land use through soil, water and biodiversity conservation, and tree planting through sustainable management of forests and trees;
- To strengthen the participation of communities and other stakeholders in forest management, to conserve water catchment areas, forest biodiversity and ensure sustainability to the forest sector;

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<sup>16</sup> Republic of Rwanda Ministry of Infrastructure, 2012. Public Transport Policy and Strategy of Rwanda

<sup>17</sup> Republic of Rwanda Ministry of Finance and Economic Planning, 2013. Economic Development and Poverty Reduction Strategy II 2013 – 2018.

<sup>18</sup> Republic of Rwanda Ministry of Forestry and Mines, 2010. National Forestry Policy.

- To promote farm forestry to produce timber, wood fuel and to supply wood and non-wood forest products; and
- To promote forest research, training and education to ensure a vibrant forestry sector.

Although the Proposed Project is not located within a recognised forestry area, a large area of vegetation and trees has been cleared. Specific aspects of the policy will need to be considered as part of the ESIA process.

### 3.2.9 The Rwanda Wildlife Policy, 2013

Sustainable management of wildlife resources depends on sound principles, clear policies and guidance, based on those principles, and the quality of decisions that stem from their consistent application. The wildlife conservation goals set out in the policy are closely harmonised with other National Development Goals such as the Vision 2020 and EDPRS. The policy also supports and compliments other sector policies, in particular, the environment, biodiversity, forestry and water policies.

The Rwanda Wildlife Policy<sup>19</sup> is based on the following overarching philosophical frameworks, recognising that:

- Wildlife is a national heritage and vital component of Rwanda's biological diversity;
- Wildlife is the cornerstone of Rwanda's tourism sector, a major contributor to the Gross Domestic Product (GDP) and has the potential to contribute to the wellbeing of the country's people;
- Wildlife, its habitats and ecosystems constitute a fundamental natural capital and provide services that are essential for life and sustainable development of the country;
- Correct utilisation of wildlife resources and the protection and management of ecosystems are essential for sustainable and equitable development;
- Steps must be taken to stem the rapid decline of wildlife populations and associated habitats;
- A balance must be established between national development needs and wildlife conservation in order to ensure long term sustainability; and
- The goal and guiding principles underpinning the Vision 2020, the Environment and Biodiversity Policies and the value of wildlife resources as a national asset contribute to the sustainable development of the national economy.

The goal of this policy is therefore to provide a framework for conserving, in perpetuity, the country's wildlife, rich diversity of species, habitats and ecosystems for the wellbeing of the people of Rwanda and the global community.

Although the Proposed Project does not traverse any national or wildlife reserves, impacts to wildlife and associated ecosystems are anticipated and therefore the ESIA will need to comply with the objectives of the policy.

### 3.2.10 The National Policy on HIV/AIDS, 2003

The National Policy against HIV and AIDS is an expression of the GOR's commitment through strategies to reduce risk, impact and vulnerability on the citizens of the country. This expression of commitment is proof of the government's determination to preserve the Rwanda population, resident foreigners and visitors to Rwanda from HIV/ AIDS. This has resulted in the development and implementation of the National Rwanda Policy and the National Strategic Plan against HIV/ AIDS, to which the government is strongly committed.

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<sup>19</sup> Republic of Rwanda Ministry of Trade and Policy, 2013. Rwanda Wildlife Policy.

The objective of the policy is to provide guidance for the implementation of the national strategic plan that is structured on the following:

- To reinforce measures for the prevention of HIV and AIDS transmission;
- To ensure that the national response to HIV and AIDS is adapted to Rwanda's evolving socio-economic and health conditions by using surveillance, research and experience;
- To improve HIV and AIDS related treatment for persons infected and affected by HIV and AIDS;
- To reduce the detrimental effects of HIV and AIDS on Rwanda's micro and macro socio-economic conditions; and
- To coordinate multi-sector response with increased efficiency.

The Proposed Project will involve relocation of communities as well as construction activities which will provide potential job opportunities, resulting in an influx of people to the area and promote interactions between people and communities. The policy will be considered during the ESIA process and mitigation/ management measures will be developed to promote the objectives of the policy.

#### 3.2.11 The Rwanda Tourism Policy<sup>20</sup>, 2009

The overall objective of the policy is to promote and increase tourism revenues in a sustainable manner, generate profits for re-investment and job creation. This will be achieved through the development of new distinctive market-led products that will be positioned to promote sustainable tourism. This will result in spatial and socio-economic balance to the distribution of tourism benefits. This includes environmental, social and economic elements for sustainable development.

The policy provides for a resource base that supports tourism and that an environmental assessment must be conducted prior to permitting development activities to occur which may affect the tourism industry. The Proposed Project will result in additional flights into the country, resulting in an increase of visitors and therefore boosting tourism in the region.

#### 3.2.12 The Occupational Safety and Health Policy, 2006

The policy provides for strategy objectives, scope, guiding principles, policy strategies, coordination and alignment of institutional roles and activity strategy, harmonisation of legislation and standard strategies, inspection strategies, preventive measures, skills development and competent strategies, and integrated information system strategies. The policy provides guidelines to cover areas that support the development and implementation of an effective occupational, health and safety systems.

#### 3.2.13 The National Strategy for Growth and Reduction of Poverty (NSGRP II), 2010

Rwanda's EDPRS<sup>21</sup> provides a medium term framework for achieving the country's long term development aspirations as embodied in the Vision 2020, the Seven Year Government of Rwanda Programme and the Millennium Development Goals. The EDPRS aims to consolidate and extend the achievements in human development while promoting three flagship programmes; Sustainable Growth for Jobs and Exports, Vision 2020 and Good Governance. The flagship programmes are the means through which Rwanda is prioritising public spending and improving coordination across its sectors to achieve the joint goals of stronger growth, faster poverty reduction and a better governed country.

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<sup>20</sup> Republic of Rwanda Ministry of Trade and Industry, 2009. Rwanda Tourism Policy.

<sup>21</sup> Republic of Rwanda Ministry of Finance and Economic Planning, 2013. Economic Development and Poverty Reduction Strategy II 2013 – 2018.

The EDPRS incorporates a number of cross-cutting issues including HIV/ AIDS, gender and social inclusion as well as youths. Significant work has been done on mainstreaming HIV/ AIDS and gender issues through government policy and planning. The focus is to mainstream environmental policies at all government levels. Better environmental management will improve livelihoods, health and wellbeing and contribute to sustainable economic growth.

### 3.3 Legal Framework

The Proposed Project will generate several activities that would have to comply with various national laws and regulations. Some of these laws are discussed below as part of the ESIA process.

#### 3.3.1 The Constitution of the Republic of Rwanda, 2003 (Revised in 2015)

The Constitution of the Republic of Rwanda<sup>22</sup> ensures the protection and sustainable management of the environment and encourages the rational use of natural resources.

Article 8 provides that the national language in Rwanda is Kinyarwanda and the official languages are Kinyarwanda, English and French. It also mandates the organic law to add or remove an official language and mentions that the Official documents may be either in one, two or all of the official languages.

Article 10 on fundamental principles states that the state of Rwanda commits itself to upholding the fundamental principles and ensuring their respect including among others the eradication of discrimination and divisionism based on ethnicity, region or on any other ground as well as promotion of national unity.

Article 22 requires that everyone has the right to live in a clean and healthy environment.

Article 53 specifies that everyone has the duty to protect, safeguard and promote the environment. The state ensures the protection of the environment.

The Proposed Project is complying with the provisions of the Constitution of the Republic of Rwanda.

#### 3.3.2 Organic Law No. 04/2005<sup>23</sup>

The legislative framework for environmental management establishes modes of protecting, safeguarding and promoting the environment in Rwanda. This law governs the environment in the broadest sense of the term, including lands, agriculture, forests, water, biodiversity, etc. It focuses on the following principles:

- The whole population must contribute to the protection and efficient management of the environment and all its components;
- Particular emphases must be put on education and sensitisation on environment preservation at all levels, especially among women and the youth;
- Prevention rather than rehabilitation must be seen as priority;
- Impact studies must be efficiently conducted before any activity is undertaken in wetland and steeply sloping lands;
- The principle of fair sharing of benefits from efficient environment conservation and resources sharing must be respected and explained to all people concerned; and

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<sup>22</sup> Republic of Rwanda, 2015. The Constitution of the Republic of Rwanda of 2003 Revised in 2015. Official Gazette No Special of 24/12/2015

<sup>23</sup> Republic of Rwanda, 2005. Organic Law No 04/2005 of 08/04/2005 Determining the Modalities of Protection, Conservation and the Promotion of the Environment in Rwanda. Official Gazette of the Republic of Rwanda.

- Advantages of local, national, regional and international interdependence drawn from efficient environment management must also be explained and made understood to all the people countrywide.

There are also decrees, statutory instruments and ministerial orders which constitute important legal tools in Rwanda, and they concern mainly the prohibition of the use of plastic bags, cutting and selling trees, organisation of forest regulations, underground waters, lakes and streams and their usage, pollution and contamination of springs, lakes, streams, public hygiene and safety, city and country planning, soil conservation and usage, etc.

The ESIA process is being conducted to comply with the requirements of the Organic Law No. 04/2005.

### 3.3.3 General Guidelines and Procedures for Strategic Environmental Assessment (SEA), 2011<sup>24</sup>

Organic Law No. 04/2005 and its Regulations in the form of Ministerial Orders are implemented through Law No. 16/2006 of 3rd March 2006 that established REMA as the regulating agency and determined its organisation, function and responsibilities. Following its legal mandate, REMA (2006) has put in place environmental management tools and guidelines.

Principle 1 of Article 7 in the Organic Law 04/2005 stipulates precautionary measures that are informed by the results of both, an environmental assessment of policies, plans, projects and development activities as well as an assessment of social wellbeing.

### 3.3.4 Law No. 18/2007 Relating to Expropriation in the Public Interest<sup>25</sup>

This law determines the procedures relating to expropriation that is in the public interest. Accordingly, only the GOR shall carry out expropriation. Expropriation as provided for in this law shall be carried out only in the public interest and with prior and just compensation. No person shall hinder the implementation of the programme of expropriation under the pretext of self-centred justifications.

No landowner shall oppose any underground or surface activity carried out on his or her land with an aim of public interest. In case it causes any loss to him or her, he or she shall receive just compensation. Every project at any level, which intends to carry out acts of expropriation in public interest, shall provide funds for the inventory of assets of the person to be expropriated and for just compensation in its budget.

According to Article 5, acts of public interest include, but not limited to:

- Airports and airfields;
- Roads and railway lines;
- Electric and communication lines;
- Water sewage and treatment plants;
- Waste treatment sites;
- Biodiversity, cultural and historical reserved areas;
- Valuable minerals and other natural resources in the public domain; and
- Basic infrastructure and any other activities aimed at public interest not indicated on this list.

It is understood that resettlement has been concluded within the Airport Area; however, expropriation and/or resettlement will still be required along the Expressway and Water Pipeline.

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<sup>24</sup> REMA, United Nations Rwanda and UNDP, 2011. General Guidelines and Procedures for Strategic Environmental Assessment (SEA)  
<sup>25</sup> Republic of Rwanda, 2007. Law of No 18/2007 of 19/04/2007 Relating to Expropriation in the Public.

### 3.3.5 The HIV and AIDS (Prevention and Control) Act, 2008

This act provides for the prevention, treatment, care, support and control of HIV and AIDS, for the promotion of public health in relation to HIV and AIDS in order to provide for appropriate treatment, care and support using available resources to people living with or at risk of HIV and AIDS, and to provide for related matters.

### 3.3.6 The National Forestry Act, 2002

The National Forest Act provides for the management of forests. This act deals with the protection of forests and forest products and restrictions and prohibitions in forest reserves. Although the Proposed Project will not impact on any national forest, clearing vegetation associated with the Proposed Project will need to be conducted responsibly in line with the act.

### 3.3.7 The Rwanda Tourism Industry Act, 2009

In order to implement the Tourism Policy, an enabling act has been developed and has provisions for the protection of tourists and visitors, for the regulation of hotels and other tourist enterprises and services, for the limitation of hotelier liabilities and other matters connected therewith and incidentals thereto, thus impacting positively on the development of tourism within the country. The tourism legislation is accompanied by regulations governing the registration and grading procedures and requirements. The development of the Proposed Project will have to abide by the provisions of this act.

### 3.3.8 The Water Resources Management Act, 2014

Water is a strategic natural resource for Rwanda, underpinning the country's socioeconomic development and ecosystem sustenance. The hills and valleys that produce food year round and attract international tourists are sustained by water. Rwanda's water is also a strategic tool for Rwanda's geo-political cooperation and security. All of Rwanda's waters are shared, due to its upstream location in the Nile and Congo River Basins.

In Vision 2020, the GOR has rolled out a comprehensive programme to transform Rwanda to a medium income country with a healthy and productive population. As part of the programme, the strategic exploration and productive utilisation of water resources through such uses as hydropower production and irrigation is expected to increase. Furthermore, the GOR intends to supply clean water to all Rwandans, while supporting industrialisation.

The main challenge to Vision 2020 is meeting the increased demand for water in the face of a decline in water quantity and quality. This has been particularly pronounced in various EDPRS-linked investments. A coordinated mechanism to manage water demand and regulate the use of water resources among competing demands has been emphasised by most stakeholders. An Integrated Water Resource Management (IWRM) strategy is expected to provide impetus to realise Rwanda's 2017 targets and Vision 2020 aspirations.

The Water Resource Management Act provides for the application and management of water resources in accordance with:

- The principle of precaution aiming at preventing serious and irreversible risks for water resources, through the adoption of efficient measures;
- The principle of prevention of pollution, with priority to the source;
- The principle *"user-payer and polluter payer"* according to which the user of water and the polluter support a significant part of expenses resulting from measures of prevention, pollution reduction and restoration of the resource in quality and quantity;
- The principle of users' association for the administrative management of water; and

- The principle that users of the public distribution services of drinking water and sanitation should play a major role in these services provided to them, according to the contributory capacity of users.

The Proposed Project will require water during the construction and operation phases. The provisions of this act are relevant in ensuring water resources are sustainably utilised.

### **3.4 International and Regional Conventions, Treaties and Guidelines**

Rwanda has signed and ratified a number of international conventions and treaties that commit the country to the conservation and protection of biological and environmental resources. The Proposed Project, particularly with respect to project design and management, will need to take into account such conventions. Some conventions that are relevant to the program process include the following:

- The International Convention on Biological Diversity: Rwanda ratified the Convention on Biological Diversity (CBD) of June 1992 on March 18, 1995, and has taken steps to ensure conservation and use of these resources in judicious ways. Biological resources in Rwanda are facing a significant threat from unsustainable utilisation, including the increased poaching of wildlife. It is important to ensure the basic principles of this Convention are adhered as part of the Proposed Project and in all stages of the specific project development.
- The United Nations Convention Framework on Climate Changes, 1992: Rwanda ratified this convention on August 18, 1998.
- The Vienna Convention for the Protection of Ozone Layer, 1985, and the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987: Rwanda ratified both on December 6, 2000.
- Stockholm Convention on Persistent Organic Pollutants (POP), 2001: This was adopted and ratified by the Presidential Order No 78/01 of July 8, 2002.

### **3.5 International Standards**

Relevant international standards and guidelines are listed below:

- In addition, general good international environmental, health and safety (EH&S) practice, best available techniques (BAT) and best environmental practice will be adapted;
- IFC Performance Standards, 2012;
- IFC Environmental, Health and Safety Guidelines for Airports;
- World Bank Group Guidelines - Pollution Prevention and Abatement Handbook 1998;
- Equator Principles III, 2013;
- International Standards Organisation ISO14001 and OHSAS18001 management system standards;
- ICAO – safety and environmental requirements;
- IATA Standards; and
- African Development Bank Group Integrated Safeguards System.

The IFC Performance Standards (2012) (IFC PSs) set out the standards that the project owner is required to meet throughout the life of an investment. There are eight IFC PSs as follows:

- PS 1 Assessment and Management of Environmental and Social Risks and Impacts;
- PS 2 Labour and Working Conditions;
- PS 3 Resource Efficiency and Pollution Prevention;
- PS 4 Community Health, Safety and Security;
- PS 5 Land Acquisition and Involuntary Resettlement;
- PS 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources;

- PS 7 Indigenous Peoples; and
- PS 8 Cultural Heritage.

The IFC has a recommended project screening process to decide on the nature and extent of the environmental and social assessment needed for a project. Projects are categorised by the IFC Environment Division into environmental review Category A, B, C, or Financial Intermediary (FI) in accordance with the IFC's OP 4.01, Environmental Assessment. The classification of a project depends on the type, location, sensitivity and scale of the project, as well as the nature and magnitude of its potential impacts. IFC uses four categories for its projects. They are defined as follows:

- *Category A: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These projects may affect an area broader than the sites or facilities subject to physical works. Environmental Authorisation (EA) for a Category A project examines the project's potential positive and negative impacts, compares them with those of feasible alternatives (including the "without project" scenario), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and to improve performance. For a Category A project, the project sponsor is responsible for preparing a full report, normally an Environmental Impact Assessment (EIA) and for preparing and updating an Environmental Action Plan (EAP).*
- *Category B: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas – including wetlands, forests, grasslands, and other natural habitats – are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of EA for a Category A project. Like Category A EA, it examines the project's potential positive and negative impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The project sponsor is responsible for providing the required environmental and social information. The findings and results of Category B EA are described in the project documentation (i.e. Environmental Review Summary).*
- *Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.*
- *Category FI: A proposed project is classified as Category FI if it involves investment of IFC funds through a financial intermediary in subprojects that may result in adverse environmental impacts. In addition, in some financial markets projects IFC funds are not targeted to specific subprojects (e.g. equity in a financial institution such as a commercial bank), but the financial institution has operations which may have adverse environmental impacts (e.g. project finance). In such cases IFC may also classify the project as Category FI. If subprojects potentially result in minimal or no adverse environmental impacts, the project is characterized as C."*

According to the guidance, airport developments fall within Category A. Therefore a comprehensive and transparent ESIA will need to be conducted to quantify impacts in order to develop mitigation measures to minimise significant risks associated with the Proposed Project.



## 4. ANALYSIS OF ALTERNATIVES

### 4.1 Introduction

The IFC Performance Standards on Social and Environmental Sustainability specify the requirements for the assessment of feasible alternative configurations for a project:

*“For greenfield developments or large expansions with specifically identified physical elements, aspects, and facilities that are likely to generate potential significant environmental or social impacts, the client will conduct a comprehensive Environmental and Social Impact Assessment, including an examination of alternatives, where appropriate.”*

*“For greenfield developments, the ESIA includes an examination of technically and financially feasible alternatives to the source of such impacts, and documentation of the rationale for selecting the particular course of action proposed. The purpose of the alternatives analysis is to improve decisions on project design, construction, and operation based on feasible alternatives to the proposed project. This analysis may facilitate the consideration of environmental and social criteria at the early stages of development and decision-making based on the differences between real choices. The alternatives analysis should be conducted as early as possible in the process and examine feasible alternatives; alternative project locations, designs, or operational processes; or alternative ways of dealing with environmental and social impacts”*

This section explores the main alternatives considered by BAC and previously, and gives an indication of the main reasons for the selection of the current location.

During the analysis of alternatives, the following topics were considered:

- Alternative modes of transportation;
- Possible alternative locations for a new airport; and
- No action alternative.

Furthermore, in accordance with Rwandan Organic Law No. 04/2005 of 08/04/2008, possible alternatives should be identified and environmental attributes compared. Alternatives should cover both project location and process technologies. It must be noted that the impacts associated with the location and technical alternatives associated with the Proposed Project will not be quantified as the GOR has, as defined in the following sections, identified a location for the Proposed Project. Furthermore, BAC has contracted airport engineers (ACV) who has designed the NBIA to international standards.

### 4.2 The Need for a New Airport

The development of the Proposed Project was influenced by the decision that the existing KGL is unable to support the air travel needs of Rwanda in the near future due to rapid development within the country.

KGL is the main international airport in Rwanda and it is located in the suburb of Kanombe, at the eastern edge of Kigali. The passenger traffic at KGL is growing rapidly. In 2004, the airport served 135,189 passengers, in 2013 this increased to nearly 600,000 passengers, and then to 710,000 in 2016, with the airport designed to handle only 400,000 passengers per year.

KGL does not have space for the construction of additional runways or facilities. Therefore, proposals for a new airport were put forward to replace KGL to accommodate the additional passenger traffic. KGL will remain operational for military purposes.

The need for the Proposed Project is also influenced by Rwanda's stable political systems, stable economic development, increased tourism volumes, high passenger growth rates driven by international traffic, not affected by seasonal demand and that Rwanda has available land for development, taking cognisance of international standards and best practice.

The Proposed Project will target additional regions in view of commencing direct long-haul flights to West Africa, Southern Africa, Eastern Africa and Gulf destinations. This will result in the NBIA becoming a major hub for transit passengers, freight and cargo. The NBIA will also better position the country as a leisure and business destination as well as an Information and Communication Technology and mining/manufacturing hub in central Eastern Africa.

Through the development of the NBIA, the home carrier, RwandAir, which currently has the capacity of 13 aircraft fleet housed at the KGL, will increase to a total fleet of 20 aircraft enabling non-stop long-haul services to the USAQ, China, India and Europe. RwandAir will also expand codeshare partners to Kenya Airways, South African Airways, Turkish Airlines, China Southern, Oman Air and Etihad.

#### **4.3 Alternative Modes of Transportation**

There are no alternatives to the Proposed Project that will fulfil the functions of providing relatively fast, cheap transportation. Road, rail and water transport are not suitable substitutes for an airport. Rwanda is a landlocked country with no waterbody present that can be used as a mode of transport. Furthermore, there is a limited railway transport system in the country. Road transportation is the only possible means but this is an inefficient alternative over long distances. Alternatives for the Expressway are discussed in Section 4.6.

#### **4.4 Possible Alternative Locations for a New Airport**

The Proposed Project location has been selected for its relatively flat topography in a country where there are many undulating hills and slopes.

There was one other site identified during the pre-feasibility stage for the Draft ESIA (2010); however, this was rejected for the following reasons:

- The distance to and from Kigali was more than 70 km;
- Less favourable topography on the site; and
- Site was the smaller of the two sites.

The site for the Proposed Project was selected by a committee of technical representatives from the various ministries of the GOR in 2008, primarily based on the comparatively flat topography, distance to Kigali and relatively low density of inhabitants.

#### **4.5 No Action Alternative**

Based on the increasing trend in air traffic passenger numbers arriving or transiting through KGL, the airport is currently operating beyond its limited capacity with insufficient space for expansion and therefore unable to cater for the increasing demand. Without the Proposed Project, the people of Rwanda would still need to be served by KGL. As this would limit Rwanda's air-traffic potential, it was considered unfeasible to take no action to further increase airport capacity to accommodate this rising trend. Furthermore, with an increase of air traffic into the KGL, the potential of ICAO and IATA safety risks will increase resulting in anticipated incidents and accidents with the current airport.

#### **4.6 Expressway Alternatives**

Existing national roads servicing Rwanda, although bitumen surfaced, rarely comprise dual-lane carriageways that can accommodate the increasing traffic demand and load volumes from heavy-vehicles. National roads also lack lighting at populated areas such as villages which pose safety risks to the communities.

Currently, the Proposed Project can be accessed via the KK-15 Road and an unsurfaced road of approximately 9 km from Nyamata. This road will be used during construction activities until the

Expressway has been completed. This route covers a distance of 46 km from the Airport Area. This will entail BAC to upgrade 37 km of the KK-15 Road as well as the unsurfaced road from Nyamata to the Airport Area. This is considered less feasible than developing the Expressway and will require greater distances to be travelled from the airport to Kigali.

The Expressway is a key transportation infrastructure that the Rwanda Ministry of Transportation intends to invest in the near future, linking the NBIA to the existing KK15 road, between Nyamata and Kigali.

The base data can be summarised as follows:

- Start point, immediately south of the Nyabarongo bridge, over the Akagera River;
- End point, precisely located at the southwest roundabout of the airport main square;
- Base design speed of 80 km/h;
- Typical cross section with one lane in each direction, plus shoulders, with a total width of 9 m; and
- Level links, both at the start and end points and on intermediate links to existing, unpaved roads that cross the Expressway alignment.

The data available derives from general knowledge of the Proposed Project Area and a site visit to assess the basic environment characteristics; mostly flat or gently sloped terrain, used for agriculture, and a stretch of marshland that can be flooded and has to be crossed by the Expressway.

The selection of the road corridor was primarily based in principles of value engineering and environmental mitigation, seeking to preserve, as much as possible, the local infrastructures, social context, fauna and flora, landscape, all this without the prejudice for the Expressway's serviceability and functionality. The primary decision in selecting the Expressway route was to reduce earthworks volumes and balance fills and excavations. Furthermore, the Expressway route was also considered based on the following:

- The longitudinal section is considered to be moderately uniform;
- Minimise disruption to the existing KK-15 Road by linking up to the Expressway at an existing roundabout, located east of the K-15 Road;
- The Expressway elevation, along the swamp branch, is also protected from the Akagera flood's maximum level;
- Expressway alignment was designed to minimise the number of swamp/marshland crossings and reduce its length. The alignment was designed to cross the swamp perpendicularly thereby achieving the smallest crossing of 550 m. In order to reduce stream flow, a main box culvert and lateral pipes will be installed; and
- No regional or district road cut the proposed Expressway route.

Therefore, the Expressway is considered the most suitable alternative.

## 5. STAKEHOLDER ENGAGEMENT

### 5.1 Introduction

The stakeholder engagement process has been, and will continue to be, undertaken by Ramboll Environ and NEWPLAN, with support from BAC and Mota-Engil, in a comprehensive and transparent manner. Initial stakeholder engagement was conducted as part of the Draft ESIA (2010) and additional meetings were held with a number of statutory consultees and regulators during 15 to 19 May 2017. The aim of the stakeholder engagement is to provide background and any updated information about the Proposed Project to interested and/or affected parties, the community and stakeholders in order to obtain their views and opinions about the project. The output will be incorporated in the identification of impacts, mitigation measures and in the development of a Resettlement Action Plan for the Expressway.

As resettlement has been conducted over the Airport Area, a post-resettlement audit will be conducted and consider Rwandan requirements and compliance with the IFC Performance Standards. This will be undertaken in a step by step approach by first establishing and assessing the work that has been undertaken by MINIFRA. Additional requirements for resettlement will include the routes along the Expressway, Water Pipeline and quarry road.

### 5.2 National Requirements and International Standards

The stakeholder engagement activities will be conducted in accordance with:

- Rwandan regulatory requirements for preparation of ESIA Reports; and
- IFC PS1 Assessment and Management of Environmental and Social Risks and Impacts.

#### 5.2.1 National Rwanda Requirements

Rwandan practice regarding stakeholder engagement in a development context is exemplified by the provisions of the Rwanda National Human Settlement Policy, 2009<sup>26</sup>. Its requirements on stakeholder engagement are geared to ensuring that affected persons participate during consideration and development of a project and their views understood before the implementation of a project. These requirements include:

- Development planning shall be integrated, participatory, evidence-based, and focused on addressing the priority needs of citizens, taking into consideration, the overall national development vision;
- Community participation is essential for the improvement of human settlements, meeting needs and priorities, ensuring that beneficiaries agree with the development objectives and cooperate in their implementation, establishing procedures corresponding to resources, capacities and priorities and creating the feeling of accountability among the people; and
- All the economic players (public sector, private sector, Non-Government Organisations (NGOs) and households) are required to take an active part in the planning and establishment of sustainable human settlement.

Rwandan EIA legislation and implementing guidelines<sup>27</sup> contain specific provisions regarding stakeholder engagement and the EIA process. In the Guidelines it is stated that, *"...from a social standpoint, EIA incorporates interests of public and private stakeholders, residents and communities in the planning and approval process of projects."* The Guidelines are not detailed, but the intent is clear. Stakeholders, including communities, are to be consulted early in the ESIA

<sup>26</sup> Republic of Rwanda Ministry of Infrastructure, 2009. Updated Version of the National Human Settlement Policy in Rwanda.

<sup>27</sup> In Rwanda there is a requirement to undertake an EIA to meet national laws and regulations. In the case of the Proposed Project, an ESIA will be undertaken to meet these national requirements as well as international standards.

process; especially during scoping phase by the developer for submission to REMA for review and approval. Stakeholders can also be consulted at other times during the ESIA process and, particularly, play a role, in advising, *"... project developers and REMA on approaches to avoid, minimise or compensate for adverse environmental impacts."*

ESIA Reports and accompanying ESMPs will be submitted to REMA, which is mandated to consult with other government entities (by providing them with copies of the ESIA Report and ESMP for review and comment). REMA is also responsible for organising and implementing public hearings as an input to the 'approval' process for a project. Public hearings are thus the main mechanism for community stakeholders to be involved as part of the ESIA process.

Local governments also play an important role in the local-level aspects of managing the public hearings and in conveying local stakeholder comments on both the project and the disclosed ESIA Report and ESMP to REMA. Few details are provided on how this should be done by local governments. Project developers do not play a lead role; however, they are expected to participate in all public hearings.

### 5.2.2 International Finance Corporation Standards

IFC Performance Standard 1 (PS 1) sets out the following objectives/actions with regard to stakeholder engagement:

- *"To identify the range of stakeholders that may be interested in project activities and to facilitate a dialogue with them through a process of external communications;*
- *To promote and provide means for adequate engagement with Affected communities and to ensure that relevant environmental and social information is disclosed and disseminated;*
- *To provide Affected communities with access to relevant information on: (i) the purpose, nature, and scale of the project; (ii) the duration of proposed project activities; (iii) any risks to and potential impacts on such communities and relevant mitigation measures; (iv) the envisaged stakeholder engagement process; and (v) the grievance mechanism;*
- *To undertake a process of consultation in a way that provides the Affected communities with opportunities to express their views on project risks, impacts and mitigation measures, and allows the client to consider and respond to them;*
- *To take account of the results of the engagement process with Affected communities and other stakeholders in the identification of risks and impacts associated with the project; and*
- *To establish a Grievance Mechanism to receive and facilitate resolution of stakeholders' concerns and complaints about a client's environmental and social performance".*

For projects with potentially significant adverse impacts, IFC recommends conducting an Informed Consultation and Participation (ICP) process that will result in the Affected Communities' informed participation. This process should be documented, in particular the measures taken to avoid or minimise adverse impacts on Affected Communities, to inform those affected about how their concerns have been considered. The stakeholder engagement actions, presented in a draft Stakeholder Engagement Plan (SEP), aim to provide outcomes consistent with the ICP process. The SEP is a live document and will be amended to ensure consultation is conducted in a comprehensive, independent and transparent manner at all times.

The draft SEP has been developed for the Proposed Project in terms of the IFC standards which is continually being updated and implemented in an independent and transparent manner.

### 5.3 Stakeholder Identification and Analysis

#### 5.3.1 Stakeholder Identification

IFC PS1 defines stakeholders as: *"...persons, groups or communities external to the core operations of a project who may be affected by the project or have interest in it. This may include individuals, businesses, communities, local government authorities, local nongovernmental and other institutions, and other interested or affected parties".*

In line with the principles of IFC PS1, stakeholders are divided into two types:

- *"Affected communities – persons, groups and other entities within the Project Area that are directly influenced (actually or potentially, positively or adversely) by the Project and/or have been identified as most susceptible to change associated with the Project, and who need to be closely engaged in identifying impacts and their significance, as well as in decision-making on mitigation and management measures; and*
- *Non-community stakeholders who may be able to influence decisions on the Project, or have an interest in the project".*

In order to conduct an effective stakeholder engagement process, it is necessary to identify stakeholders and understand their needs and expectations for engagement, and their priorities and objectives in relation to the Proposed Project. This information is then used to tailor engagement to each type of stakeholder. As part of this process, it is particularly important to identify individuals and groups who may find it more difficult to participate and those who may be differentially or disproportionately affected by the Proposed Project because of their marginalised or vulnerable status.

Identifying stakeholders is a continual process. It should be noted that this document focuses on stakeholders who do not have formal relationships with BAC and the Proposed Project and who, as a result, may wish to use this document for information and guidance. Mechanisms for engagement with customers, contractors, shareholders and lenders, with which BAC has regular contact in the course of its business, are not addressed in this document.

Stakeholders identified to date, based on previous stakeholder engagement, primarily for the Draft ESIA (2010) and the results of a site visit undertaken the week of 15 May 2017 by members of the ESIA team, are categorised and listed below.

#### 5.3.2 Affected Communities

Affected communities are those communities located within the vicinity of:

- The Proposed Airport Footprint;
- The Expressway;
- Water Pipeline route;
- The quarry road;
- The temporary construction and permanent operation phase water supply systems (abstraction, transfer and treatment facilities);
- Overhead transmission lines; and
- Flight paths.

To assist with the initial identification of these communities, a set of 'distance' criteria will be applied to determine the number of Affected Communities. Affected Communities are defined as being those distinguishable settlements (by law, or by name, or by recognition of local people or all three of these criteria) located within areas bounded by a:

- 10 km radius from the centre point of the airport site;

- 3 km radius from the centre point of the quarry site and a 2 km corridor, based on 1 km either side of the centre-line of the upgrade of the quarry road;
- 2 km wide corridor based on 1 km either side of the centre-line of the Expressway; and
- 1 km corridor, based on 500m either side of the centre-line of the temporary Water Pipeline right-of-way and a 2 km radius based on the water abstraction facility.

Boundaries will also need to be set for the eventual Associated Facilities which will comprise a permanent overhead transmission line and a water supply pipeline.

A number of Proposed Project elements, such as the equipment laydown/service areas and the water treatment facility are all located within the Proposed Project Area. Therefore, Affected Communities 'captured' by the airport distance criterion will include all those communities in the vicinity of these specific Project elements. Using this approach ensures that all Affected Communities will be identified and it will show which communities will be affected by more than one Proposed Project element.

An indicative list of potentially affected sectors and cells and their associated stakeholder categories is provided in Table 5-1. As expected there is overlap insofar as potentially affected sectors and cells can be identified as being potentially affected by one or more of the Proposed Project components. Specific identifiable settlements/communities will be identified as part of the social baseline work. Therefore, the number of potentially affected communities to be consulted will be fewer than indicated by the list in Table 5-1 due to 'duplication' of sectors and cells.

Table 5-1: Indicative List of Affected Communities and Stakeholder Categories	
Affected Communities	Stakeholder Categories
<p>Proposed Airport Area:</p> <ul style="list-style-type: none"> <li>• Rilima Sector, including Nyabagendwa, Kirimaranzara, Karera and Kabeza Cells</li> <li>• Nyamata Sector, including Murama, Kayumba, Nyamata, Maranyundo and Kananzi Cells</li> <li>• Mwogo Sector, including Rugunga, Kagasa, Rurenge and Bitama Cells</li> <li>• Juru Sector, including Kabukuba, Musovu, Rwinume and Juru Cells</li> <li>• Gashora Sector, including Kagomasi, Ramiro, Kabuye, Biryogo and Mwendo Cells</li> </ul>	<ul style="list-style-type: none"> <li>• Settlements/Affected communities' leaders/elders;</li> <li>• Respected community members (teachers; medical staff; religious leaders);</li> <li>• Groups dependent on specific livelihood activities (SMEs, agriculture; fishing; crafts, public transport operators, other);</li> <li>• Women;</li> <li>• Youths;</li> <li>• Community-Based Organisations;</li> <li>• Vulnerable people/households/groups (such as female-headed households; very poor households; disabled/chronically sick people; internally displaced peoples/refugees, and ethnic minorities); and</li> <li>• Local service providers.</li> </ul>
<p>Expressway</p> <ul style="list-style-type: none"> <li>• Mwogo Sector</li> <li>• Nyamata Sector</li> <li>• Juru Sector</li> <li>• Gahanga Sector</li> <li>• Ntararama Sector</li> <li>• All affected Cells</li> </ul>	
<p>Quarry and quarry road</p> <ul style="list-style-type: none"> <li>• Nyamata Sector</li> <li>• Juru Sector</li> </ul>	
<p>Construction Phase Water Supply System</p> <ul style="list-style-type: none"> <li>• Gashora Sector</li> </ul>	

Table 5-1: Indicative List of Affected Communities and Stakeholder Categories	
<ul style="list-style-type: none"> <li>Ntarama Sector</li> <li>Rilima Sector</li> </ul>	
Overhead Transmission Line <ul style="list-style-type: none"> <li>To be confirmed when route for this Line is known</li> </ul>	

### 5.3.3 National Government: Regulatory and Executive Institutions

A number of stakeholders and government institutions at national level will be or have been consulted. These include, but are not be limited to, the following:

- Ministry of Infrastructure (MININFRA);
- Ministry of Natural Resources (MINIRENA);
- Ministry of Agriculture and Animal Resources;
- Ministry of Finance and Economic Planning;
- Ministry of Gender and Family Promotion;
- Ministry of Local Government;
- Single Project Implementation Unit (SPIU);
- Rwanda Development Board (RDB);
- Rwanda Environment Management Authority (REMA);
- Rwanda Water and Forests Authority;
- Rwanda Land Management and Use Authority (RLMUA);
- Rwanda Water and Sanitation Corporation;
- Rwanda National Planning Authority;
- Rwanda Civil Aviation Authority (RCAA); and
- Rwanda Transport Development Agency (RTDA).

### 5.3.4 Local Government

Officials from Bugesera District will be consulted, including officials from potentially affected sectors such as Juru, Rilima and Nyamata Sectors. These may include, but not be limited to, all or some of the following:

- Bugesera and other Districts:
  - Mayors;
  - Vice Mayors for Social Affairs;
  - Vice Mayors for Economic Development; and
  - District Environmental Officers;
- Sector Executives (Rilima, Juru, Nyamata, Gashora, Mwogo and Mayange):
  - Managers for Land Management, Infrastructure and Community Settlement; and
  - Managers for Social Affairs;
- Cells (Kimiranzara, Karera and Ntarama plus others as appropriate):
  - Village Chairpersons; and
  - Opinion leaders/Elders.



### 5.3.5 Non-Governmental Organisations (NGOs)/Community Based Organisations (CBOs)

National-level NGOs that may be consulted are:

- World Vision;
- ACCORD;
- Aegis Trust;
- Association pour la Conservation de la Nature au Rwanda;
- World Relief;
- Food for the Hungry;
- Education Development Centre Inc. (EDC);
- CECI; and
- Plan International Rwanda.

Local-level NGOs/CBOs have been identified and further work will be undertaken to determine local NGOs/CBOs to be consulted. Based on current knowledge NGOs/CBOs to be consulted may include, but need not be limited to, the following:

- Itorero Imanzi;
- Rwanda Girls Initiative;
- Millennium Promise;
- Send A Cow;
- Right to Play;
- Miracle Corners;
- Rafiki Foundation;
- Nibakure Children's Village; and
- Human in Love Rwanda Branch.

### 5.3.6 Company/ Engineering, Procurement and Construction (EPC) Contractor and Sub-contractor Workforces

- Company workers;
- EPC Contractor workers;
- Sub-contractor workers; and
- Trade union representatives.

### 5.3.7 Media

- Rwanda Broadcasting Agency (RBA);
- Radio Rwanda and TV Rwanda;
- Radio 1 and TV 1;
- Radio 10 and TV 10;
- Contact FM and Contact TV;
- Igihe.com;
- Izuba Rirashe; and
- New Times.

Also, both electronic and print media outlets, as well as Contractor's and BAC's outlets, will be engaged, as appropriate. All the media houses can be used to transmit information but the preferred media outlet will be the RBA. RBA has eight radio stations and a television network that

gives it a national coverage including five regional radio stations in different Provinces, which are an effective platform for providing information to the public. Igihe.com Newspapers in Kinyarwanda and the New Times Newspaper in English are important print media outlets.

The above, indicative stakeholder list will be reviewed periodically and updated as necessary during the ESIA process to reflect new information and the evolving status of both the new ESIA work and the Proposed Project.

#### 5.4 Summary of Previous Stakeholder Engagement Activities

During the preparation of the Draft ESIA (2010), stakeholder engagement was undertaken with a range of Affected Communities and other stakeholders, and these engagement actions and the results are presented in the Draft ESIA (2010) and are not repeated in this SEP.

During early fact-finding activities as part of this current ESIA work, members of the ESIA team attended a number of meetings with national and local governmental stakeholders in May 2017. The list of meetings is provided in the Table 5-2. The objectives of these meetings were as follows:

- Introduction of project team to government agencies; and
- Discussion of the Proposed Project and way forward with regards to roles, responsibilities and functions.

Table 5-2: Stakeholder Meetings, May 2017		
Date	Stakeholder	Location
16 May 2017	Ministry of Infrastructure	Ministry of Infrastructure offices, Kigali
17 May 2017	Rwandan Civil Aviation Authority	Mota-Engil offices in Kigali
17 May 2017	Bugesera District Deputy Mayor and Sector Leaders from Rilima and Juru	Proposed Project site, Bugesera
18 May 2017	Rwanda Land Use and Management Authority	Nyarugenge Pension Plaza Building, Kigali
19 May 2017	Rwanda Development Board/REMA	Rwanda Development Board offices, Kigali
19 May 2017	Sector-level REMA office	Sector-level REMA office, Bugesera

These meetings provided valuable baseline data which will be used in preparation of both the Scoping Report/ToR and the new ESIA Report.

#### 5.5 Way Forward

Engagement activities during the ESIA update work will occur at two distinct stages:

- Following submission of this Scoping Report/ToR to REMA; and
- New ESIA Report disclosure (following submission of the new ESIA Report and ESMP to REMA).

During the first ToR/Scoping stage, engagement will take the form of consultation meetings, with all stakeholder categories focusing on issues/concerns views regarding the likely impacts of the project; particularly with respect to the interests of the stakeholders. To the extent that it is feasible, stakeholders will be encouraged to consider measures that should be taken to avoid or reduce the severity of expected adverse impacts and to enhance positive impacts. The consultation results will be incorporated into the work programme leading to preparation of the new ESIA Report.

The second stage of engagement (new ESIA Report Disclosure) will involve public hearings, in different locations, led by REMA (the number and location of these public hearings is not known at present). BAC will participate in all public hearings. At this stage, local governments also play an important role in organising and communicating public comments, obtained separate from the public hearings, to REMA. In addition and in accordance with good international industry practice, engagement will also occur with Affected Communities and specific livelihood groups, such as farmers along the Expressway. The consultation results will be an important input into the deliberations of the REMA Technical Committee (this Committee provides a recommendation on a proposed project/ESIA Report to the REMA Executive Committee).

For the engagement process to be effective and meaningful, a range of approaches will be applied, which will be tailored specifically to the identified stakeholders. For Affected Community stakeholders, the format of each engagement activity (whether focus group discussions or public meetings) will meet general requirements on accessibility; that is the engagement events will be held at venues that can be easily accessed by community members, do not incur financial costs, and are culturally appropriate. The overall planning of engagement activities will also be based on the principle of inclusiveness, by ensuring mechanisms for engaging specific social categories (for example, women and men; young people and the elderly/retired) and vulnerable people. If necessary, assistance may be provided to enable vulnerable people to attend meetings.

Engagement will be based on the following key principles of good practice:

- Timeliness to consider key issues and provide input to Company decisions;
- Dissemination of information in readily understandable formats and using culturally appropriate techniques, in advance of engagement events/meetings, to ensure that stakeholders are informed;
- Gender-inclusivity (for meetings/events, where it is feasible to do so, setting a target of 50% participation by both men and women respectively at each event);
- Free from manipulation and coercion; and
- Documentation to keep track of who has been consulted and the key issues raised with feedback to stakeholders at key stages in the ESIA update process.

#### 5.5.1 Information Disclosure

Stakeholder consultation disclosure materials will be prepared in English. The ESIA Report Non-Technical Summary (NTS) will be translated into Kinyarwanda prior to disclosure. Leaflets for consultation events will be prepared in English and translated into Kinyarwanda and French.

The main mechanisms for information disclosure are presented below by type of stakeholder engagement event:

- **Meetings with officials:** Intended new ESIA work programme and/or PowerPoint (PPT) slide presentation will be made available. These will be used, as appropriate, depending on the stakeholders and the timing of the meetings. Materials will be available in French and English versions (Kinyarwanda is not considered necessary for government officials);
- **Focus group and other types of non-public meetings:** Leaflet and PPT slide presentation. Leaflets will be available in Kinyarwanda, English and French versions and the appropriate versions will be distributed according to stakeholder type and needs. Leaflets will be distributed at least five working days prior to meetings. PPT presentations will be made at the beginning of meetings. Each meeting agenda will have time allocated to clarifications and questions focused on the Project and the ESIA process; and
- **Public meetings:** The new ESIA Report (including the ESMP), the new ESIA Report NTS, PPT presentations, leaflets and presentation material will be made available. The ESIA Report will be available in English only but the NTS will be available in English and Kinyarwanda.

Leaflets will be available in Kinyarwanda, English and French. Presentation materials will be displayed at different public buildings in the locality of a public hearing and leaflets will be made available at least five working days in advance of a public hearing. Leaflets will also be available in selected public buildings/locations for members of the public to consult/take away (maximum of two leaflets per person to be taken away).

In addition, the BAC website will provide up-to-date Proposed Project information (<http://en.mota-engil.pt/>). It will also be possible for users to provide feedback or ask questions about the Proposed Project via email and the website.

#### 5.5.2 Information Communication

Communications alerting stakeholders to future stakeholder events/meetings and also concerning organisations/logistical aspects of stakeholder events/meetings will be provided by a range of means, but primarily by:

- **Public announcements:** BAC will place announcements in key public locations, such as bulletin boards at local government offices and other public sector buildings;
- **Emails:** BAC will inform stakeholders of project milestones and other current project/ESIA news (it is recognised that stakeholder access to emails will be variable);
- **Media (primarily radio and newspapers) announcements/notices:** These will mostly concern provision of key information about project milestones and certain engagement events/meetings,
- **Oral communications:** Community leaders will be requested to inform other community members about stakeholder events/meetings to be organised in their community/locality.

An overview of the planned stakeholder engagement activities with breakdown by stakeholder group is given in Table 5-3. This table will be updated during the ESIA process, as necessary.

#### 5.5.3 ESIA Phase

An overview of the planned stakeholder engagement activities, to occur at an early phase in the work to update the ESIA Report, with a breakdown by stakeholder group is given in Table 5-3. This table will be updated during the ESIA process, as necessary.

**Table 5-3: Stakeholder Engagement Methods and Information Disclosure**

Stakeholder Category	Stakeholder Engagement and Methods	Indicative Timeframe	Disclosure: Material Mechanisms and Timing	Location
Local government entities (Districts, Sectors and Cells)	<p>Meetings with officers/elected members of Bugesera and other affected districts will be organised.</p> <p>Also, meetings will be held with the Executive Committees of Rilima, Juru, Mayange, Mwogo, Gashora and other affected sectors. Meetings will also be held at Karera, Ntarama, Kimiranzara, Nyabagendwa, Kabukuba and other project affected Cells*.</p> <p>*Other sectors and cells will be identified for inclusion in this engagement programme</p>	Likely to be in August 2017	<p>PPT presentation (as above), leaflets (including details of the Proposed Project, and ESIA update process, and intended stakeholder engagement activities/ Grievance Mechanism).</p> <p>Copies of leaflets (including details of project, ESIA process), in Kinyarwanda, English and French will be distributed, at least five working days in advance of meetings, to the contact point for all local government entities to be met.</p> <p>PPT presentation by a BAC representative will presented at beginning of meetings with time for clarifications.</p>	To be determined
Affected Communities	A range of consultation events will occur as below. The key objective of these events is as indicated for the stakeholders above.			
	<p>Four clustered meetings will be held in four out of the following Sectors: Rilima, Juru, Mayange, Mwogo, Gashora</p> <p>Village leaders will be asked to attend and to select a small group of literate village representatives with a maximum number of six representatives: consisting of, to the extent possible, an elder, a medical professional and/or a teacher, a student (age 16 – 18 years), and an entrepreneur/ business person. At least two of the group members must be female.</p>	Likely to be in August or early September 2017	<p>Leaflets (including details of project, ESIA update process, intended stakeholder engagement activities/Grievance Mechanism). Leaflets will be provided in Kinyarwanda, English and French at least five working days before the date of the meetings.</p> <p>A nominated BAC representative will a) liaise with the specific village leaders to ensure selection of community representatives and obtain names and b) liaise with the selected representatives to ensure that they have a copy of the leaflet. Also, the representatives will be encouraged to read the leaflet five working days before the meeting of the village 'cluster' which their village will attend.</p> <p>BAC representative will leave multiple copies of the leaflet with the village leaders and request that they are made available in public places. Also, the village leader will be asked to request that literate village residents read the leaflet and discuss their issues and concerns with one or more of the selected representatives who will attend the</p>	To be determined

**Table 5-3: Stakeholder Engagement Methods and Information Disclosure**

			<p>clustered meeting.</p> <p>Each clustered meeting will be attended by a BAC representative who will be available to provide answers to clarification questions.</p>	
	<p>Four focus group meetings with selected individuals who represent the main livelihood strategies followed in the Proposed Project Area of Influence (for example farmers, fishermen/fish sellers, those involved in artisanal crafts, and business people). Those selected will not have attended any of the previous local government or Affected Community meetings.</p> <p>Advice/information on how to identify and select members of the focus groups and the most appropriate time/ place for the meetings will be obtained during work to prepare the updated socio-economic baseline.</p>	<p>Likely to be in August or early September 2017</p>	<ul style="list-style-type: none"> <li>• Leaflets (including details of project, ESIA update process, intended stakeholder engagement activities/Grievance Mechanism). Leaflets will be provided in Kinyarwanda, English and French at least ten working days before the date of the meetings.</li> <li>• The group members will be encouraged to read the leaflet least five working days before the meetings they will attend. Selected members will be requested to discuss the project and its implications for livelihoods, with other individuals who follow similar livelihood strategies, before the meetings.</li> </ul> <p>Each meeting will be attended by a BAC representative who will be available to provide answers or clarification to questions.</p>	<p>To be determined</p>
	<p>To identify vulnerable people/households/ groups (for example, the disabled, chronically sick, female-headed households or households dependent on the elderly, and the very poor – the actual types of vulnerable people/households will be identified prior to the beginning of stakeholder engagement work), four village leaders (selected randomly from the leaders identified previously) will be asked to identify up to five literate vulnerable people/households per village and then meetings with the vulnerable people/ households will occur in each of the four villages.</p>	<p>Likely to be in September 2017</p>	<ul style="list-style-type: none"> <li>• Leaflets (including details of project, ESIA update process, intended stakeholder engagement activities/Grievance Mechanism). Leaflets will be provided in Kinyarwanda, English and French at least five working days before the date of the meetings.</li> <li>• The selected individuals will be encouraged to read the leaflet at least five working days before the meetings they will attend. Selected members will be requested to discuss the project and its implications, with other vulnerable people/ households before the meetings.</li> </ul> <p>Each meeting will be attended by a BAC representative who will be available to provide answers to clarification questions.</p>	<p>To be determined</p>
International and national	<p>One workshop for NGOs. The objective of this workshop will be to discuss the intended</p>	<p>Likely to be in August</p>	<ul style="list-style-type: none"> <li>• PPTs, leaflets (including details of project, ESIA process, intended stakeholder engagement activities</li> </ul>	<p>Kigali</p>

**Table 5-3: Stakeholder Engagement Methods and Information Disclosure**

NGOs	programme of work and to help identify gaps which may need to be addressed by revision or addition to the investigation programme.	or early September 2017	<p>and the Grievance Mechanism) and summary of investigation programme.</p> <ul style="list-style-type: none"> <li>• PPT presentation (including details of Project, ESIA update work programme, and intended stakeholder engagement activities/Grievance Mechanism).</li> <li>• Copies of leaflets (including details of project, ESIA process), in French and English will be distributed, at least five working days in advance of the workshop.</li> </ul> <p>PPT presentation by a BAC representative will occur at beginning of the workshop with time for clarification.</p>	
Media	National and local media will be kept informed by press releases and press conferences as to the Proposed Project/ESIA developments.	Periodic	Press releases and press conferences to be issued periodically by BAC.	Kigali

## 6. ESIA METHODOLOGY

### 6.1 Introduction

The impact assessment methodology set out in this section is proposed for the ESIA of NBIA. It will provide the means to characterise and evaluate the environmental and social impacts (including community health and safety). It is based on a generic method commonly employed in ESIA work.

Potential impacts arising from planned project activities, cumulative impacts with other developments and unplanned events (e.g. accidents, natural disasters, etc.) will also be assessed using this methodology. In the case of planned activities, impact magnitude and receptor sensitivity are the two key considerations. The concept of likelihood (or probability) is included in the methodology for unplanned events only.

### 6.2 Impact Assessment

The purpose of the ESIA process is to determine a baseline (pre-project) environment; assess the significance of potential environment and social impacts; and identify mitigation measures that are designed to avoid, minimise or mitigate the identified significant impacts.

The ESIA will be conducted according to Rwandan environmental legislation to ensure a comprehensive, transparent and independent process. In addition, BAC will seek financing from International Financial Institutions to fund the Proposed Project development. Therefore, an ESIA is required in order for the Proposed Project to meet IFC Performance Standards 2012.

The ESIA will also identify and estimate the extent and quality of available data and uncertainties associated with predictions, and specify topics that do not require further attention.

The ESIA will incorporate:

- Initial scoping of the assessment process;
- Proposed Project description;
- Examination of alternatives;
- Identification of the Proposed Project Area of Influence;
- Stakeholder identification and gathering of environmental and social data;
- Impact identification, prediction, analysis and assessment of effects;
- Development of mitigation and management measures and actions;
- Evaluation of residual impacts;
- Assessment of Cumulative impacts; and
- Development of an Environmental and Social Management Plan.

The ESIA is required to be proportionate to the nature and scale of the Proposed Project's potential impacts and must comply with the host country's laws and regulation, including the relevant disclosure of information and public consultation requirements.

### 6.3 ESIA Process

The ESIA process is a systematic approach to identifying, describing and evaluating the potential environmental and social impacts of the Proposed Project, and formulating measures that will be implemented to manage these impacts, for example, so that adverse impacts can be avoided or reduced to an acceptable level and beneficial impacts can be enhanced (in this document all references to 'impact mitigation' or to 'mitigation measures' imply both avoiding/minimising adverse impacts and enhancing beneficial impacts).



With respect to potential adverse impacts, and as part of the Project design process, certain measures to avoid or minimise impacts will be identified and incorporated into the Proposed Project design. These are referred to as “design controls” and include both physical design features (such as location of structures/activities) and management measures (such as timing of activities). These design controls are based on GIIP and best or good practice guidance such as the IFC mitigation hierarchy presented in IFC’s (2012) Performance Standard 1 *“Assessment and Management of Environmental and Social Risks and Impacts”* and, as applicable, the various standards and guidance documents produced by sector/industry associations). Where the outcome of the ESIA indicates that design controls are insufficient to manage certain impacts to acceptable levels, further mitigation measures will need to be identified.

Before presenting the impact assessment methodology; it is important to understand the ESIA process within which the methodology is applied, particularly the work done prior to impact assessment. The stage immediately prior to impact assessment is ‘Scoping’ and one of the key activities is collection/analysis of baseline data. This is the subject of the current Scoping Report.

To ensure a robust and comprehensive impact assessment, the ESIA process will be structured around a series of progressive and iterative stages. Figure 6-1. Stakeholders, the Proposed Project design/ implementation team and the ESIA team will provide inputs to these stages.

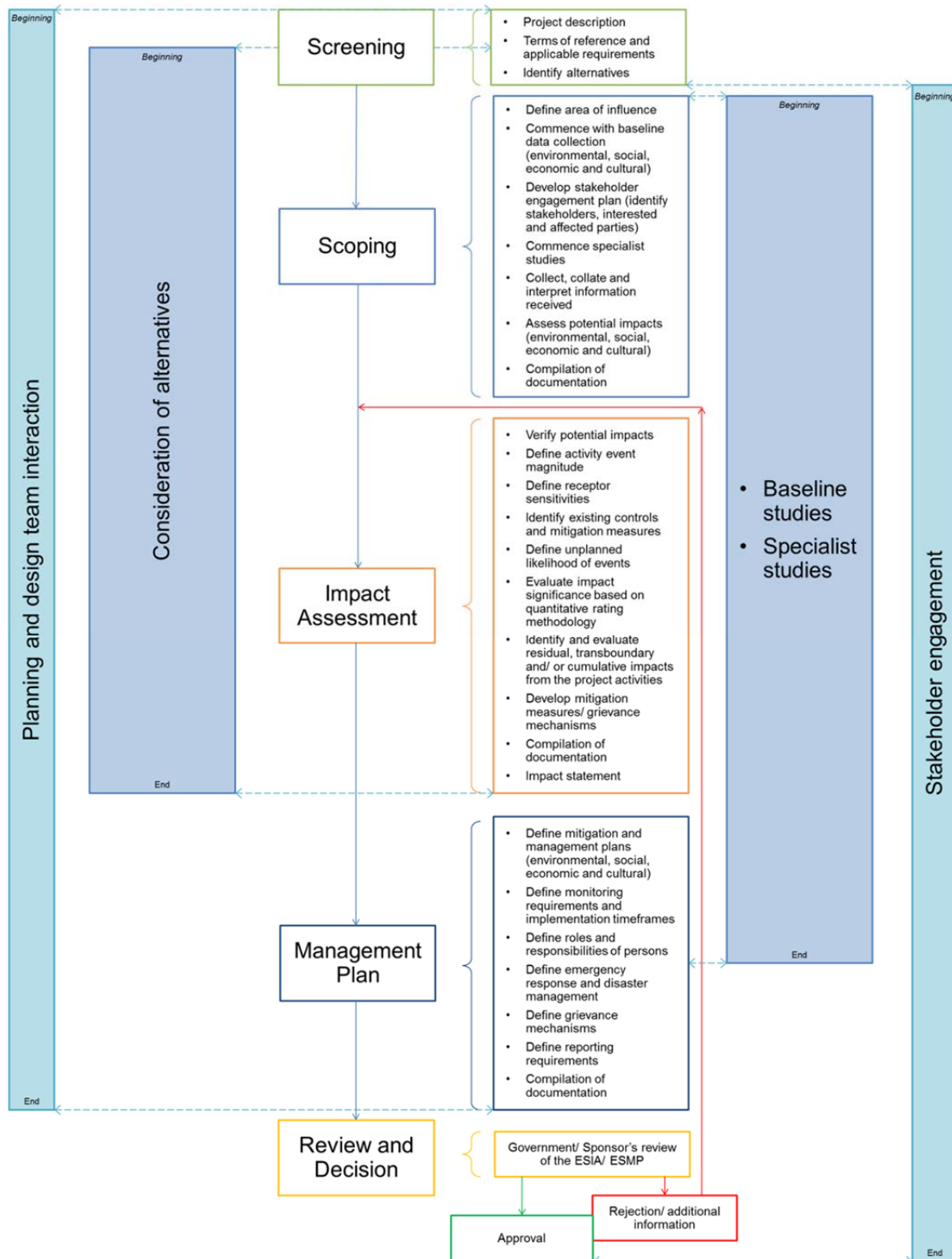


Figure 6-1: ESIA Process

### 6.3.1 ESIA Scoping

ESIA Scoping, which is stated previously is the subject of this report, results in the scope of the ESIA being defined; using available information on the Proposed Project location and design, known baseline situation/trends, results of early stakeholder engagement and applicable legal requirements. This stage requires:

- Proposed Project design data, including alternative sites, and details of design configurations and construction methods;

- Initial baseline description, including identification of potential environmental and social receptors, and known trends in the status of receptors, that may be affected by the Proposed Project; and
- Stakeholder engagement: views of stakeholders on the key impacts to be assessed. Stakeholder engagement can also provide useful baseline information and help to identify receptors.

During this stage, the initial Proposed Project Area of Influence is identified, according to the IFC criteria included in PS 1, which entails consideration of areas affected by a) direct and indirect impacts (in terms of indirect impacts, the focus is specifically on impacts affecting biodiversity and ecosystem services upon which Affected Communities' livelihoods are dependent), b) impacts from unplanned, but predictable developments caused by the Proposed Project that may occur later or at a different locations, c) Associated Facilities and d) cumulative impacts arising from a Project and other existing, planned or reasonably defined developments at the time ESIA process is conducted.

#### 6.3.2 Baseline Studies

Baseline studies are undertaken, primarily at two key stages (scoping and impact assessment); however, as shown in Figure 6-1, they continue to provide input throughout the entire ESIA process. During scoping work, relatively 'high-level' baseline data are required to assist identification of likely key impacts. Baseline data used for scoping forms the core of the baseline data used in the impact assessment. Additional surveys and studies are also being undertaken to supplement this and allow for full technical assessments to be made.

#### 6.3.3 Identification of Receptors

Receptors are environmental and social components that may be affected, adversely or beneficially, by a Project. Potential receptors are identified, and their sensitivity determined in scoping work and baseline studies. Four high-level categories of Project receptors can be identified:

- Environmental (such as air quality, waterbodies, landscapes, terrestrial soils and geology);
- Biodiversity (such as habitats, species etc.); and
- Social (such as residents of local communities, businesses, land and other resource users, and cultural heritage resources).

### 6.4 Potential Impacts

The actions undertaken to determine the significance of potential Project impacts involves the following four key steps:

- **Prediction:** What will happen to the status of specific receptors as a consequence of this Project (primarily; what is the magnitude of the impact?);
- **Evaluation of significance:** How significant is the impact? What is its relative significance when compared to other impacts?
- **Mitigation:** If there are impacts of concern (adverse), can anything be done to avoid, minimise, or offset the impacts? Or to enhance potential beneficial impacts?
- **Residual Impacts:** After mitigation, are the impacts still of concern? If yes, the process needs to be repeated at least once before the 'final' determination of residual impact significance occurs.

#### 6.4.1 Impact Prediction

Impact prediction involves determining the magnitude or extent of a change or changes in the status of a receptor or linked receptors resulting from a Project. To the extent possible these changes in status should be quantified. Impact prediction provides valuable information to determine the broader characteristics of impacts.

#### 6.4.2 Impact Types and Characteristics

Impacts can be divided into types and exhibit a number of characteristics. The degree to which an impact may be managed or modified by the mitigation measures is dependent upon the impact type and its characteristics. Table 6-1 provides definitions of key impact types.

<b>Table 6-1: Impact Types</b>	
<b>Term</b>	<b>Definition</b>
Direct Impact	An impact that results from a direct interaction between a Project activity and the receiving environment (e.g. between occupation of an area of seabed and the habitats which are lost).
Indirect Impact	An impact that follows on from the primary interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g. loss of part of a habitat affects the viability of a species population over a wider area).
Induced Impact	An impact that results from other activities that occur or are encouraged to occur as a consequence of the Project (e.g. Project implementation promotes service industries in the region which, in turn, cause additional impacts).
Reversible impact	An impact that can be changed (reversed) such that the original status of a receptor is restored to its condition prior to the impact occurring.
Cumulative Impact	A 'combined' impact which results from the interaction of two or more impacts, arising from a Project and one or more other Projects.

All of these impact types exhibit certain characteristics. They can be:

- Adverse or beneficial;
- Limited or extensive in scale (extent);
- Long or short-term in duration;
- Continuous or intermittent (frequency); and
- Reversible or irreversible.

#### 6.4.3 Evaluation of Significance

Impact significance needs to be assessed with and without mitigation measures in place (in both cases it is assumed that the design controls are in place) i.e. with the Proposed Project and design controls and then with additional mitigation if relevant to understand the residual impact. A residual impact is the impact that remains following the application of additional mitigation measures, and is thus the final 'level' of impact. Residual impacts are the focus of management and monitoring activities during project implementation. Figure 6-2 represents the aforementioned approach.

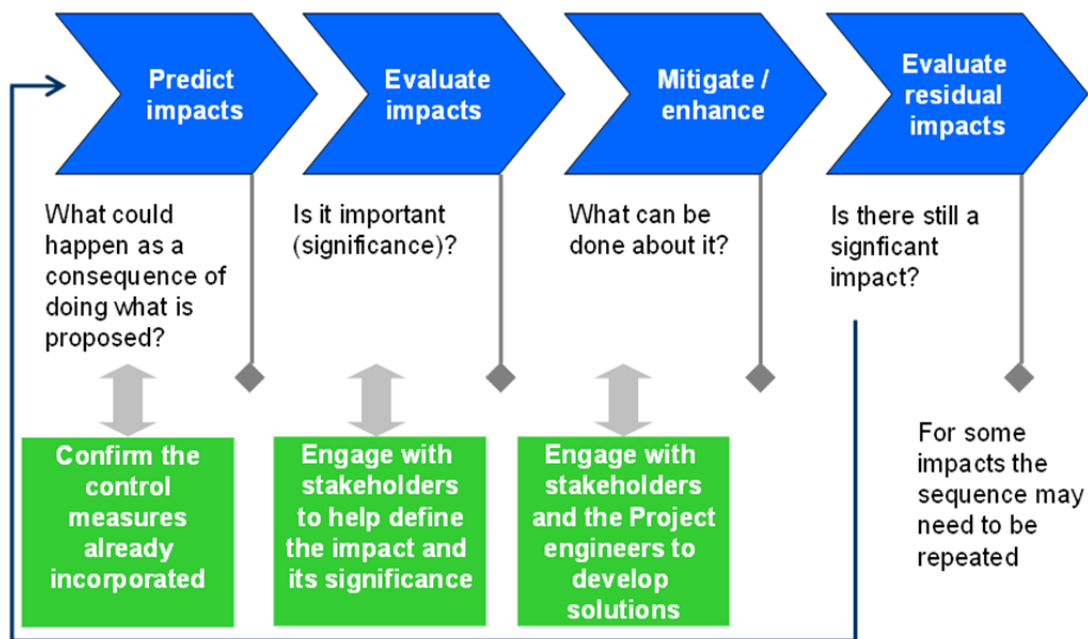


Figure 6-2: Impact Evaluation Framework Process

#### 6.4.4 Assigning Impact Significance: Planned Events

For adverse impacts, significance is assigned, as presented below, based on determining impact magnitude and receptor sensitivity. Beneficial impacts are identified, assessed and evaluated, making use of impact magnitude (as per the guidance below), but not receptor sensitivity. Instead, beneficial impacts are described and evaluated on the basis of the available data, alignment with government policies/targets, stakeholder inputs and professional expert judgement. Measures to enhance them will be identified to try to maximise the expected benefits.

The first step is to determine impact magnitude. The magnitude of an impact is a measure of the scale of a change from baseline conditions for a receptor. This measure of change can be described by considering the following factors in combination:

- Extent: Spatial extent (e.g. habitat impacted) or population extent (e.g. proportion of the population/ community affected);
- Duration: Period of time over which an impact will interact with a receptor;
- Frequency: How often the impact will occur; and
- Reversibility: Restoration of the pre-impact status of a receptor.

For each impact, a decision needs to be made as to its extent, duration, frequency, and reversibility – on the basis of the information provided in Table 6-2.

Table 6-2: Impact Magnitude Factors		
Factors	Elements	Explanation
<b>Impact Magnitude</b>		
<b>Extent</b>	Local	Impacts that affect receptors in areas close to the source of impact, for example within a 'radius' of 10 km from a Project boundary.
	Regional	Impacts that affect receptors beyond the defined local level, but are not experienced at the national level.
	National	Impacts that affect receptors at a national scale.
	Trans-	Impacts that affect receptors, beyond the boundaries of the

Table 6-2: Impact Magnitude Factors		
	boundary	country in which the project is located.
Duration	Short term	Impacts that are predicted to last only for a limited period (e.g. noise during the period of a certain construction activity that will occur only during a 6-month period), but will cease either on completion of the activity or soon afterwards.
	Medium term	Impacts that are predicted to last for a longer time period. Examples include impacts occurring during a period of extended construction activities which may occur over 2 or 3 years.
	Long term	Impacts that are predicted to continue over an extended period, (e.g. noise from operation of a development, impacts from operational discharges or emissions). These include impacts that may be intermittent or repeated rather than continuous if they occur over an extended time period (e.g. impacts resulting from annual maintenance activities).
Frequency	Infrequent	Impacts are predicted to be rare in nature over a certain period (see 'Duration' above).
	Periodic	Impacts are predicted to be recurring over a certain period (see 'Duration' above).
	Constant	Impacts are predicted to be permanent during a certain period (see 'Duration' above).
Reversibility	Irreversible	Impacts that cause a permanent change in the affected receptor.
	Reversible	Restoration of the pre-impact status of a receptor as a result of mitigation/reinstatement measures and/or natural recovery. The time periods over which impacts may reverse link to the duration over which an impact is experienced (see 'Duration' above).

The next step is to determine the impact magnitude itself. Table 6-3 provides generic criteria to be used to determine the impact magnitude. Taking the results derived from the previous step a decision can be made on impact magnitude (negligible, low, moderate, high).

Table 6-3: Impact Magnitude	
Impact Magnitude	Criteria
Negligible	No discernible impact. Receptor change is essentially indistinguishable from natural background variation.
Low	Limited impacts which are: <b>Extent:</b> local <b>Duration:</b> short term <b>Frequency:</b> infrequent to periodic <b>Reversibility:</b> reversible
Moderate	Noticeable impacts which are: <b>Extent:</b> regional <b>Duration:</b> medium term <b>Frequency:</b> periodic to constant <b>Reversibility:</b> reversible
High	Prominent impacts which are: <b>Extent:</b> national or transboundary

Table 6-3: Impact Magnitude	
	<b>Duration:</b> long term <b>Frequency:</b> constant <b>Reversibility:</b> irreversible

Once the respective magnitudes of each impact have been allocated the next step is to determine receptor sensitivity. Receptor sensitivity is based on two components: the degree to which a particular receptor is resilient to a change and the value attributed to the receptor by stakeholders or applicable regulations/policies.

Receptor resilience takes into consideration not only activity - receptor- impact pathways, but also the characteristics of a receptor that might make it more or less resilient to change. As such, a receptor can be considered as existing within a spectrum of 'vulnerable' to 'resilient'.

Receptor value takes into consideration its importance as represented, for example, by its conservation status, its socio-cultural importance and/or its economic value. Certain receptors are deemed to be of greater importance than other receptors.

For each impact, the receptor sensitivity must be determined. Sensitivity is specific to the biophysical or socio-economic environment identified during the baseline study.

The final step is to combine the impact magnitude and receptor sensitivity results to determine impact significance. This is done by using an impact significance matrix (Table 6-4), whereby impact significance is determined by finding the cell where the impact magnitude and sensitivity results intersect, for example, an impact of low magnitude affecting a receptor of moderate sensitivity is an impact of low/moderate significance (the actual significance determination - low or moderate - in this case can be made by the ESIA team) or an impact of high magnitude affecting a receptor of moderate sensitivity results in an impact of high significance.

Table 6-4 provides an account of the key features (definitions) of each of the impact significance classifications (from Not Significant to High); specifically linking them to the need for mitigation measures.

Table 6-4: Impact Significance Matrix					
		Receptor Sensitivity			
		Negligible	Low	Moderate	High
Impact Magnitude	Negligible	Not Significant	Not Significant	Not Significant	Not Significant/Low <sup>28</sup>
	Low	Not Significant	Low	Low/Moderate <sup>29</sup>	Moderate
	Moderate	Not Significant	Low/Moderate	Moderate	High
	High	Low	Moderate	High	High

Table 6-5: Impact Significance Definitions		
Adverse Impacts	High	Impacts with a "High" significance are likely to disrupt the function and value of a receptor, and may have broader systemic consequences (e.g. ecosystem or social well-being). These impacts are a priority for mitigation in order to avoid or reduce the significance of the impact.

<sup>28</sup> Allows technical discipline author to decide if impact significance is Not Significant or Low

<sup>29</sup> Allows technical discipline author to decide if impact significance is Low or Moderate

	<b>Moderate</b>	Impacts with a "Moderate" significance are likely to be noticeable and result in lasting changes to baseline conditions, which may cause hardship to or degradation of a receptor, although the overall function and value of a receptor is not disrupted. These impacts are a priority for mitigation in order to avoid or reduce the significance of the impact.
	<b>Low</b>	Impacts with a "Low" significance are expected to be noticeable changes to baseline conditions, beyond natural variation, but are not expected to cause hardship, degradation, or impair the function and value of receptor. However, these impacts warrant the attention of decision-makers, and should be avoided or mitigated where practicable.
	<b>Not Significant</b>	Not Significant. Any impacts are expected to be indistinguishable from the baseline or within the natural level of variation. These impacts do not require mitigation and are not a concern of the decision-making process.

This method is applied twice: to both pre- and post-mitigation scenarios for all impacts identified i.e. for the Proposed Project including design controls and with additional mitigation to identify the residual effects. Example results from a pre- and post-mitigation comparison of impacts are shown in Table 6-6.

In general, residual impacts classed as "Not Significant" or "Low Significance" are not considered to be of concern for the project<sup>30</sup>. For adverse impacts of "Moderate" and "High" significance, an iterative process is undertaken to further investigate opportunities for mitigation, according to the hierarchy above. Where the significance cannot be further reduced, an explanation is provided of why further reduction is not practicable. Monitoring may be required to confirm the measures used to mitigate adverse impacts are working properly and that the impact is not worse than predicted. Monitoring requirements are presented in the Environmental and Social Management Plan (ESMP).

<sup>30</sup> A more stringent approach may be applied for the assessment of ecological receptors of high sensitivity, such as critical habitat, or species classified as having vulnerable or above conservation status. In this case, residual impact significance of Low and above is very likely to be a concern to the further development of the Project.

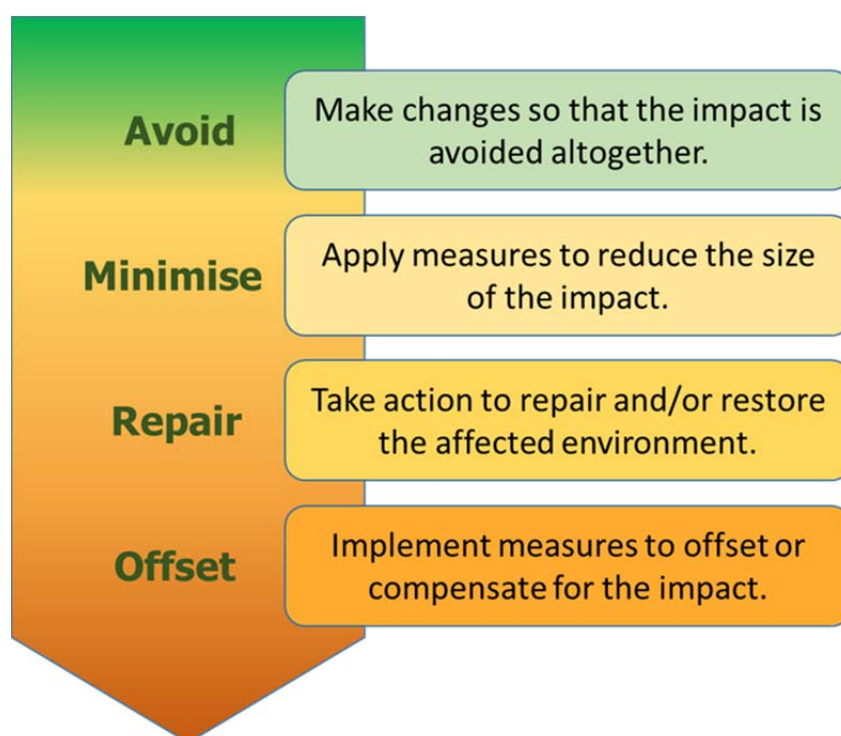


Table 6-6: Evaluation of Impact Significance: Example Table							
Activity	Potential Impact	Receptor(s)	Receptor Sensitivity	Impact Magnitude	Pre-Mitigation Impact Significance	Additional Mitigation Measurement	Residual Impact Significance
Plant operation at construction site	Noise disturbance to local residents and land-users	Local communities and land-users	High	Low	Moderate	<ul style="list-style-type: none"> <li>Schedule construction works to occur only during daylight hours</li> <li>All plant and equipment to be regularly maintained in good working order</li> </ul>	Low
Construction of Right of Way for Water Pipeline	Damage/loss of wildlife habitat	Terrestrial fauna	Moderate	Moderate	Moderate	<ul style="list-style-type: none"> <li>Minimise footprint of clearance</li> </ul>	Low
Land take for roads	Permanent loss of agricultural land for land owners with resulting economic displacement according to amount and type of land lost	Number of land owners and their dependents to be specified	High	Moderate	High	<ul style="list-style-type: none"> <li>Routing to minimise land take in total and by land owner</li> <li>Compensation for land, structures and crops plus livelihood restoration measures aimed at improving livelihood status of the land-owner households</li> </ul>	Moderate

#### 6.4.5 Impact Mitigation

As part of the ESIA process, when adverse impacts are identified (which cannot be managed via design controls), mitigation measures are developed (including avoiding, management and monitoring actions). The process of identifying design controls and mitigation measures must follow the sequence of the mitigation hierarchy (Figure 6-3), as specified in IFC PS 1, which is widely regarded as the best practice approach to managing impacts.

First, efforts are made to avoid or prevent, then minimise or reduce adverse impacts. Through the application of design controls. Subsequently, these design controls are supplemented by additional design controls plus mitigation measures to be applied through the effective management of project-related activities during construction, operation and decommissioning. Any remaining significant residual impacts are then addressed via consideration of mitigation measures such as offsetting and compensation.



**Figure 6-3: Mitigation Hierarchy**

Identifying, assessing and then selecting mitigation measures is a process involving the ESIA team, working with the Project engineers, to identify practicable and cost-effective approaches to mitigate the impacts. These measures are agreed and integrated into the Project ESMP.

#### 6.4.6 Assigning Impact Significance: Unplanned Events

For unplanned events, it is necessary to add the likelihood of an event occurring to the methodology. Table 6-7 provides definitions for the likelihood categories that need to be applied to all events.

Table 6-7: Likelihood Categories for Unplanned Events	
Likelihood	Definition
Certain	Events that will occur during normal operating conditions (i.e., they are inevitable).
Possible	Events that are likely to occur at some time during normal operating conditions.
Unlikely	Events that are unlikely but may occur at some time during normal operating conditions.

**Table 6-7: Likelihood Categories for Unplanned Events**

Improbable	Events that are extremely unlikely to occur during normal operating conditions.
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Unplanned events will often result in a very High impact significance, even with mitigation/remedial measures in place e.g. major oil spills. In such cases, not only must measures be in place to manage an unplanned event, but the probability must be minimised to levels seen to represent good industry practice. In this table, unplanned events with a High residual impact significance would need to be categorised as 'Improbable'. In many cases quantified risks assessment will be required to quantify the probability of an event and this should be compared with industry good practice. Where quantification is possible, the likelihood criteria should include quantified probabilities i.e. Improbable equates to less than a  $1 \times 10^{-6}$  event.

## 6.5 Cumulative Impacts

The IFC has defined cumulative impacts as follows:

*"Cumulative impacts are those that result from the incremental impact of the Project when added to other existing, planned and reasonably predictable future projects and developments."*

The IFC (2013) released a Guidance Note *"Cumulative Impact Assessment and Management – Guidance for the Private Sector in Emerging Markets"* in August 2013. The guidance note introduces a framework for identifying and assessing potentially significant cumulative impacts. The assessment of cumulative impacts will be undertaken in accordance with this Guidance Note.

This will be considered during the ESIA phase of the project and will include, but will not be limited to the effects of the Aerotropolis (social economic development zone), impact on land use, noise from flight paths, etc.

## **7. BASELINE, POTENTIAL IMPACTS AND APPROACH TO ASSESSMENT AND MITIGATION**

### **7.1 Introduction**

The Proposed Project has the potential to cause impacts to the immediate, surrounding and regional environmental and socio-economic considerations. Specific environmental and socio-economic impacts will occur at different phases of the Project during the life of the airport. The impacts associated with each of these phases will be specific to the biophysical and socio-economic context, spatial and temporal aspects of the airport and required international rehabilitation goals.

For the purpose of this report, anticipated/potential impacts have been identified, although this was distinguished from a desktop approach. This approach also took into consideration typical impacts previously identified from similar projects that Ramboll Environ has managed. Approach to mitigation measures to potentially reduce the significance of impacts is discussed in brief within this report; however, specific mitigation measures and recommendations will be included in detail in the ESIA Report.

The impact assessment process will include the identification of mitigation and control measures which will adopt the principles of avoid, mitigate and restore in line with the mitigation hierarchy. Residual impacts will also be assessed and control methods, including monitoring and measurement plans, will be identified for each particular topic area.

The following environmental aspects will be considered in the ESIA and are discussed in greater detail in the following sections:

- Air Quality;
- Noise and Vibration;
- Topography, Geology and Soils;
- Water Resources;
- Biodiversity;
- Waste Management;
- Traffic and Transport;
- Resource Efficiency;
- Archaeology and Cultural Heritage;
- Landscape and Visual; and
- Socio-economics (including Land Use, Employment, Labour and Working Conditions, Access to Social Assets, and Community and Occupational Health and Safety).

### **7.2 Air Quality**

This section considers the effects from particulate matter, nitrogen oxides and other sources of air pollution during both construction and operation of the Proposed Project.

#### **7.2.1 Existing Environment**

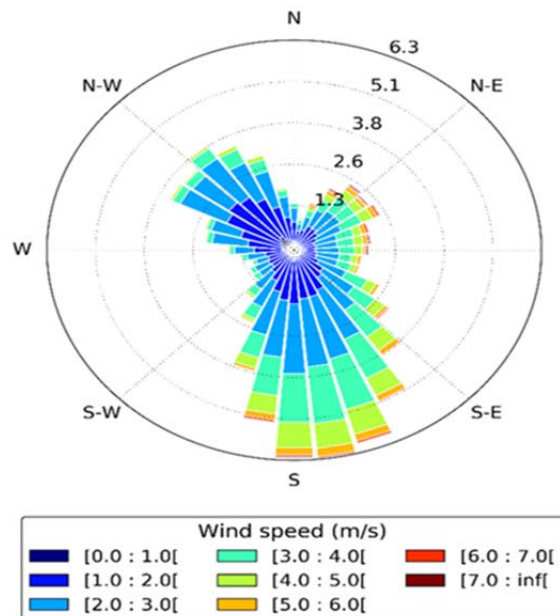
According to UBIMET (Weather Report, 2017<sup>31</sup>), Bugesera's weather profile follows a seasonal pattern throughout the year due to the movement of the Intertropical Convergence Zone (ITCZ). The ITCZ is a global weather pattern which moves north of the equator during the northern

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<sup>31</sup> UBIMET, 2017. Analysis of weather conditions in Bugesera, Rwanda.

hemisphere summer (April-October) and south during the southern hemisphere summer (October-April).

The wind rose for the last five years (period between 2012 and 2016) indicates that the prevailing winds come from the southeast and southern sectors. North-westerly and easterly winds directions are less frequent. The plot also shows that the wind speeds are relatively low (2.46 m/s on average over the 5 years). 84% of winds are between 1 m/s and 5 m/s, and 11% are less than 1 m/s (calm conditions).. This is illustrated in Figure 7-1.



**Figure 7-1: Wind-rose over Kigali International Airport (2012 – 2016 period)**

The highest wind speeds generally occur around noon during April-October, reaching a maximum in August/September, and they rarely exceed 25 m/s. From November to March the mean hourly wind speed is notably lower. Winds are mostly calm overnight. There is no clear discernible direction at night, although a westerly flow is somewhat predominant from September to April, changing progressively to a southerly direction from April to September.

A total of 900-1200 mm falls over the Bugesera area each year with the region experiencing two distinct tropical wet seasons, a significantly pronounced dry season and an additional relatively drier period earlier in the year. During the two wet seasons, on average, the most hazardous rainfall intensities are likely to fall for a period no longer than sixty minutes between the hours of 06:00 and 17:00.

The Bugesera area receives most of its annual rainfall between mid-September and mid-June. The main dry season occurs from mid-June until mid-October with a slight temporary decrease in rainfall also occurring in January. Most precipitation is generated from short-lived convective weather events such as that from tropical thunderstorms and squall lines.

The time of the year, duration and intensity of rainfall and drought distinguish the four seasons as follows:

- The short dry season known as "urugaryi" from January to mid-March;
- The long rainy season known as "itumba" from mid-March to mid-June;
- The long dry season known as "impeshyi" covers mid-June to mid-October; and
- The short rainy season called "umuhindo" starts in mid-October and ends in December.

Mean temperatures range from 15-16 °C during night-time hours to 26-28 °C during daylight periods. The average maximum temperatures reach 32° C in February and September-October. Overall, there is little seasonal variation in temperature throughout the year.

Maximum daily temperatures are likely to occur between the hours of 10:00 and 14:00, whilst minimum temperatures are likely to occur between the hours of 21:00 and 04:00. The warmest temperatures occur towards the end of the main dry season from July to mid-September and during the short wet season break in January to mid-February.

Rwanda has one of the world's lowest per capita emissions of greenhouse gases (GHGs), although it is highly vulnerable to the impacts of temperature and rainfall changes due to climate change since it relies heavily on rain-fed agriculture for subsistence livelihoods. According to the State of the Environment and Outlook Report<sup>32</sup> (2015), the country's average temperature increased by 1.4° C since 1970, higher than the global average, and by the 2050s, it is likely to rise by up to 2.5° C from the 1970 average, while in the future, it could experience increased rainfall intensity during both rainy seasons.

Agriculture contributes approximately 67% emissions, mainly because of carbon released from cultivating soils. The energy demand sector; dominated by methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions from biomass combustion; accounts for 25% of GHG emissions. Industrial processes accounted for 6% emissions and energy supply for about 2% (Stiebert, 2013).

Air pollution is a growing problem in Rwanda's urban areas. The major emission sources are the transport sector; manufacturing industries such as cement, and steel mills; quarrying activities that contribute dust to the air; domestic cooking; soil-blown dust; and waste combustion.

Transportation is one of the largest sources of air pollution, especially in Kigali. The combustion of fossil fuels to power vehicles and engines (cars, trucks, buses, motorbikes, aircraft and water craft) has major long term adverse impacts on the environment and human health, with implications for climate change due to the release of CO<sub>2</sub> and for respiratory ailments from the inhalation of small particulates. It is noted, however, that Rwanda has one of the lowest per capita emissions of GHGs.

#### 7.2.2 Sensitive Receptors

A first set of receptors have been defined during the baseline preparation. All communities within the Airport Footprint have been relocated and no families are currently located within the Airport Area. These receptors include dwellings/residential areas located close to the boundary of the Airport Area. The main sectors or urban areas that are located within 15 km radius of the Proposed Project include Rilima, Nyamata, Mwogo, Juru, Gashora, Gahanga and Ntararama. This includes receptors around the Expressway and Water Pipeline.

#### 7.2.3 Potential Impacts: Construction Phase

Construction activities associated with the Proposed Project have the potential to impact air quality within the area. The main potential air quality pollutant during construction is the generation of dust and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) related to earthworks, the movement of traffic on unsurfaced roads and the loading/unloading of materials. It is understood that cut and fill activities will be required to level the topography of the Airport Footprint. Furthermore, the generation of dust can also occur from wind on exposed and unprotected soil stockpiles.

Additionally, air quality will be affected by exhaust emissions from diesel and petrol powered equipment, vehicles and machinery during the construction phase. This includes the emission of particulate matter, nitrogen oxides (NO<sub>x</sub>), sulphur dioxide (SO<sub>2</sub>), carbon monoxide (CO), carbon

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<sup>32</sup> REMA, 2015. Rwanda – State of Environment and Outlook Report.

dioxide (CO<sub>2</sub>) and benzene. Burning of solid waste onsite could also generate particulate matter, NO<sub>x</sub> and associated dioxins.

The source, location, duration and intensity of the construction activities will be assessed to qualitatively determine their potential impact on sensitive receptors including ecological receptors. Exhaust emissions from the machinery used in construction will be estimated based on fuel use to establish the potential impacts.

The potential for dust emissions from construction activities would be greatest during the initial site clearing and removal of top soil.

#### 7.2.4 Potential Impacts: Operation Phase

The potential sources of air pollutants from the Proposed Project can be divided into natural and anthropogenic sources. The following potential sources of pollution have been identified as likely to occur during the operation phase.

##### 7.2.4.1 Natural Sources of Air Pollution

Wind can generate dust from un-vegetated soils and unsurfaced rural roads during the dry months and during high intensive thunderstorms. The dust particles, in general, are larger than PM<sub>10</sub> and are not respirable.

There are several natural sources of ozone in the boundary layer which is the part of the atmosphere closest to the ground. These include jet streams bringing stratospheric ozone down to ground level, lightning and its formation in the atmosphere due to natural emissions of hydrocarbons and NO<sub>x</sub>.

##### 7.2.4.2 Anthropogenic Sources of Air Pollution

Airport operations can be considered as the most significant sources of potential impact. According to the IFC - Environmental, Health, and Safety Guidelines for Airports, the main sources of airport air emissions include:

- Combustion exhausts from aircraft during landing and take-off (LTO) and ground operation (including Auxiliary Power Units, APU). Emissions above 1000 ft can be neglected, according to ICAO recommendations;
- Ground service vehicles;
- Vapours from fuel storage and handling; and
- Emissions from local ground transportation activities servicing the airport (including staff and visitor traffic).

Other sources of emissions from the operation phase may include fuel combustion during fire training activities, combustion emissions from onsite electricity and heat generation systems, and emissions from waste treatment activities.

The following pollutants of concern are likely to be generated during the operation phase.

- Nitrogen dioxide (NO<sub>2</sub>);
- Sulphur dioxide (SO<sub>2</sub>);
- PM<sub>10</sub> and PM<sub>2.5</sub>;
- Carbon monoxide or (CO); and
- Volatile Organic Compounds (VOCs).

## 7.2.5 Impact Assessment

### Construction Phase

According to IFC General EHS Guidelines, earthworks and construction activities may generate emissions of fugitive dust caused by a combination of:

- Onsite excavation and handling/transport of earth materials;
- Contact of construction machinery (including dumpers, loaders, etc.) with bare soil and unpaved roads;
- Exposure of bare soil and soil piles to wind; and
- Exhaust from diesel engines of earth moving equipment (emissions of PM, NO<sub>x</sub>, SO<sub>2</sub>, Benzene), considered as a secondary source of emission.

An emission assessment of related emissions will be conducted based on levels of cut and fill required to establish the platform levels and (if available) on the list and time use of required equipment. Emission factors from the AP-42 document of the US EPA will be used to quantify potential emissions of pollutants.

A similar approach will be used to assess the impact of the truck traffic on the quarry road. Based on traffic expected and characteristics of the trucks (average weight and load) and the nature of the road (paved/unpaved), emission will be calculated using factors from the AP-42.

The impact of the expressway construction will be considered qualitatively, as the duration of related annoyances should be very limited for a given receptor.

### Operation Phase

Aircraft emit pollutants to the atmosphere through the combustion of kerosene in aircraft engines, particularly during take-off when the thrust is at a maximum. As recommended by ICAO guidelines, local air quality concerns concentrate on effects created during the landing and take-off (LTO) cycle as these emissions are released below 1,000 ft.

Once the aircraft arrives at the stand the aircraft is turned around and prepared for its next departure. This involves switching off the main engines, unloading of arriving passengers and/or cargo from the aircraft, possibly replacement of the aircraft crew, cleaning of the aircraft, aircraft refuelling, loading of departing passengers and/or cargo, starting of aircraft main engines and pushback from the stand. Some of these functions involve operation of the aircraft APU (auxiliary power unit) and GSE (ground support equipment). The APU can provide the aircraft with electrical power, preconditioned air and bleed air for starting the main engines. GSE is the equipment used to service the aircraft between flights and usually located on the ramps. This equipment is used for ground power operations, aircraft mobility and loading operations.

To calculate air emissions from the future airports operations, international air emission factors will be used according to the following general methodology:

$$\text{Emission} = \text{Emission Factor} \times \text{Activity}$$

Emissions are calculated based on the number of movements for the aircraft, annual average daily traffic and the duration of annual operation for APUs or GSE. The emission factors used for air emission calculations are provided per type of aircraft used by airline companies (e.g., Boeing, Airbus, and Embraer). The aircraft proportions for each runway will be provided by the client for each development phase including geographical directions.

For this study, emissions (from aircraft operations and road traffic) will be calculated using EMIT (comprehensive emissions inventory toolkit) software. EMIT is a database tool for storing, manipulating and assessing emissions data from a variety of sources and has been specially



developed to generate ADMS-readable inventories. Many pollutants are treated in EMIT such as particles (PM<sub>10</sub> and PM<sub>2.5</sub>), VOCs, NO<sub>x</sub>, NO<sub>2</sub> and GHGs.

The pollutants emissions due to the road traffic on the expressway will be calculated through the COPERT, methodology that has the capability to generate comprehensive information on vehicle emissions. COPERT emissions will be calculated for the four pollutants required in the original request for quotation: SO<sub>2</sub>, NO<sub>2</sub>, benzene, and PM<sub>10</sub> and PM<sub>2.5</sub>. In addition the total fuel consumption predicted by COPERT will be extracted to validate our approach outlined below in this section.

COPERT is a software tool used world-wide to calculate air pollutant and greenhouse gas emissions from road transport. It is used by most of the EU Member States (air quality agencies) and has been recently implemented by Ramboll for several cities in Africa (Abidjan, Rabat, Yaoundé, Dar Es Salam and Lusaka). The development of COPERT is coordinated by the European Environment Agency (EEA), in the framework of the activities of the European Topic Centre for Air Pollution and Climate Change Mitigation. The European Commission's Joint Research Centre manages the scientific development of the model. COPERT has been developed for official road transport emission inventory preparation in EEA member countries. However, it is applicable to all relevant research, scientific and academic applications.

#### Dispersion Modelling

The impacts of pollutants will be assessed using air dispersion modelling of pollutants and comparing the predicted ambient air concentrations with international standards of reference. The air dispersion modelling will be undertaken using the internationally recognised ADMS-Airport Model.

ADMS-Airport is an air quality model developed by Cambridge Environmental Research Consultants (CERC) and designed to calculate pollutant concentrations in the vicinity of an airport. The model represents an extension of the well-known ADMS-Urban model, also developed by CERC, which models the impact of the complex mix of sources typical of an urban area, including road, industrial, commercial and domestic sources and other diffuse or small sources.

ADMS-Airport is recognised by ICAO and several other organisations and governmental bodies around the world. It has been widely used to model air quality at London Heathrow Airport. It is currently used by the Heathrow, Gatwick, Schiphol and Beijing airports operators, as well as research bodies, including the French aerospace research centre (ONERA).

The approach used in ADMS is to calculate pollutant concentrations for each hour using as input hourly varying meteorological data, emissions data and background pollutant data. The meteorological input data are derived from standard meteorological measurements from one station. The model is able to account for the effects of variations in surface elevation and surface roughness on the mean wind and turbulence.

ADMS allows a specific treatment of aircraft sources using "accelerating jets" or volume sources. Full landing and take-off (LTO) cycles, as well as auxiliary power units (APU) and GSE emissions, can be considered in the model. Other aspects of ADMS-Airport of particular relevance to this assessment include treatment of chemistry (NO<sub>x</sub>-NO<sub>2</sub> conversion) and "intelligent" gridding. This last feature allows the coverage of a large domain with a standard resolution (250 m) with a focus on emission sources using a much higher resolution gridding (< 50 m). ADMS-Airport has been widely validated through comparisons with monitored air quality data and other modelling approaches including semi-empirical methods, the Lagrangian model LASPORT and the FAA model EDMS.

Short term and long term concentrations will be considered, for the evaluation of possible acute and chronic impacts on population and ecosystems.

#### Impact Identification

Impacts will be identified in terms of air concentrations of pollutants at defined receptor locations.

According to the IFC General EHS Guidelines – Air Emissions and Ambient Air Quality, projects with significant sources of air emissions and a potential for significant impacts to ambient air quality should prevent or minimise impacts by ensuring that:

- Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines, or other internationally recognised sources; and
- Emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards. As a general rule, this Guideline suggests 25% of the applicable air quality standards to allow additional, future sustainable development in the same airshed.

These two criteria will be considered in assessing the potential air quality impacts of the Proposed Project.

#### 7.2.6 Mitigation

Where possible, mitigation alternatives for the reduction of pollutant emissions will be considered. When the reduction of emissions is not possible, mitigation alternatives by means of improvements to dispersion characteristics of sources will be identified and suggested.

In order to minimise potential impacts during construction, unsurfaced areas and roads can be watered and serviced regularly, especially during dry windy seasons. Soil stockpiles can also be covered to reduce the generation of dust. Machinery, equipment and vehicles can be serviced regularly in order to ensure efficient operation and limit excessive emissions during the construction phase.

Mitigation and residual impacts in term of actions and strategies designed to avoid, minimise or offset the potential adverse air quality impacts of the Proposed Project or to enhance potential projects benefits will be provided in the ESIA Report, based on recommendations from the IFC EHS Airport Guidelines. An example of mitigation includes the optimisation of aircraft ground traffic in order to reduce taxiing and therefore reduce NO<sub>x</sub> and SO<sub>2</sub> air emissions.

### 7.3 Noise and Vibration

This section considered the potential impacts with respect to noise and vibration. Noise is defined as unwanted sound, and the normal unit of measurement is the decibel (dB(A)). Sound pressure levels range from the threshold of hearing at 0 dB(A) to levels of over 130 dB(A), at which point noise becomes painful to the human ear. Vibration can be defined as the analogous motion of the particles of a mass of air or the like, whose state of equilibrium has been disturbed, as in transmitting sound.

#### 7.3.1 Existing Environment

The area surrounding the Proposed Project (Airport Footprint, Water Pipeline and quarry road) and along the Expressway is rural farmland with scattered dwellings along local roads with limited motorised traffic. The baseline noise environment is therefore characterised by low noise

levels with no, or very limited, impact from infrastructure, industry etc. At sites where the Expressway will cross and link to existing roads limited road traffic noise levels exist.

The subjective response to noise is dependent not only upon the noise level but also on its character, its duration and the time of day it occurs. Noise levels fluctuate, for instance during an aircraft passing overhead or changes in traffic flow on a nearby road. Scientific surveys have shown that there is a strong correlation between average noise levels and human response to the noise. During night hours sleep disturbance is related to the possible risk of adverse health effect of noise. This effect of noise can also be quantified by the average noise levels but the maximum noise level (e.g. during an overflight near an airport) has also been used.

For this reason, environmental noise is normally described as average noise levels (equivalent continuous sound pressure levels), which can be thought of as a constant noise level over a time period (T) that contains the same sound energy as the fluctuating noise level. As an addition, the maximum noise level can be introduced. This descriptor has also been found to be relevant for assessment of disturbance of wildlife.

The notation for the noise descriptors is  $LA_{eq,T}$  for average noise levels and  $LA_{max}$  for maximum noise levels. The concept is shown graphically in Figure 7-2 and Figure 7-3. For this Proposed Project, an hour average,  $LA_{eq}$  1 hr, will be used to assess the noise impact on humans and the maximum noise level,  $LA_{max}$ , to assess noise impact on wildlife.

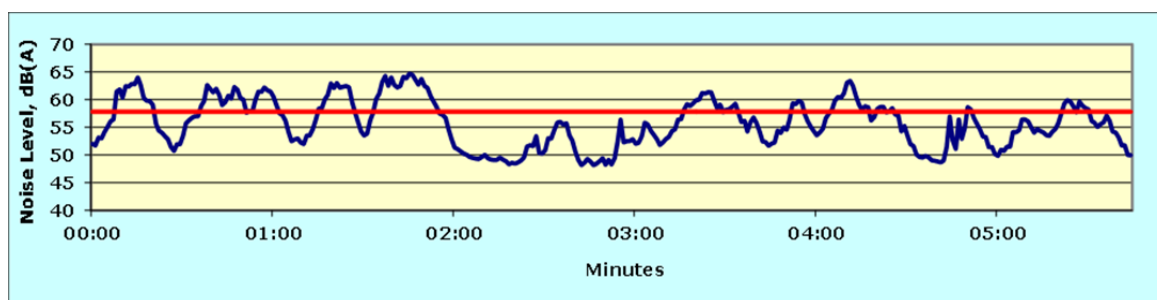


Figure 7-2: Illustration of Noise along a Road during Six Minutes

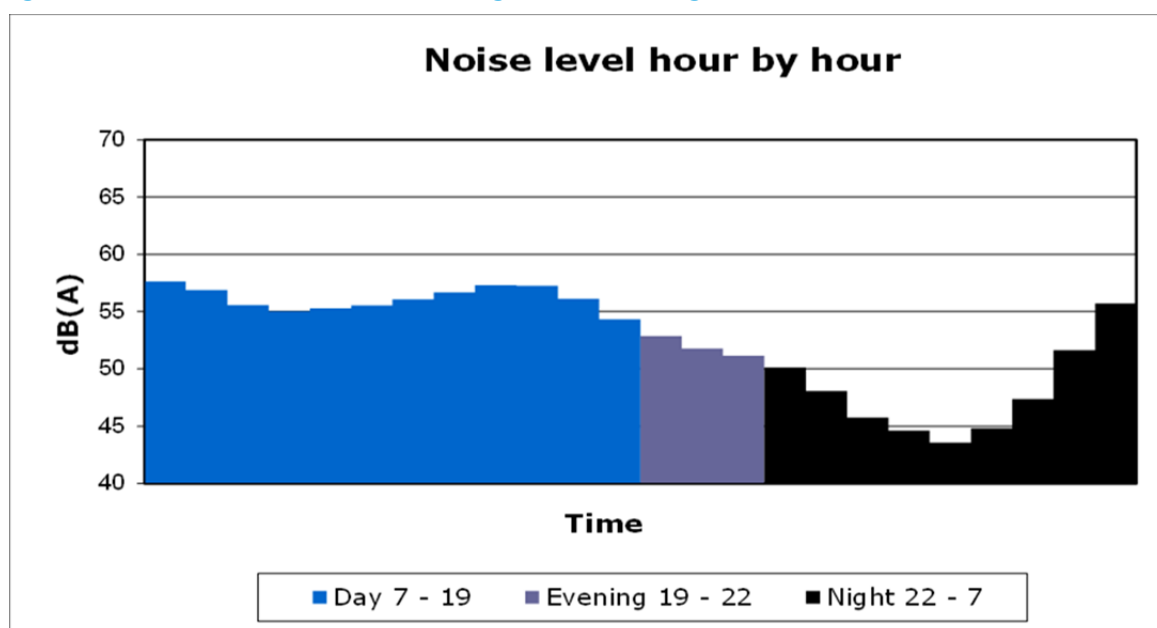


Figure 7-3: Noise Level along a Road Measured Hourly for 24 Hours

For the Proposed Project, fixed noise limits (Table 7-1) based on IFC Guidelines will be used to assess the noise impact from the Proposed Project (i.e. Airport Area, Expressway, Water Pipeline and quarry road), and not an approach based on an increase in background noise levels. This

approach will be adopted given the present background noise levels in the area are low as there are no existing major roads, railways or industry in the vicinity which generate noise. If the noise limits for the impact assessment are based on a low background noise level, which would be the result of a baseline survey, an increase of 3 dB will result in unrealistic low and unachievable noise limits. Instead, references to the noise limits in Table 7-1 are considered to be a more appropriate approach which are not related to the background noise levels.

<b>Table 7-1: IFC Noise Level Guideline</b>		
<b>Receptors</b>	<b>Daytime 07:00 – 22:00 hrs (<math>LA_{eq}</math> 1hr)</b>	<b>Night-Time 22:00 – 07:00 hrs (<math>LA_{eq}</math> 1hr)</b>
Residential; institutional; educational	55 dB	45 dB
Industrial; commercial	70 dB	70 dB

The IFC guidelines address noise impacts at any point on offsite premises occupied by persons/wildlife where extraneous noise and/or vibration are received. Examples of receptor locations may include: permanent or seasonal residences; hotels/motels; schools and day care centres; hospitals and nursing homes; places of worship; and parks and campgrounds.

The IFC guidelines are interpreted as being relevant to the long term operational noise emissions from the Proposed Project, rather than the short term construction noise levels. According to the Environmental Organic Law No. 04/2005 of 08/04/2005, noise pollution is defined as excessive automobile noise and/or unbearable music noise. No specific limits are provided by the GOR; however, noise that is harmful to health of biodiversity, disrupts the neighbourhood or damages the property must be minimised and mitigated.

#### 7.3.1.1 Baseline Road Traffic Noise

At some locations along the Expressway there are crossings and connections to existing roads. At these locations, there is an existing background noise level from road traffic. To establish this baseline, the road traffic noise from the existing roads will be calculated together with the future noise from the Expressway. The results will be assessed using the noise limits in Table 7-1.

The baseline situation is based on the Draft ESIA (2010), observations onsite by our project team and digital map surveys. Furthermore, baseline noise is considered low as no activities which will affect the baseline exist. A model will be run and noise and vibration impacts calculated.

#### 7.3.2 Sensitive Receptors

As stated previously, all communities/persons within the Airport Area have been relocated. Potential sensitive receptors that may be adversely impacted by an increase in ambient noise levels during the construction and operation of the Proposed Project include dwellings/residential areas located close to the boundary of the Proposed Project Area. The main sectors and urban areas located within 15 km radius of the Proposed Project include Rilima, Nyamata, Mwogo, Juru, Gashora, Gahanga and Ntararama.

##### 7.3.2.1 Natural Habitats

The IFC Guidelines do not include noise impacts on natural habitats and wildlife. As there are internationally important wetland habitats in the vicinity of the airport there is a need for assessment of noise disturbance to fauna and birds. This assessment typically needs information on the maximum noise levels that occur, especially during take-off and landing of aircrafts. This will be discussed in detail during the Biodiversity assessment.

### 7.3.3 Potential Impacts: Construction Phase

Construction activities may result in noise and vibration emissions as a result of vehicle movement, equipment and machinery operation, ground-breaking activities and construction of structures and infrastructure associated with the Proposed Project.

The IFC guidelines do not include criteria for construction works. As this noise impact will occur within a limited time frame, it is normal practice in many countries to use noise criteria higher than the criteria for the long term operation phase. Based on Ramboll Environ's experience from other countries, the following significance criteria for noise sensitive neighbours (residential, institutional and educational) are suggested:

- Daytime 07:00 – 18:00: Average noise level  $LA_{eq}$ , 11 hr = 70 dB
- Daytime 18:00 – 22:00: Average noise level  $LA_{eq}$ , 1 hr = 70 dB
- Night-time 22:00 -07:00: Average noise level  $LA_{eq}$ , 1 hr = 45 dB

The noise levels apply outside buildings. The criterion during daytime is an average noise level ( $LA_{eq}$ ) through the whole working day giving the contractor freedom to generate higher noise levels for shorter periods of time during a single day as long as there are other periods with lower noise levels during the same day.

The proposed criteria take into account that relatively high noise levels are acceptable for most people in the daytime during the construction phase as this has a limited timeframe. During night-time, however, sleep disturbance can lead to major annoyance, even for a short period of time. This is the argument for a rather high daytime criterion and a rather low night-time criterion.

The noise emissions from all significant noise sources during construction will be estimated based on experience from other similar construction works. There is a need to consider if and to what extent construction work will take place during night-time hours (22:00 – 07:00). The areas that may be exposed to noise above the criteria will be illustrated on maps and the size of these areas will be calculated. If relevant data are available (e.g. average number of dwellings per square kilometre) the number of affected dwellings will be calculated.

As the nearest residential areas and individual dwellings are some distance from the Airport Area, it is expected that noise impact from construction of the Proposed Project is anticipated to be limited. Noise associated with the construction and development of the Expressway has the potential to impact sensitive receptors within close proximity to the proposed route.

### 7.3.4 Potential Impacts: Operation Phase

The most significant sources of noise and vibration from airport operations will be during the aircraft landing and take-off cycles. Other sources of noise and vibration impact relate to ground operation equipment including aircraft taxiing, operation of ground support vehicles, aircraft APUs and aircraft engine testing activities where maintenance activities are proposed. The flight path also has the potential to result in noise and vibrations impacts on sensitive receptors, although this will decrease with distance and height from the Airport Area.

Additional sources of noise and vibration will be generated from vehicle traffic from the Expressway. A range of vehicles will utilise the Expressway once complete resulting in potential noise and vibration impacts from heavy-vehicles (i.e. trucks transporting cargo), buses, cars and light-vehicles. It is anticipated that sensitive receptors in close proximity to the Expressway will be most impacted.

### 7.3.5 Impact Assessment

Noise from construction and ground operations will be calculated using ISO 9613 Acoustics – Attenuation of sound during propagation outdoors, Parts 1<sup>33</sup> and 2<sup>34</sup>. The software package, Soundplan, will be used for these calculations..

For the calculation of the air traffic noise, the US Federal Aviation Administration Aviation Environmental Design Tool (AEDT) method and software will be used. This method is used world-wide to estimate air traffic noise in accordance with ICAO recommendations. GIS will be used as an integrated part of the modelling and presentation of results.

Typical vibration from construction and operation phases will be calculated and the impact extend assessed. It must be noted that no blasting activities are anticipated during construction which will minimise impacts to surrounding receptors.

### 7.3.6 Mitigation

Where practicable, mitigation alternatives for the reduction of noise impact on noise sensitive areas will be developed and integrated, including noise monitoring. This could be the implementation of preferred procedures and routes for landing and take-off, use of night-time or other operating restrictions and other measures as outlined by IFC and ICAO (Environmental, Health, and Safety Guidelines, Airports, 2007<sup>35</sup> and the ICAO, Resolution A33/7, Balanced Approach to Aircraft Noise Management).

## 7.4 Topography, Geology and Soils

Impacts to geology and soils are assessed in relation to the potential to encounter existing soil contamination associated with past and current land use or for new contamination to occur through accidental leaks or spills, which could result in impact on soils and mobilisation of soil contamination which may impact a number of environmental receptors. In addition, the major cut to fill exercise to be undertaken along with subsequent re-profiling will result in change to the soil structure within the Proposed Project Area.

### 7.4.1 Existing Environment

#### 7.4.1.1 Topography

Rwanda lies on the great East African Plateau, with the divide between the water systems of the Nile and Congo Rivers passing in a north to south direction through the western part of the country. To the west of the divide, the land drops sharply to Lake Kivu in the Great Rift Valley; to the east, the land falls gradually across the central plateau, characterised by its grassy highlands which are the core areas of settlement of Rwanda's population (swamps and lakes on the country's eastern border).

Almost all of Rwanda is at least 1,000 m above sea level; the central plateau is between 1,500 m and 2,000 m high. In the northwest, on the border with the Democratic Republic of the Congo, are the volcanic Virunga Mountains; the highest peak is Mt. Karisimbi at 4,519 m, which is snow-capped. Lake Kivu, 1,460 m above sea level, drains into Lake Tanganyika through the sharply descending Ruzizi River. The Kagera River, which forms much of Rwanda's eastern border, flows into Lake Victoria.

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<sup>33</sup> ISO, 1993. ISO 9613-1:1993 – Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere

<sup>34</sup> ISO, 1996. ISO 9613-2:1996 – Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation

<sup>35</sup> IFC, 2007. Environmental, Health and Safety Guidelines for Airports.

Bugesera District's relief is a succession of plateaus with rolling hills ranging between 1,300 m and 1,667 m. The Bugesera area is also characterised by a series of undulating hills with gentle slopes. Some mountains jut over low plateaus including Juru (1,667 m) Mount Nemba (1,625 m) and Mount Maranyundi (1,614 m). The topography comprises a succession of low plateaus with old mountains, hills and dry valleys, as well as swampy area resulting from a tectonic fault in the area.

#### 7.4.1.2 Geology

The geology of Rwanda comprises Mesoproterozoic metasediments, largely quartzites, sandstones, and shales of the Burundian Supergroup which are locally intruded by granite. There are four types of granite in the Kibaran Belt. In eastern Rwanda are the "older granites" along with granitic-gneisses and migmatites of Palaeoproterozoic age. In the northwest and southwest are Neogene volcanics, ranging in age from Cenozoic to recent. Some of the volcanoes in the area are highly alkaline. Alluvium and lake sediments of Quaternary age occur in parts of the Western Rift and along rivers and lakes.

The geology of Rwanda is similar to the geology of neighbouring Burundi and southern Uganda. The oldest rocks of Rwanda are migmatites, gneisses and mica schists of the Paleoproterozoic Ruzizian basement overlain by the Mesoproterozoic Kibaran Belt.

Based on the Bugesera geological map sheet, the solid geology underlying the weathered granite (saprolite) in the Proposed Project Area consists of Precambrian granitic rock, metaquartzites, pegmatites, and mica schists (Bakundukize et al., 2016).

The morphology and topography (i.e. the rounded and slightly undulating) underlying the Proposed Project Area indicates an altered granite massif. Additionally, the relatively thick soil cover and the occurrence of lateritic deposits in the vicinity are indicators of deep alteration of the granite.

During the Draft ESIA (2010) geological site investigation, which included a resistivity study, it was determined that the depth of the bedrock beneath the Proposed Project Area varies from approximately 8 m to 34 m below ground level (bgl). These findings correspond to the drill logs of the seven boreholes drilled by RMTCLtd during 2017 as part of the current Proposed Project activities.

Drill logs were undertaken onsite by RMTCLtd during 7 March to 26 March 2017. Rock (decomposed granite) was only intercepted in borehole BHC2 at a depth of 13 mbgl. Geo Environmental Group (GEG) was appointed by Mota-Engil in 2017 to conduct additional soils testing (soil trial pitting, sinking of boreholes and analysis of soil samples) in and around the Airport Area. According to GEG, the silty/clayey soils overlying the granite are due to weathering of the granite based on the lithologies intersected during drilling. GEG grouped the lithologies into five geological-geotechnical ground types based on their standard penetration test (SPT) blow counts.

No structural intrusions (i.e. faults, dykes and sills) are present over the Airport Area. The geology of the Expressway is expected to be similar as the lithology is uniform within the area. However, the Kivu Rift located approximately 100 km southwest of the Proposed Project may cause seismic activity, which could impact structures and infrastructure associated with the Airport Area, Expressway, Water Pipeline and quarry road.

#### 7.4.1.3 Soils

The rich volcanic soils in the northwest (highlands at more than 2,000 m) are generally fertile and allow cultivation of a wide range of food crops (for example, maize, potato, banana, beans, sorghum, green peas and wheat); acidic soils of Congo-Nile Crest (1,500 m-1,700 m) are

suitable for certain other crops, such as tea, and soils in the larger river valleys and extensive wetlands are the most fertile. Most volcanic soils in naturally forested areas, such as the Volcanoes National Park and the Gishwati Forests, are high in nitrogen (Nzeyimana, Hartemink, & de Graaff, 2013).

The eastern lowlands have relatively fertile soils, but because of the long dry season, crops require irrigation. In many highland areas, the deep soils are typically acidic (with a pH of less than 5.0) because nutrients have been leached away. Aluminium is very soluble in soils with low pH levels, making the soil toxic to plants, inhibiting growth and often leading to high soil phosphorus fixation. Deforestation and tillage rapidly deplete organic matter in highland soils, threatening the viability of long term cultivation.

It is thought that about three-quarters of Rwanda's soils are acidic, with a pH below 5.5. Soils in the central and southern regions are often deficient in nitrogen (Nzeyimana, Hartemink, & de Graaff, 2013). Nitrogen deficiency causes soil erosion and quick mineralisation (Nabahungu, 2013). In most soils, but particularly those resulting from volcanic deposits, phosphorus is the main limiting nutrient for crops. Approximately 87 % of soils have a pH of less than 5.2 and are deficient in phosphorus (Nzeyimana, Hartemink, & de Graaff, 2013).

According to the Draft ESIA (2010), electrical resistivity logs of 31 onsite boreholes, the soil composition beneath different locations across the Proposed Project Area is summarised in Table 7-3. The soil beneath the Proposed Project Area is made up predominantly of sand and clay, in terms of the Unified Soil Classification System (USCS).

The soils collected from the trial pits undertaken by GEG indicate that the soil beneath the site comprises (from dominant to least dominant): reddish, silty/clayey sand (B1), topsoil (A0), dark grey clayey sand (A1), light grey clayey sand (A2).

Drill logs of seven onsite boreholes confirmed that the Proposed Project Area is underlain by the following lithologies, from shallow to deep:

- Topsoil (A0) with an average thickness of 1.2 m;
- Dark grey silty/clayey sand (A1) with an average thickness less than 0.0 m;
- Light grey silty/clayey sand (A2) with an average thickness less than 0.0 m;
- Reddish silty/clayey sand (B1) with an average thickness of 4.7 m;
- Reddish silty/clayey sand with yellowish nodules (B2) with an average thickness of 7.5 m;
- Yellowish silty/clayey sand (B3) with an average thickness of 2.5 m;
- Lateritic soil (C) with an average thickness of 4.2 m; and
- Decomposed granite (R) with an average thickness of 10.3 m.

Laboratory tests carried out on the soils collected from the test pits for laboratory analysis were similar to the soil results for soil samples collected from test pits by Mota-Engil during September and October 2016. Soils present beneath the Proposed Project Area consist predominantly of silt and sand, with lesser gravel and clay.

Although no soil samples were taken to analyse potential for contamination, it is unlikely that contamination from foreign sources viz. hydrocarbons, heavy metals, chemicals, etc. will occur within the Proposed Project Area as the area was predominantly used for subsistence cattle and crop farming activities. Biological impacts from low-density informal housing may have had an impact on the soils, although the extent of this is not considered significant.



#### 7.4.2 Sensitive Receptors

The topography and landscape sensitivity is considered to be low with the exception of the high-raise areas such as Juru (1,667 m) Mount Nemba (1,625 m) and Mount Maranyundi (1,614 m). There are no sensitive landscape features within the Proposed Project Area.

Rwandan soils are naturally fragile. In many highland areas, the deep soils are typically acidic (with a pH of less than 5.0) because nutrients have been leached away. The fertile soils of the Bugesera District are vulnerable to wind erosion following disturbance from de-vegetation due to crop farming, grazing and vehicle traffic. The loss of soil from wind erosion can result in the loss of diversity of vegetation, altered ecological structures and reduced pastoral productivity.

#### 7.4.3 Potential Impacts: Construction Phase

During the construction of the Proposed Project, surface soil would be disturbed by the construction of structures and infrastructure, development of foundations, construction of roads, the storing materials (construction materials) and development of borrow pits. As a result, surface soil would be compacted and/or soil structure would be disturbed by vehicle movement, resulting in the degradation of the soil protective layer in the immediate vicinity of the Proposed Project.

Soil contamination may occur during construction and operation of the Proposed Project from:

- Handling and disturbance of soil and vegetative cover during construction activities;
- Accidental spills and/or releases of fuel and oil from vehicles and construction equipment;
- Loss of hydrocarbon from fuel and lubricant storage vessels or spills during loading and transportation;
- Spills or leaks from water treatment chemicals; and
- The release of contaminated wastewater or hydrocarbon contaminated stormwater from the Proposed Project which may also impact surrounding soils.

Exposure of soil surfaces to wind and rain during site clearance, earth moving and excavation can result in soil erosion. This can also result in sedimentation of surface drainage networks resulting in an impact to water quality.

#### 7.4.4 Potential Impacts: Operation Phase

Airport operations can result in instance of soil and groundwater contamination as a result of incorrect storage and handling of potentially contaminating substances (i.e. hydrocarbons, wastewater, contaminated runoff, etc.).

It is understood that 95% of the Airport Area and Expressway will be covered with hardstanding, resulting in a low possibility for any existing contamination to migrate offsite to the receiving environment.

Mitigation and management measures to address impacts identified as adverse in relation to soil, contamination, geology and groundwater would be developed in liaison with BAC.

#### 7.4.5 Impact Assessment

The predicted impacts from the Proposed Project will be assessed over the planned lifespan of the Project and may include:

- Impacts on the existing users in terms of groundwater levels and reduction in yield of existing boreholes;
- The potential inflows of groundwater into the Proposed Project;
- Possibility of water diversion impacting upon soil quality and/or use; and

- Possibility of pollution.

Furthermore, potential seismic activity from the Kivu Rift will be assessed during the ESIA phase of the Proposed Project. Adequate soil sampling has been conducted across the Proposed Project Area and therefore, no additional soil sampling will be conducted.

#### 7.4.6 Mitigation

Where possible, measures to reduce the impact to underlying soil quality within the Proposed Project will be identified and may include:

- Management of construction and operation activities (i.e. spill prevention procedure, emergency and response plan, etc.);
- Soil management;
- Offsetting of land use;
- Requirements for on-going monitoring;
- Erosion control measures; and
- Flood prevention measures.

### 7.5 Water Resources

Impacts on water quality and management of water resources and wastewaters during the construction and operation phases of the Proposed Project will be considered during the ESIA for both surface water (hydrology) and ground water (geohydrology) features.

#### 7.5.1 Existing Environment

##### 7.5.1.1 Hydrology

With its relatively high average rainfall, Rwanda is often perceived as a water-rich country, but precipitation is not evenly distributed over the country and trends show increasingly short and more intense rainy seasons, bringing with them increased erosion, flooding and drought. Similarly, Rwanda has a dense drainage network which allows most of the country to receive water, although it is unevenly distributed both spatially and temporally: the west receives most precipitation and the eastern part of the country is relatively dry, while there are long dry periods between rainy seasons.

Other challenges include changes in climate that are already disturbing normal temperature and rainfall patterns and the need to supply more of the country's population with water for improved domestic supplies and sanitation. Water use will also rise with the needs of a growing population and for planned irrigation and hydroelectricity developments. As well, water quality needs to be protected from sources of pollution.

There are two main hydrographical basins in Rwanda that lie on either side of a north-to-south watershed line known as the Congo-Nile divide; the Congo and Nile River Basins. The Proposed Project is located in the Akagera Upper Catchment area. The Akagera Upper Catchment covers an area of 3,053 km<sup>2</sup> and is defined as a transboundary (with Burundi and Tanzania) downstream catchment that drains the area from the confluence of Nyabarongo and Akanyaru Rivers down to the Rusuma Falls. It features numerous lakes with significant evaporation losses and the confluence with the Ruvubu River (from Tanzania/ Burundi).

The Proposed Project is situated in the Akagera River System. The Nyabarongo (situated at 7 km southeast of the Proposed Project Area at its nearest point) and Akagera Rivers are linked to the largest marshlands and lakes, some of which are located within 10 km of the location of the Proposed Project. The given vegetation of these marshlands and volume of the lakes constantly changes in accordance with rainfall and river flow.

Three lakes are located in close proximity to the southeast of the Proposed Project, and include Lake Kidogo, Lake Gashanga and Lake Rumira. Although water quality of these lakes is not known, it is presumed that the water is of fair quality, impacted on mostly by sediment loads, sewage from surrounding communities and high organic loads from cultivation activities. Other surrounding water bodies have been identified and are presented in Table 7-2.

<b>Table 7-2: Water Bodies Surrounding the Proposed Project Area</b>		
<b>Feature</b>	<b>Direction from Proposed Project</b>	<b>Distance</b>
Mwesa River (ephemeral stream)	North and east	Approximately 500 m
Kibilizi River (ephemeral stream)	West	Approximately 1 km
Kigogoma River (ephemeral stream)	West	Approximately 3.5 km
Lake Kidogo	Southeast	Approximately 2 km
Lake Gashanga	East	Approximately 4.8 km
Lake Rumira	Southeast south	Approximately 5 km
Nyabarongo River (perennial stream)	Southeast east	Approximately 7 km
Lake Birara	Southeast east	Approximately 8 km
Lake Miravi	Southeast south	Approximately 8 km
Lake Mugesera	East	Approximately 9 km
Lake Cyohoha Nord	Southwest	Approximately 11 km

The wetlands of Rwanda cover a total area of 164,000 ha and includes a variety of ecosystems, ranging from large, permanently flooded swampy peat-lands to smaller, seasonally flooded wetlands characterised by soil with a high mineral content.

The Proposed Project falls within one of these wetlands, called the Nyaborongo Wetland, which acts as ponds for sediment particles. It also has an important role in the water balances of Rwanda by acting as a buffer, which subsequently reduces the maximal flow rates during the rainy season and sustains a relatively high flow rate during the dry season. Some of the land uses of this wetland include agriculture production, collection of leaves to make handicrafts, extensive grazing and the making of bricks.

### 7.5.2 Hydrogeology

As the geology of Rwanda is similar to the geology of the neighbouring Burundi, it is expected that the aquifer systems will also be similar to one another. Based on a study by Bakundukize et al. (2016), investigating the Burundian portion of a transboundary aquifer which stretches over north-eastern Burundi and south-eastern Rwanda (i.e. Bugesera area) it is believed that the aquifer system underlying the Proposed Project Area is characterised by a relatively deep groundwater level, with thick clayey weathered overburden (saprolite) followed by fractured/weathered basement rock which overlies fresh granite bedrock.

The weathered substratum is characterised by a network of fractures and fissures resulting from weathering processes, lithostatic decompression, cooling stresses or tectonic activity. The typology of the basement aquifers is complex. They are generally considered as unconfined aquifers, but may respond in a leaky (semi-confined) fashion when the groundwater table rests in the uppermost clayey layer of the weathering profile (Carruthers et al., 1992).

The clayey weathered overburden is characterised by a large storage capacity but low hydraulic conductivity. Boreholes which tap the deeper weathered/fractured basement generally have high yields as the fractures drain the substantial storage of the overlying weathered overburden.

Based on pumping test conducted on seven offsite boreholes completed in the same aquifer as the one suspected to be present onsite, the aquifer underlying the Proposed Project Area has a specific yield in the range of 17.4 – 744.5 m<sup>2</sup>/d which indicates that the aquifer is highly heterogeneous.

#### 7.5.3 Sensitive Receptors

It is understood that onsite boreholes have been drilled up to 80 mbgl and that no groundwater has been identified. Although a deep aquifer may be present under the Proposed Project Area, due to the relatively thick weathered clayey overburden, which has a high storage capacity and low hydraulic conductivity, it is suggested that the fractured/weathered basement has a low to moderate probability of being contaminated by surface activities.

A number of surface water bodies will need consideration in the ESIA including surrounding lakes (Lake Kidogo, Lake Gashanga and Lake Rumira) as well as the Nyaborongo Wetland. The Expressway follows the topography of the area and will run along the Mwasa stream/ wetland. Although the Nyabarongo River may not be impacted on directly as a result of the Proposed Project, the Expressway joins in close proximity to where the KK-15 Road crosses the river and is considered a sensitive receptor.

#### 7.5.4 Potential Impacts: Construction Phase

Surface runoff and indirect discharge from the Proposed Project have the potential to have an impact on surface water quality within adjacent water bodies as well as soils and groundwater during construction. There is also the potential for impacts on the local hydrological regime and river beds during this phase in the event of uncontrolled surface runoff.

The water during the construction phase will be sourced from Lake Kidogo. Lake Kidogo covers an area of approximately 1.4 km<sup>2</sup>, although the depth of the water body is not known. The lake is recharged from surrounding marshlands/ wetlands from rainfall. The volume of water within the lake will need to be calculated during the ESIA phase in order to ensure that water supply from the lake is sustainable.

Potential impacts from abstraction of water from Lake Kidogo may result in changes to the overall hydrological balance of the lake which can have additional biodiversity (i.e. ecological) and socio-economic (i.e. local fisherman, surrounding users, etc.) impacts.

Activities that have the potential to generate sources of contamination during construction activities include management of workshops, hydrocarbon and hazardous material storage and handling areas, laboratory effluent, sewage handling and treatment systems, stormwater collection and transportation of sedimentation from surface water erosion. Potential health and safety impacts could arise during high-intensive rainfall events where the Mwasa stream/wetland could flood.

#### 7.5.5 Potential Impacts: Operation Phase

According to BAC, the water supply for the operation phase of the airport will be sourced by the GOR; however, limited information is available about the source although it is understood that water will not be obtained from Lake Kidogo.

The Airport Area and Expressway will be constructed in accordance with Rwanda legal requirements and international best practice. Therefore, limited contamination to surface and groundwater sources is anticipated. Potential impacts may arise from incorrect hydrocarbon and hazardous material storage, sewage and wastewater handling and treatment facilities, stormwater collection and containment systems and from accidental spillages/leakages from vehicles, equipment, machinery and airplanes in uncontained areas. Potential flooding of the

Mwasa stream could also result in contamination to the receiving water body from hydrocarbon spillages along the Expressway. Similarly, stormwater runoff could result in the flooding of the Mwasa stream and surrounding wetlands during high rainfall events.

#### 7.5.6 Impact Assessment

##### 7.5.6.1 Geohydrology

The data gathered from the various activities will be interpreted to provide the hydrogeological characterisation of the Airport Footprint and Expressway areas. At this stage the linkages between the groundwater and surface water will be used to determine the dynamics within the study areas. Data interpreted included borehole logs drilled onsite and available information from published documents.

It is understood that limited groundwater exists beneath the site in deep aquifers. The potential of operational activities to affect the groundwater conditions are considered negligible as the Airport Area and Expressway will comprise of hardstanding and stormwater controls will be incorporated into the design limiting permeability to underlying resources. Furthermore, as no groundwater will be used for the Proposed Project, no impacts will occur to potential users within the area.

The likely impacts predictions on the groundwater regime will be discussed and comments made with respect to:

- The potential inflows into the planned development; and
- Possible development of pollution plumes.

##### 7.5.6.2 Hydrology

Once the flow and water quality data has been provided, it will be analysed to produce statistics which characterise the flow and water quality profiles of the potentially impacted streams. This data will be collated into a database that will track the monthly changes in water quality and flow throughout the monitoring period if deemed applicable following the compilation of the ESIA report.

The available climate data will be collated and analysed. Historical rainfall data from the site will be evaluated to check if the rainfall statistics are comparable and determine long term rainfall patterns. The data will be used to produce a daily rainfall record, rainfall statistics and evaporation depths for use in the study.

##### 7.5.7 Mitigation

Where possible, mitigation alternatives for the reduction of impacts upon local hydrology and geohydrology will be identified and mitigation measures proposed if necessary. Mitigation measures during construction and operation activities may include but not be limited to the following:

- Sustainable water abstraction rates from Lake Kidogo during construction and from other sources during operation;
- Installation of groundwater monitoring wells;
- Requirements for ongoing monitoring;
- Stormwater control measures; and
- Flood prevention measures.

Liaison with the BAC Design Team would take place to define mitigation and management measures to address any impacts identified as adverse to water quality.

Surface and potentially groundwater monitoring will include analysis of hydrocarbons and chemicals used in the wastewater treatment plant. The incorporation of stormwater control systems to reduce potential contamination of receiving water bodies will be incorporated in the Proposed Project design. Engineering designs will also be considered around hydrocarbon tanks, waste areas and maintenance workshops to limit potential runoff of contaminated water into the environment. The requirement for monitoring will be identified during the ESIA phase of the project.

## 7.6 Biodiversity

The biological environment includes designated sites (both protected by Rwandan Law as well unprotected sites that are Internationally Recognised Areas) habitats (including terrestrial and freshwater), and their component species. The ecological baseline has been characterised through a combination of secondary data and field surveys. The field surveys conducted in May and June 2017 (beginning of the dry season) included:

- **Flora:** to confirm the broad habitat type at each sample location, assess habitat quality, provide a comprehensive plant species list for each habitat type and locate any endemic, restricted-range, or threatened flora species in the Project Area;
- **Herptiles:** amphibian and reptiles within the Area of Influence were surveyed using a combination of visual encounter surveys (VES), audio encounter surveys (AES) and dip netting;
- **Birds:** were surveyed using a combination of point counts, timed species counts, and observations.
- **Mammals:** were surveyed in combination with the other surveys and incidental sightings, which were recorded.

In order to identify the potential presence of plant and animal species of conservation importance within the Area of Influence, the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (RL) was searched to identify species with global ranges that overlapped with the Project Area of Influence. The classification system used by the IUCN RL, for representing the extinction risk of species is presented in Table 7-3. Species classified as VU or above on the IUCN Red List, are referred to collectively as 'threatened' species.

Table 7-3: International Union for Conservation of Nature Categories of Extinction Risk	
Category	Definition
Extinct in the Wild (EXW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range.
Critically Endangered (CR)	Species facing an extremely high risk of extinction in the wild.
Endangered (EN)	Facing a very high risk of extinction in the wild.
Vulnerable (VU)	Facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Data Deficient (DD)	Inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.
Least Concern (LC)	A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or

Table 7-3: International Union for Conservation of Nature Categories of Extinction Risk	
	Near Threatened. Widespread and abundant taxa are included in this category.

### 7.6.1 Existing Environment

#### 7.6.1.1 National Context

Rwanda's ecosystems lie within and are characteristic of a larger ecological and geographical region or ecoregion of East Africa called the Albertine Rift. Due in part to its location within the biodiversity-rich Albertine Rift and because of its varied landscapes and climates, Rwanda is one of Africa's most important biodiversity areas (REMA, 2010a). Its landscape is made up of a variety of ecosystems, including humid Afromontane forests, planted forests and remnant forests such as riparian gallery forests, savannahs, a large network of water bodies (lakes, rivers and wetlands), and large cropland and grazing areas.

Rwanda's natural forest ecosystems mostly lie within the Akagera, Nyungwe and Volcanoes National Parks, and the Gishwati, Iwawa Island and Mukura Forest Reserves. Wetlands cover a significant proportion of the country and are often referred to as marshes. Rwanda's wetlands are some of its most threatened ecosystems (REMA, 2011a). Large parts of Rwanda were once covered with natural montane-grassland ecosystems, which today are occupied mostly by terraced agriculture. This has led to serious soil erosion in some areas. In the flatter eastern part of the country, poorer soils support open savannah and broad-leaved woodland areas with acacia and grass species typical of Africa's classic savannahs and open woodlands (RoR, 2014c).

A large proportion of Rwanda's land is under agricultural systems defined as *"ecosystems used in agriculture under similar conditions, with similar components, interactions and conditions. Included in agro-systems are mono-cropping, mixed farming and associated crops, including agro-pastoral systems, agroforestry, aquaculture, grassland, grazing land and fallow land"* (MINITERE, 2003).

In 2015, REMA conducted the Study to Establish a National List of Threatened Terrestrial Ecosystems and Species in Need of Protection in Rwanda<sup>36</sup>. It concluded that there are 17 threatened ecosystems, classified in different categories as defined by the IUCN. Three ecosystems are classified as Collapsed (Ndoha Natural Forest; Sanza Natural Forest; and Mashyuza Natural Forest); 10 are Critically Endangered (Volcanoes National Park; Busaga Natural Forest; Dutake Natural Forest; Gishwati Natural Forest; Karama Natural Forest; Karehe-Gatuntu Natural Forest Complex; Ibanda-Makera Natural Forest; Nyagasenyi Natural Forest; Rujambara Natural Forest; and Mukura Natural Forest); and four are Endangered (Kibirizi and Muyira Natural Forest; Akagera National Park; Nyungwe National Park; and Muvumba Gallery Forest) (REMA, 2015).

Because of its varied ecosystems, Rwanda has a very rich diversity of flora and fauna, with some 2,150 known plant species, 151 mammal species, 87 species of amphibians and reptiles and 670 bird species (REMA, 2011b). Rwanda accounts for 40% of Africa's mammalian species (REMA, 2009) and about 30% of the global population of mountain gorillas is situated in the Rwandan part of the Albertine Rift (REMA, 2010a).

### 7.6.2 Sensitive Receptors

#### Protected Areas and Internationally Recognised Areas

<sup>36</sup> REMA, 2015. Study to Establish a National List of Threatened Terrestrial Ecosystems and Species in Need of Protection in Rwanda

The Proposed Project Area is located outside any protected areas. The nearest protected area is Akagera National Park, which is approximately 40 km away. Therefore, no nationally protected areas occur within the Project Area of Influence. The study area includes parts of the Nyabarongo wetlands Important Bird Area (IBA)<sup>37</sup>, which is an internationally recognised area as defined by IFC PS6. The Nyabarongo wetlands IBA is recognised for internationally important populations of the following species:

- Papyrus Gonolek *Laniarius mufumbiri*;
- Carruthers's Cisticola *Cisticola carruthersi*;
- Calamonastides gracilirostris;
- White-winged Swamp-warbler *Bradypterus carpalis*;
- Black-lored Babbler *Turdoides sharpie*;
- Northern Brown-throated Weaver *Ploceus castanops*;
- White-collared Oliveback *Nesocharis ansorgei*; and
- Papyrus Canary *Crithagra koliensis*.

The Proposed Project Area, including the Airport Area, Expressway and water pipeline, is characterised of mainly five vegetation types: anthropic landscapes; grassland; wooded grassland; bushland and thicket; and swamp and aquatic vegetation. All of the habitats within the Proposed Project Area are modified habitats as defined by the IFC PS6. Within the Area of Influence, the only natural habitats are wetlands situated to the west, north and east of the Proposed Project. A total of 59 plant species were recorded in the wetland areas; of these 15 were wetland species. The most abundant is the giant sedge, *Cyperus papyrus*. No threatened or endemic plant species were recorded.

A total of 124 bird species were recorded in the Airport Area, Water Pipeline, and Expressway development areas. A single threatened species was recorded: grey crowned crane, *Balearica regulorum*, with a total of four individuals recorded. No other threatened or endemic fauna species were recorded.

Furthermore, four endemic fish species with global ranges overlapping the Proposed Project Area may occur, including one species that is considered to be Critically Endangered. Therefore, the species has a low threshold for being considered critical habitat. *Labeo victorianus* is a potamodromous species in that it spends most of its life span in lakes and ascends large rivers during the rainy season. Additional studies will be conducted to identify the potential presence of this species.

### 7.6.3 Potential Impacts: Construction Phase

Potential impacts on ecological resources on and adjacent to the Proposed Project may occur as a result of removal of natural habitats during site clearance and construction. Noise and vibration and air quality impacts associated with construction activities can also impact species resident in neighbouring areas of the Proposed Project Area, such as birds and aquatic and terrestrial animals.

Furthermore, artificial lighting during construction can impact ornithological and terrestrial ecological resources. Resultant impacts on the flora and fauna may have a direct impact on ecological sensitivity in the area. Potential impacts may occur during construction activities on habitat corridors, or isolation of sensitive areas may result in the degradation of indigenous flora

<sup>37</sup> BirdLife International (2017) Important Bird Areas factsheet: Nyabarongo wetlands. Downloaded from <http://www.birdlife.org> on 07/06/2017.



and fauna species, and changes in populations reliant on movement or interchange between habitats.

The biodiversity and ecology within the Proposed Project Area can also be impacted through mismanagement of dangerous goods. Construction could also result in the generation of alien vegetation, which may encroach and impact on the sensitive ecosystem.

#### 7.6.4 Potential Impacts: Operation Phase

Ecological resources can be impacted by the operations of the airport in terms of noise and vibration disturbance. Birds flying across the take-off and landing areas can be involved in fatal strikes. Mitigation measures can be introduced to avoid this occurrence but there is a subsequent impact on the ecology of the area. Reduced air quality as a result of engine and fuel emissions from aircraft can impact species both on and in the vicinity of Airport Area.

Contamination from the poor management of wastes generated onsite can also impact the surrounding fauna and flora. The accumulative effect of emissions into the air is anticipated to have an adverse effect on the flora and fauna populations. Operational mismanagement resulting in releases, spillages and leakages of chemicals, hydrocarbons and sewage may lead to a depletion of the natural ecosystem. Associated impacts from traffic and transport activities from the Expressway and quarry road will also impact flora and fauna species.

Additionally, lighting arrangements during airport and Expressway operations can impacts ornithological and terrestrial ecological resources.

#### 7.6.5 Impact Assessment

IFC PS6 (Biodiversity) will be considered to establish whether critical habitat requirements are triggered and, if so, measures will be set out to ensure compliance with these. In addition, consideration will be given to ecosystem system services as set out in the IFC PS 6.

The biodiversity baseline will be described through a combination of secondary data and primary field studies. Secondary data will be obtained from official sources, published scientific literature and 'third party' documents (such as published survey reports and Environmental and Social Impact Assessments that may have been completed in the vicinity of the study area). Online databases will be accessed such as the IUCN red list. Also, local wildlife experts, statutory agencies and research establishments would be contacted with the aim to obtain additional data records and unpublished information.

Vegetation has been classified through the use of standard quadrat surveys. A list of plant species has been compiled within the quadrats to enable the vegetation types to be classified accurately. Particular attention has been made to identify any wetland habitats.

The faunal surveys will be completed with a combination of transect surveys and point counts. Species specific survey methodologies have been completed for the following:

- Birds;
- Mammals;
- Amphibians; and
- Reptiles.

Following completion of field studies, habitats will be assessed according to IFC PS6 criteria as modified, natural or critical habitat. In addition, the data will be used to screen the likely ecosystem services that are relevant to the Project Area of Influence and categorise them according to either priority 1 or priority 2 ecosystem services which are as follows:

- Priority 1 - services on which project operations are most likely to have an impact and, therefore, which result in adverse impacts to Affected Communities.
- Priority 2 - those services on which the Proposed Project is directly dependent for its operations (e.g. water).

The assessment will consider the likely effectiveness of the proposed mitigation measures in order to predict any potential significant adverse residual impacts on biodiversity or ecosystem services that would require restoration, compensation, or offsets. This prediction will be based on published studies, expert experience, and case studies of similar impact scenarios.

#### 7.6.6 Mitigation

Potential mitigation measures will be identified by application of the mitigation hierarchy where avoidance is sought first, followed by minimisation (by improving design, technologies, construction practices, operational parameters, etc.) and, when residual impacts remain, restoration, compensation, and/or offsets are applied. Mitigation will be identified from available international best practice for similar impact scenarios.

### 7.7 Waste Management

The definition of waste is taken from the IFC Environmental, Health and Safety (EHS) Guidelines as follows: *"A waste is any solid, liquid, or contained gaseous material that is being discarded by disposal, recycling, burning or incineration. It can be a by-product of a manufacturing process or an obsolete commercial product that can no longer be used for its intended purpose and requires disposal"*.

#### 7.7.1 Existing Environment

The GOR Ministry of Infrastructure acknowledges that Rwanda is facing significant challenges in relation to solid waste management. Waste generation is increasing nationally, with a sizeable proportion of this waste being disposed of within improperly located and operated dumpsites, resulting in adverse impacts on the environment and human health.

The National Policy and Strategy for Water Supply and Sanitation (Ministry of Infrastructure, 2010<sup>38</sup>) targets the implementation of an integrated solid waste management system in a manner that ensures the protection of human health and the environment. A National Task Force is committed to the establishing of an affordable, integrated approach to solid waste management based on the waste hierarchy.

Rwanda Utilities Regulatory Authority (RURA) regulates three main sanitation services including solid waste management collection and transportation services. These are services provided to households and institutions as well as public areas such as markets and hospitals. Operators in this domain are composed of companies, cooperatives and individuals providing solid waste collection and transportation services. National trends of waste management could not be identified; however, REMA's Kigali State of the Environment and Outlook Report 2013<sup>39</sup> does provide an overview of waste management practices within Kigali.

##### 7.7.1.1 Waste Management in Kigali

In 2007, it was reported that Kigali generated an average of 500 metric tonnes (t) of solid waste per day, but by 2012, figures quadrupled to 1,800 t to 2,000 t of waste. These estimates equate

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38 Republic of Rwanda Ministry of Infrastructure, 2010. National Policy and Strategy for Water Supply and Sanitation Services

39 REMA, 2013. Kigali State of the Environment and Outlook Report.

to about 1.8 kg to 2 kg of waste generated per person, per day in Kigali. Food waste accounts for more than 65% of solid waste for all districts and low-income populations. Middle and high income populations produce slightly less, with 63.1% and 58.9%, respectively. Table 7-4 provides an overview of the types of waste generated for each district within Kigali.

<b>Table 7-4: Waste Streams Arising for Districts in Kigali in 2013</b>			
<b>Waste Stream</b>	<b>Percentage of Waste Generated</b>		
	<b>Nyarugenge</b>	<b>Gasabo</b>	<b>Kicukiro</b>
Food	66.4	67.5	66.7
Paper	16.4	16.6	15.4
Grass	6.7	7.3	6.8
Plastic	1.6	1.0	1.9
Metal	0.9	0.5	1.9
Textile	1.8	2.4	1.8
Glass	1.6	0.8	1.7
Wood	3.2	3.0	2.5
Leather	0.5	0.2	0.4
Cans	0.9	0.7	0.9

In Kigali, the percentage of households using a formal collection service has increased since 2005, but the percentage of households that dispose of waste in public areas, such as bushes or fields, has also increased.

Private companies operate municipal waste collection in Kigali and solid waste is required to be dumped in the city's landfill. Waste was originally sent to Nyanza landfill, which has now been closed due to problems associated with health and environmental hazards, as proper protection measures were not installed during its creation. The new landfill is located in Nduba, approximately 20 km to the north of Kigali. This site is further from the city's densest populations, reachable only by dirt roads on steep slopes making it challenging for both large waste vehicles and the common resident to reach.

The City of Kigali and the Belgian Development Agency (BTC Rwanda) conducted a study during the first few months of Nduba's opening. It found that waste brought to Nduba is primarily generated from households (65%) and less often from commercial establishments (26%) and industries or medical facilities (less than 10%). Only an estimated 25% of the solid waste generated in Kigali makes its way to the Nduba landfill.

Some recyclables such as polyethylene terephthalate (PET) are sorted and sold to outsourced recycling companies, as there are no municipal recycling facilities in Kigali for such plastics. Some other types of waste can be recycled in Kigali without much infrastructure. The COPED group collects film plastics to make into plastic materials and biomass to produce briquettes. The COPED group collects 30 t of waste per month, 10 t of which is recycled into briquettes for households to burn as fuel (Nishimwe 2013). This initiative prevents the gathering of some fuel wood, helping to alleviate deforestation in the surrounding forest.

#### 7.7.1.2 Waste Management in Bugesera

The Bugesera District Development Plan identifies crop farming and livestock rearing as the district's main economic outputs with 77.8% of the local population involved in agriculture. The majority of commercial waste arisings in the district are assumed to be associated with these agricultural practices.

The district currently has poor rural and inter-district road networks and the inter-sector and existing tarmac road networks are considered insufficient to accommodate the traffic anticipated to arise upon completion of the Proposed Project. There is no comprehensive waste management and treatment plan for Bugesera, although the district government has identified its need. The District has committed to focusing on improving solid waste management by constructing landfill and solid waste dumping sites.

Information obtained from the Master Plan indicates that, as a general benchmark, waste production of 0.5 kg per passenger and 1.0 kg per employee can be assumed. Up to 45% of the generated waste can be considered recyclable which are composed like shown below:

- 50% Paper;
- 25% Plastics;
- 5% Timber;
- 4% Glass;
- 3% Metals; and
- 13% Other.

#### 7.7.2 Sensitive Receptors

Sensitive receptors include groundwater and surface water resources that have the potential to be impacted by inappropriate management of waste streams. In addition, the health and amenity of occupants in the Project Area of Influence could be impacted by inappropriate management practices. More specifically, the following existing sensitive receptors may be impacted by the construction and operation of the proposed NBIA:

- Regional groundwater aquifer systems and surface water bodies;
- Local communities;
- Local waste management facilities;
- Employees of NBIA who live and/or work on-site during excavation and construction and operation; and
- Local flora and fauna and migrating fauna.

The Proposed Project is likely to generate the following waste streams:

- Non-hazardous and domestic/ general wastes (liquid and solid);
- Hazardous wastes (liquid and solid);
- Recyclable wastes (wood, scrap metal, etc.);
- Redundant wastes (recyclable and non-recyclable);
- Waste tyres; and
- Electronic waste.

#### 7.7.3 Potential Impacts: Construction Phase

During construction, various wastes will be produced, including, waste construction materials; waste excavation materials (that are unsuitable for use as fill material); scrap wood and metals; waste oils and chemicals from maintenance and re-fuelling activities; waste tyres; redundant vehicle and machinery batteries; food waste from project site catering facilities; general household waste from site office and construction camp operations. All wastes will need to be segregated and recycled/disposed in accordance with Rwandan requirements and GIIP.

Potential waste streams will be identified from different elements of the construction process, e.g. excavation, site clearance, batching plants, construction offices, etc. The estimates of total

waste quantities will be made using benchmarking data –from Rwanda or if not, available international benchmarks.

#### 7.7.4 Potential Impacts: Operation Phase

Waste materials created by an operational airport are similar to those produced by a town, with wastes generated containing a mixture of inert, household, and hazardous waste. Waste producers and sources during the operation of Proposed Project are expected to be varied, and it is expected that these will include the airport operator, the airlines, passengers, visitors, operating companies, such as baggage handlers, aircraft and airport maintenance, refuelling, cargo, retail and catering.

The airport will generate solid, non-hazardous, food waste from catering facilities, packaging materials from retail facilities, paper, newspaper and a variety of disposal food containers from offices and common passenger areas.

Waste will also be received from arriving aircraft and may contain food waste, disposable food containers and paper/newspaper materials.

Airport maintenance activities will create waste in the form of waste oils and lubricants, redundant tyres and vehicle/ equipment batteries. Airport operations will also generate liquid and solid hazardous wastes, such as, used lubricating oils, solvents, and oily rags from aircraft and ground service vehicle maintenance.

Potential waste streams will be identified from different elements of the operation of the airport, e.g. terminal, offices, catering, etc. The estimates of total waste quantities will be made using benchmarking data – either from Rwanda or if not, available international benchmarks. Liaison with engineering designers will occur to obtain information about the solid waste treatment facility proposed for the airport.

#### 7.7.5 Impact Assessment

Information provided in the Master Plan and conceptual design will be reviewed in conjunction with GIIP guidance to define typical types of waste that are likely to be created as a result of the construction and operation phases of the Proposed Project. The impact prediction will be based on the estimated quantities of waste to be produced and whether this can be managed.

Detail regarding the waste management infrastructure in Rwanda, and more specifically in the Bugesera District, will be reviewed to provide an overview of the waste disposal options available to BAC.

#### 7.7.6 Mitigation

Where possible Ramboll Environ will suggest measures to manage both construction and operational waste in accordance with the waste hierarchy, i.e. prevent/reduce > reuse > recycle > recovery > disposal, and to manage waste to avoid associated impacts such as scavenging of waste by animals and windblown waste.

The potential impacts associated with the disposal of wastes from the Proposed Project will primarily be managed through reducing wastes disposed of to landfill. Waste reduction will be achieved through the development and implementation of a waste management plan for construction and operations.

No hazardous materials or chemicals, including drums, batteries, solvents and acids will be disposed of with domestic waste. Organic food waste generated by the kitchen facilities will be disposed of at the landfill (Nduba landfill). Packaging refuse and waste paper will be collected separately in sealed receptacles. Hazardous waste materials will be collected within a central

waste handling facility and incinerated. Other chemical wastes (paints, solvents etc.) will be stored in approved containers in bunded areas in a hazardous waste transfer station prior to incineration.

## **7.8 Resource Efficiency**

Resource efficiency considers the key resource demands (i.e. fuel, water and materials) associated with the construction and operation of the Proposed Project, and outlines mitigation measures for adverse impacts and opportunities for resource efficiency, based on current information that is available.

This is informed by the requirements of IFC PS3, which states that *"...the client will implement technically and financially feasible and cost effective measures for improving efficiency in its consumption of energy, water, as well as other resources and material inputs with a focus on areas that are considered core business activities."*

### **7.8.1 Existing Environment**

The area immediately surrounding the Airport Footprint and Expressway is relatively undeveloped, comprising primarily of subsistence farming, rural housing and wetland/open areas. Limited services exist within the Airport Footprint and Expressway such as a dedicated electricity supply (and transmission lines), potable water supply, sewage and wastewater treatment plant, surfaced access roads, natural gas lines, etc. Surface water bodies are located in close proximity to the Proposed Project which has been earmarked for water supply during the construction phase. Therefore, the expected resource use during construction and operation of the Proposed Project will primarily be based on the proposed Master Plan and extrapolation from expected operational usage.

### **7.8.2 Sensitive Receptors**

Sensitive receptors are identified from the presence of local communities, environmentally sensitive receptors (such as potable water supplies or protected areas), the expected demand for water, and the availability of waste disposal facilities.

### **7.8.3 Potential Impacts: Construction Phase**

It is noted that, given the current status and location of the Proposed Project and its existing uses, the construction activities could comparatively result in a significant increase in the use of natural resources and other materials. It is expected that the earthwork requirements will be delivered through cut and fill activities and therefore could result in land use change. Furthermore, building materials will need to be sourced such as aggregate, concrete and asphalt for airport buildings, facilities and surface treatments, including lime for soil improvement.

Construction will require the availability of water for dust suppression activities, concrete batching and wash down activities. In addition, construction personnel will require potable water for sanitation. Fuel will be required for operating construction vehicles, machinery and equipment. Office facilities and worker accommodation will require cooling and lighting (electricity) during the construction phase.

The usage of non-renewable resources can have a direct impact on the receiving biophysical and social environment as a result of resource minimisation, generation of carbon dioxide, VOCs, etc. and potential impacts associated with mismanagement of dangerous goods, fuels and chemicals.

### **7.8.4 Potential Impacts: Operation Phase**

Operation of the airport will require water, fuel and oils, electricity and materials for maintenance and repair purposes. This will result in the increased fuel demand associated with the operation

of airport, increased water demand associated with operation of airport (welfare facilities); and increased material demand associated with operation activities. This would result in biophysical and social impacts from resource minimisation required to supply the Proposed Project and associated emissions and wastes generated from resource use.

#### 7.8.5 Impact Assessment

In order to quantify the key resource demands (i.e. fuel, water and materials) associated with the construction and operation of the Proposed Project, and outline mitigation measures for potential adverse impacts and opportunities for resource efficiency will be based on detailed information and engineering calculations of the Proposed Project.

Key issues identified which will be considered during the ESIA are as follows:

- The amount of energy, fuel and water required to support earthworks and construction will be identified and potential significant impacts assessed;
- The amount of energy required to support the airport will be identified and potential significant impacts will be assessed; and
- Water consumption will be evaluated for the airport during the operation and potential significant impacts will be identified.

#### 7.8.6 Mitigation

Following the quantification of impacts associated with the use of resources, a resource management plan will be developed which will include measures to avoid, minimise and control resources during construction and operational activities of the Proposed Project. Many mitigation measures will also be included in other topics such as air quality, waste management, etc.

### 7.9 Archaeology and Cultural Heritage

Before the colonial era, Rwanda was a nation-state with people sharing the same religious beliefs, the same traditions, same customs, speaking the same language, Kinyarwanda. The Constitution of the Republic of Rwanda of 4 June 2003, as amended to date, reaffirms the GOR's commitment to protecting sound traditional and cultural practices based on Rwandan philosophy and culture in general. The Constitution stipulates that the GOR has the obligation to ensure preservation of its cultural heritage, memorials and sites of genocide.

The section follows the recommendations and requirements of the IFC Performance Standard 8 (PS8): Cultural Heritage.

For the purpose of this study and chapter, cultural heritage is defined in IFC PS8 as:

- *"Tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), historical, cultural, artistic, and religious values;*
- *Unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and*
- *Certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles."*

#### 7.9.1 Existing Environment

The existing environment was identified following a literature review as well as a site visit. The literature review phase included examination of the existing dataset on Rwandan heritage, focussing on the Bugesera District in particular. This included discussions with Rwandan museums such as the Institute of National Museums of Rwanda. A review of applicable Rwandan regulations was also undertaken.

The data review included an extensive review of policy, national legal and international agreements on culture and heritage in Rwanda from websites and consultation.

Following the desktop review, no potential cultural heritage was noted within the Airport Area and along the Expressway route during the field survey. It is understood that the quarry road will be widened and the land use comprises altered farm lands and therefore, no cultural heritage findings are anticipated along the road. Therefore, the quarry road was not considered as part of the field survey. The survey included walking over selected sample locations looking for visible cultural heritage signs such as surface materials (i.e. pottery shreds, stone tools, slag, etc.) and any structural remains (i.e. historic buildings, evidence of historic settlement, etc.). The survey was conducted during 29 May and 4 June 2017. Potential areas of importance were also targeted and surveyed for signs of graves, headstones and or unusual formations. No below-ground investigation was conducted.

A hand-held Global Positioning System (GPS) was used to navigate and record the routes taken. The GPS points and routes were downloaded to a computer, together with digital photographic images. Each location found with any archaeological material GPS co-ordinates (longitude and latitude) were recorded.

Surrounding community leaders from Kakera and Nyabagendwa in the Rilima Sector were also consulted in order to obtain local knowledge of known and potential sites of cultural heritage.

Due to lack of inventories of physical cultural resources, and stringent laws on physical cultural resources in Rwanda, there is limited to no secondary data available for review. Therefore, the collection of archaeological and cultural heritage baseline information was obtained through an archaeological survey and stakeholder consultations.

There are no declared archaeological, paleontological and or historic monuments sites in the Bugesera District. The Institute of National Museum of Rwanda has plans to conduct archaeological and ethnographical surveys to record significant sites in the Eastern Province where the Bugesera District will be covered as well. A total number of 22 sample sites were assessed during the field assessment.

A number of scatters of potsherds were observed in various locations across the Airport Area. It should be noted that Proposed Project Area has been already disturbed due to human activities such as settlement, agricultural practices including cattle grazing and the on-going clearing activities and therefore these scatters of potsherds are not in their natural context (in situ). The potsherds with decorations resemble the i'kagera pottery tradition (as seen from the Museum Ethnographic Collection).

These potsherds are as a result of human skills in pottery making, within or by nearby communities. Today, many potters have acquired modern tools for working on clay, mounting, decoration and firing.

Four consultation meetings were organised during the archaeological and heritage resources baseline study. These included meetings with the Institute of National Museum of Rwanda (INMR), the Rilimi Sector Office, the Karera Cell and the Nyabagendwa Cell. The primary discussions were based around historic and current land uses, potential sites of cultural heritage and religious practices. The following was summarised from the discussions:

- Communities within the wider area practice subsistence farming practices;
- Social facilities located in the wider area include schools, market places and shops;
- No areas of cultural heritage are known to exist within the area;
- No identified burial ground has been identified within the Karera Cell; however, localised graves in close proximity to house dwellings may exist; and



- The communities within the wider area practice Christian or Muslim beliefs and therefore no traditional practices occur.

#### 7.9.2 Sensitive Receptors

Although no cultural heritage areas of significance have been identified to date, potential areas of receptor concern include dwellings/residential areas located close to the boundaries of the Proposed Project Area. Similarly, potential sensitive receptors exist along the width of the Expressway. Potential sensitive receptors include, but are not limited to family graves in close proximity to rural dwellings, plants that may have medicinal properties, etc. No receptors have been identified; however, may exist within the Proposed Project Area.

#### 7.9.3 Potential Impacts: Construction Phase

Any undiscovered cultural heritage, archaeological or palaeontological objects or features may potentially be disturbed as a result of ground intervention activities associated with construction of the Proposed Project. Objects of spiritual value, worship and community gathering may also be disturbed, if such are present on the Proposed Project activities or within the surrounding vicinity.

The construction of the Expressway and widening of the quarry road also have the potential to result in disturbance or damage to the physical sites of cultural heritage and places that represent sacred meaning to the local communities such as objects of living tangible heritage, including features of the natural landscape and man-made structures.

#### 7.9.4 Potential Impacts: Operation Phase

It is foreseen that potential impacts may only arise during construction activities, as no sites of cultural heritage have been identified within the area. Noise and vibrations associated with traffic and aircraft take-off and landing may impact on the 'sense of place' and potentially result in impacts to areas of cultural heritage significance. No impacts to archaeological or palaeontological features are anticipated during operation.

#### 7.9.5 Impact Assessment

The data gathered from the desktop review and site visit will be interpreted to provide the areas of archaeological, cultural or heritage importance. The likely impacts predictions on the areas of archaeological, cultural or heritage importance from the Proposed Project will be quantified during the construction, installation, commissioning and operation phases based on the general methodology contained in Section 6.

#### 7.9.6 Mitigation

A Chance Finds Procedure has been developed and implemented in order to provide management measures should an archaeological, cultural or heritage features be discovered. Furthermore, mitigation alternatives for the reduction of impacts upon areas of archaeological, cultural or heritage importance and proposed mitigation measures will be identified where possible. Such mitigation measures may include, but will not be limited to, the following:

- Incorporation of measures within the Proposed Project design;
- Relocation of artefacts identified;
- Protection measures of areas identified/artefacts observed;
- Monitoring of the condition of the identified areas/sites; and
- Educating the public with regards to the importance of archaeological, cultural and/or heritage aspects.

## **7.10 Traffic and Transport**

This section will consider the impacts of the Proposed Project on traffic, access and on the condition of roads associated with the Proposed Project.

The Proposed Project will be the next gateway for air traffic into Rwanda, and as such, will increase the volume of road traffic in the Bugesera District and in Kigali. Forecast vehicular transport to the Proposed Project is anticipated to increase from less than one million vehicles annually in 2020 to approximately four million vehicles per annum by 2045.

### **7.10.1 Existing Environment**

The Bugesera District is serviced by a provincial bitumen surfaced road which is the main transport route between Rwanda and Burundi. The Kicukoro-Nyamamata-Nemba highway (KK-15 Road) extends for a distance of approximately 50 km from Kigali to the border of Burundi. The road is utilised by heavy vehicles (i.e. trucks and busses) and light motor vehicles (civilian vehicles including automobiles, motor bikes and SUVs and 4x4 vehicles).

Four additional routes will be used during the construction of the Proposed Project which are unsurfaced, single-lane roads which are prone to degradation as a result of excessive usage from heavy vehicles and erosion during high rainfall periods. These roads include:

- The road from Nyamata to the Airport Area along an unsurfaced road of approximately 9 km in length which will be used primarily during the construction phase;
- The road from the Airport Area to the existing quarry, which is unsurfaced and passes through the Kabukuba Village. The road is approximately 20 km in length and will be used primarily by heavy vehicles for the transportation of aggregate which will be required during construction activities;
- The existing unsurfaced road from the Airport Area to Gashora, which is used by a limited number of senior construction staff travelling between the Construction Camp and Gashora Lodge, where accommodation is provided; and
- An existing alternative road from Kabukuba Village to the Airport Area which will require upgrading for use by heavy vehicles transporting aggregate from the quarry to the Airport Area. This route is considered shorter than the existing route and will reduce health and safety issues at the village and reduce the distance vehicles need to travel thereby reducing the use of fuel, generation of dust and minimising transport times.

### **7.10.2 Sensitive Receptors**

Sensitive receptors will include the surrounding communities, as well as the ecological environment. These sensitive receptors are identified in close proximity to the existing road infrastructure that will need to be upgraded (graded only, no surfacing will occur) for the Airport Area (i.e. road from Nyamata to the Airport Area) and the quarry road, which will need to be widened and graded but no bitumen surfacing will be laid.

Additional sensitive receptors will include the communities and ecosystems in close proximity of the proposed Expressway, which may need to be either relocated or may be impacted by noise, vibration, air quality, light and dust issues.

### **7.10.3 Potential Impacts: Construction Phase**

There may be an increase in traffic within the immediate area which would result in the generation of dust, noise, air emissions and hydrocarbon spillages. Once construction commences, site roads providing access to the Construction Camp and Airport Area could cause road deterioration and have a negative impact on the movement of communities within the area.

Safety concerns could also occur as a result of increased traffic in the area and anticipated road-related accidents to the communities and fauna and flora.

#### 7.10.4 Potential Impacts: Operation Phase

Potential impacts from traffic during the operation of the airport could result in generation of VOCs, noise, light pollution, air emissions, hydrocarbon spillages and road-related accidents. The airport will introduce a number of passengers travelling to and from the airport to meet flights, this will increase the number of vehicle movements on the Expressway and KK-15 road, which could contribute to congestion at peak times.

#### 7.10.5 Impact Assessment

The transport and traffic impacts will be estimated through a comparison of baseline traffic levels to construction and operation phase scenarios. A desktop-based approach will be calculated with the anticipated increase of vehicles (road transport), condition of the existing roads and potential safety and environmental risks that may occur as a result of the Proposed Project. Consideration will also be made to the Master Plan and estimated traffic demand within the area. MININFRA has existing road volume data which will be used to calculate impacts associated from increased traffic in the area. In accordance with GIIP, the significance criteria, receptor groups and topics applied for the topic will be sourced from Institute of Environmental Assessment guidance: "Guidelines for Environmental Assessment of Road Traffic").

#### 7.10.6 Mitigation

Where possible, mitigation alternatives for the reduction of transport and traffic impact will be highlighted and mitigation alternatives by means of improvements to reduce the source of transport and traffic impacts will be identified. To reduce transport and traffic impact measures could include:

- Changes to intersections to improve performance;
- New safety measures e.g. formal crossings or bicycle lanes; and
- Measures to reduce severance such as land-bridges.

To reduce transport and traffic impact at source could include:

- Greater use of non-car transit to/from the airport;
- Alteration to the flight schedule to smooth peaks;
- Re-profiling of staff rotas to avoid terminal peaks;
- Greater use of rail for construction phase; and
- Relocate parking off site with shuttles to the terminal.

### 7.11 Visual and Landscape

#### 7.11.1 Existing Environment

The Proposed Project is located on the central plateau of Rwanda, southeast of Kigali. In the vicinity of the Proposed Project Area, elevations typically range between 1,300 and 1,500 magl, the lowest occurring to the north and east, along the meandering alignment of the Nyabarongo watercourse and adjoining the western end of Lake Mugesera. Elsewhere, elevations increase to summits and ridges up to 1,675 masl to the west and northeast of the Proposed Project, as well as the Kigali and Bihembe ranges that climb to approximately 1,900 masl and enclose the study area to the north and northeast of the site, respectively.

The topography of the extended area undulates between 1,350 and 1,450 masl and is encircled by the incised landforms of Mwesa to the north, Kibilizig to the west, Lake Kidogo to the south, and Lake Gashanga to the east.

The Expressway follows the alignment of Mwesa north-westwards from the Airport Area before joining the existing road bridge alignment of the Nyabarongo River and climbing into the Kigali range beyond.

The landscape is characterised by farm lands, transformed wetlands and swamps, altered natural vegetation, rural households (outside of the Airport Footprint) and local roads/foot trails.

#### 7.11.2 Sensitive Receptors

The principal visual receptors within the study area include:

- Widespread local residential receptors and farmers;
- Residents and visitors to nearby main settlements, including Kinazi, Kayumba, Mwogo, and Rilima; and
- Road users of the minor local roads.

#### 7.11.3 Potential Impacts: Construction Phase

Earth moving and construction activities can impact local amenity and have a visual impact. Site clearance and earthworks will impact on the existing visual amenity of the area and neighbouring communities will be impacted by this change. During construction, light sources are required to facilitate night working, security and health and safety. These lighting arrangements can have a negative impact on the local community. Furthermore, infrastructure such as the Construction Camp could impact on the surrounding land characteristics.

#### 7.11.4 Potential Impacts: Operation Phase

The existence of the airport and Expressway associated with the Proposed Project will impact local amenity and have a visual impact. During operations, light sources are required to facilitate night-time airport operations and security and these lighting arrangements can have a negative impact on the local community. This can also have an impact on the local sense of place.

#### 7.11.5 Impact Assessment

The assessment of impacts will address the phased development of the Proposed Project and will comprise an assessment of viewsheds considering:

- Direct impacts in landscape fabric within the Proposed Project Area;
- Impacts on landscape character within the study area;
- Visual impacts on key tourist and recreational receptors locations and transportation routes; and
- Visual impacts on residential receptors and residents of settlements.

This will be conducted for the construction and operation phases.

#### 7.11.6 Mitigation Measures

The assessment will identify potential sources of significant effects associated with the construction and operation of the Proposed Project. Limited mitigation measures can be developed for the design of the Airport Area. Cognisance will be given to limiting light spill, using colours which correspondence the surrounding environment, etc.

## 7.12 Socio-Economics

### 7.12.1 Existing Environment

To date, social data collection has been implemented through a review of secondary information sources, obtained from:

- National and local governmental entities/authorities, primarily, the National Institute of Statistics of Rwanda;
- Online materials prepared by a variety of organisations/companies; and
- Reports, plans and programmes, prepared by international organisations such as multi-lateral banks and members of the UN family.

Almost all of the statistical data, issued by the GOR and/or local government entities pertain to the following levels of government: national; provincial and district. Data for the two lower levels of local government: sectors and cells, are not as readily available. Thus, the social baseline description provided below relates, primarily, to Bugesera District (when relevant comparisons are made to other districts and to provincial and national data). However, this is preceded by an overview of the baseline situation for Rwanda to provide an overall context for consideration of a more detailed description of the Bugesera baseline situation.

The most recent census was held in 2012 and, therefore, most datasets refer to 2012 or earlier and other sources provide more recent and current data. In addition, a review of the section entitled 'Socio-economic Environment' contained in the Draft ESIA (2010). The data/information presented in this section is based, in part, on a survey (March 2010) of 1,963 households located in the three cells of Karera, Ntarama and Kimaranzara within the Rilima Sector; focusing on the households directly affected by the proposed airport project, that is those that were living within the designated airport site (an area of ~25 km<sup>2</sup>)<sup>40</sup>. Although undertaken seven years ago it is expected that most of the survey results will reflect the situation for similar rural households in the area expected to be affected by the Proposed Project, despite the rapid economic growth and poverty reduction that has occurred in Rwanda. As such, they provide a useful way to ground-truth the official National, Regional and District-level statistics. This survey is referenced in the text below as the '2010 ESIA survey'.

#### 7.12.1.1 Overview: Rwanda

Following the genocide, in the mid-1990s, rapid population growth occurred which, was considered by the national government to contribute to poverty, malnutrition and poor health among the population as well as to environmental degradation. Rwanda still has a high population growth and density. Between the 2002 and 2012 censuses the population grew at an average annual rate of 2.3% (this is projected to reach 2.53 by 2016)<sup>41</sup>. According to the 2012 census, the population density was 415 inhabitants per km<sup>2</sup> whereas in sub-Saharan Africa the average population density is 23 inhabitants per km<sup>2</sup>. Ethnically (excluding foreigners residing in Rwanda), Rwanda consists of Tutsi, Hutu and Twa peoples. The Twa ethnic group has a significantly lower population compared to the other ethnic groups; however, official statistics do not record the population sizes of these groups.

The 1994 genocide severely damaged Rwanda's fragile economic base, significantly impoverished the population, particularly women, and temporarily stalled the country's ability to attract private and external investments. However, Rwanda has made substantial progress in stabilizing and

<sup>40</sup> The people living within this area and/or using land in this area have been compensated for their assets, which were acquired by MININFRA, as a preparatory step in making the site ready for the proposed airport. Following the compensation process, these people have left the site and it is now free of human occupancy and other land use activities.

<sup>41</sup> <https://www.cia.gov/library/publications/the-world-factbook/geos/rw.html>

rehabilitating its economy. GDP has rebounded: between 2001 and 2015, real gross domestic product (GDP) growth averaged about 8% per annum (from a relatively low base) and inflation was reduced in recent years to single digits (the rate for 2016 was 7.3%<sup>42</sup> and currently the rate (consumer price index) for year-on-year July 2017 is 9.4%<sup>43</sup>, but this is expected to decline in the future). The inflation rate in rural areas is higher than the urban rate thus affecting the rural population, which tends to be poorer, disproportionately as the main increases have been in food, non-alcoholic beverages, housing and utility services (water, electricity, gas) and fuels. Similarly, Rwanda's GDP per capita has increased from less than US\$ 200 in 1994 to US\$ 644 in 2012. Poverty and inequality have also declined.

Despite its significant socio-economic achievements, Rwanda remains a poor rural country with almost 90% of the population engaged in agriculture (mainly at the subsistence level) and some mineral and agro-processing. Rwanda faces important challenges, in particular: likely continuing relatively high population growth rate; high overall and increasing population density, pressure on land and other natural resources; and fragmentation of land holdings (reducing agricultural cost-effectiveness).

#### 7.12.1.2 Bugesera District

##### Demographics

Administratively, the Airport Area and related and Associated Facilities are located within Bugesera District, one of seven districts of the Eastern Province<sup>44</sup>. The Airport Area lies within three cells (Karera, Ntarama and Kimaranzara) in the Rilima Sector. The Expressway and other supporting infrastructure are partly located within these three cells and partly in other cells.

Bugesera District ranks third in terms of its population size, within the Eastern Province, accounting for 361,914 (14% of the province's population). The Rilima Sector has a population of 26,203 people, which corresponds to 7% of the population of Bugesera District. The average annual growth rate is 3.1%. Due to its relative size compared to other Districts its population density is amongst the lowest for all Districts (280 people per km<sup>2</sup> compared to 415 per km<sup>2</sup> for Rwanda as a whole). The District's population is predominantly rural: 92.0% of the resident population lives in rural areas compared to 8.0% in urban areas. By sector there are distinct differences; Rilima Sector has no urban dwellers while neighbouring Nyamata District is the most urbanised sector with 48.9% of its population residing in urban areas<sup>45</sup>.

The age profile of the district shows that approximately 52% (189,754) people are aged between 16-64 years (economically active), followed by those aged between 0-15 years (45%). The population above 65 represents 3%<sup>46</sup>. Thus, the dependency ratio (ratio of population considered to be dependent, that is under 15 and over 64 years, to those of working age, that is over 15s and under 64 years) is relatively high, at approximately 90%. This ratio is higher than the ratio for Rwanda which is likely to be between 80 to 85% (based on a figure of 82.7% in 2013/2014)<sup>47</sup>. The high dependency ratio means that those of working age in the district are responsible for supporting a significant number of dependents placing considerable strain on livelihood strategies and the resources that support them.

At the national level, three households out of ten (29%) are headed by women. Female-headed households are more common in rural areas (30%) than in urban areas (24%). Bugesera District

<sup>42</sup> <http://statistics.gov.rw/publication/rwandas-cpi-73-pct-year-year-december-2016>

<sup>43</sup> <https://tradingeconomics.com/rwanda/inflation-cpi>

<sup>44</sup> Bugesera District Development Plan (2013-2018). Accessed from [http://www.bugesera.gov.rw/fileadmin/user\\_upload/Bugesera\\_District\\_DDP\\_2012-17\\_Final.pdf](http://www.bugesera.gov.rw/fileadmin/user_upload/Bugesera_District_DDP_2012-17_Final.pdf)

<sup>45</sup> National Institute of Statistics of Rwanda, 2012. District Profile, Bugesera. <http://www.statistics.gov.rw>

<sup>46</sup> District Profile, Bugesera. Accessed from <http://statistics.gov.rw/publication/eicv-3-bugesera-district-profile>

<sup>47</sup> National Institute of Statistics of Rwanda, 2013/2014. Rwanda Poverty Profile Report. <http://www.statistics.gov.rw>

has the second lowest percentage of female-headed households of all Provinces/Districts excluding Kigali Province<sup>48</sup>. The 2010 ESIA survey recorded a figure of 36.4 female-headed households which is high compared to the current District situation and may reflect specific local and historical conditions.

Migration data produced by the National Institute of Statistics of Rwanda is based on lifetime migration and recent migration which are defined as follows:

- A lifetime migrant is a person whose residence at the time of the census (conducted in 2012) is different from their place of birth; and
- A recent migrant is a person whose residence at the time of the census is different from his/her previous one in the last five years preceding the census.

At the district level, Bugesera District ranks the third lowest regarding lifetime in-migrants and the second lowest with respect to recent in-migrants and had the highest number of lifetime and recent out-migrants<sup>49</sup>. It is reasonable to assume that most in-migration occurs for economic reasons; therefore most in-migrants to Eastern Province are not attracted to Bugesera District as they do not consider it to be the best destination in terms of economic opportunity. This implies that Bugesera District is not economically advanced compared to other Districts of Rwanda. The relatively high out-migration figures would seem to support this view.

The 2010 ESIA survey found that 36.5% of the respondents migrated from other places within the country to the project area. This is slightly higher than the equivalent figure for in-migration to Bugesera District (approximately 28%) in 2012, but the difference could be accounted for by specific local factors and changing migration patterns over time.

#### Economic Activity and Livelihoods

The national and local labour markets are dominated by agriculture. Agricultural production is largely based on subsistence farming, with a production breakdown at national level as follows: food crops: 85%, forestry: 7%, livestock: 5%, export crops: 2%, and fisheries: 1%. Other key sectors include industry and services.

Bugesera District ranks 17th in Rwanda regarding number of households involved in agriculture and livestock activities. Crop farming and livestock primarily contribute to the district's economy relating to 77.8% of the population depending on agriculture against a national average of 72%.

Results from the Draft ESIA (2010) indicate that:

*"Female headed households in the project area control less than 15% of the total income from wage employment and own businesses. They however control more than 70% of the total income from farming activities. This suggests that their main income is totally land based. Access to agricultural land is therefore very important to their economic well-being."*

There is limited data available on employment rates for Bugesera District. Unemployment is mainly an urban phenomenon; the unemployment rate is three times higher in urban areas (7.7%) than in rural areas (2.6%); probably due to the high levels of subsistence farming in rural areas 'absorbing' labour. Comparisons of unemployment rates in all districts show that the Bugesera District has the highest unemployment rate (5%) when compared to the other districts (the equivalent figure for Rwanda is 3.4%)<sup>50</sup>.

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<sup>48</sup> National Institute of Statistics of Rwanda, 2012. Population and Housing Census: Main Indicators Report. <http://www.statistics.gov.rw>

<sup>49</sup> Fourth population and Housing Census, Rwanda, 2012: Main Indicators Report. Accessed from <http://www.statistics.gov.rw>.

<sup>50</sup> National Institute of Statistics of Rwanda, 2012. Population and Housing Census: Main indicators report. <http://www.statistics.gov.rw>

Child labour occurs in Rwanda (based on numbers of under 17s which were employed during seven days preceding the census). In the 5 to 9 years and in the 10 to 14 year age bands the figures (both sexes) for Rwanda are 0.9% and 2.8% respectively (of all children in these age bands). The figures for Bugesera (0.7% and 2.8% respectively) closely resemble the national figures. Slightly more boys and girls are employed within the Bugesera District). There are no statistics on forced labour.

### Poverty

In Bugesera District, 48.4% of people are considered to fall below the poverty line: 28.3% are poor and 20.1% are extremely poor<sup>51</sup>. These figures are higher than the equivalent figures for Eastern Province which itself exhibits higher poverty rates than Rwanda. As presented in the National Institute of Statistics of Rwanda (2015) 2013/2014. Rwanda Poverty Profile Report<sup>52</sup>, rural areas have both a higher number of poor people and higher relative incidence of poverty, at 42% compared to 15% in urban areas.

### Land Use and Land Tenure

#### *Land Use*

The majority of Rwandan households cultivate at least one parcel of land; most households are directly dependent on agriculture as their main or only source of income, especially in rural areas (96%). The 2010 ESIA survey recorded a figure of 90.9%. The average area cultivated per rural household is 0.6 ha and only 16% of rural households cultivate 0.9 ha or more. In Eastern Province, households cultivate land as follows:

- 41% of households cultivate land between 0.3 ha and 0.9 ha;
- 32% of households cultivate land less than 0.3 ha;
- 24% of households cultivate land between 0.9 ha and 3 ha; and
- 2.5% of households cultivate more than 3 ha.

Results from the 2010 ESIA survey show that all the land owners in the Proposed Project Area had previously registered their land and held the appropriate documentation. Based on estimates given by the survey respondents, the average land parcel size owned by a household is approximately 14,963 m<sup>2</sup> (approximately 1.5 ha). This may indicate that average size land holdings in certain areas of Bugesera District may be above both the national and Eastern Province averages.

#### *Land Tenure*

Results of a household survey, undertaken for the National Institute of Statistics of Rwanda, show that 68% of all households own at least one land parcel that was inherited, while 46% of households own a parcel that was purchased. Richer households are more likely to have purchased land, compared to poorer households which are more likely to have inherited land (71%)<sup>53</sup>. Most land in the Eastern Province has been purchased (51%) or inherited (48%). Nationally, 85% of cultivating households have the right to sell their land or use it as a guarantee for a loan.

<sup>51</sup> Bugesera District Development Plan (2013-2018).  
[http://www.bugesera.gov.rw/fileadmin/user\\_upload/Bugesera\\_District\\_DDP\\_2012-17\\_Final.pdf](http://www.bugesera.gov.rw/fileadmin/user_upload/Bugesera_District_DDP_2012-17_Final.pdf)

<sup>52</sup> National Institute of Statistics of Rwanda, 2013/2014. Rwanda Poverty Profile Report. <http://www.statistics.gov.rw>

<sup>53</sup> National Institute of Statistics of Rwanda, 2013/2014. Rwanda Integrated Household Living Conditions Survey.  
<http://www.statistics.gov.rw>



## Physical Infrastructure and Services

### *Electricity*

In Bugesera District, only 4.3% of households use electricity as their main source for lighting, ranking the district 11th out of all districts. However, in urban areas within the District, 48.7% of households use electricity as their main source for lighting.

For main sources of energy for cooking at the national level, 95% of households depend either on firewood (82%) or charcoal (13%). Firewood is more likely to be used in rural areas (93%) than in urban areas (31%), while charcoal is more likely to be used in urban areas (63%) than in rural areas (3%). The 2010 ESIA survey states that the majority (98.1 %) of the households reported that they use firewood as their main source of fuel.

### *Water*

Nationally, approximately 73% of the housing units collect their water from improved water sources (internal pipe-borne water and protected spring/wells), with protected springs/wells (37%) and public taps outside the compound (28%) being the most common sources. The percentage of houses using improved water sources is higher in urban areas (92%) than in rural areas (69%).

In urban and rural areas within Bugesera District, the main sources of water supply are from improved sources, with 85.7% and 64% of urban and rural households obtaining their water supply from these two sources respectively. The highest number of private households using water from unimproved sources is found in Mwogo (98.4%), Rweru (84.6%) and Juru (73.8%) Sectors. The highest numbers of private households that use water from improved sources are found in Ruhuha (95.9%), Mayange (92.6%) and Nyarugenge (89.7%) Sectors.

### *Sewage Treatment/Disposal*

The main types of toilet facilities nationally used by households are private pit latrines (82%), with the rest using communal/ shared pit latrines (12%); only 0.8% of the households are equipped with flush toilet/WC system. Private pit latrine are the most used in urban (58%) and rural areas (89%), followed by shared pit latrines, 37% and 8%, in urban and rural areas respectively.

In the Bugesera District, 58.4% of households dispose sewage in the bush, while 21.8% of sewage is disposed using other/unspecified modes. In the provinces, sewage disposal in the bush is the highest in the Eastern (53%) and Western Provinces (46%). Nationally, approximately 42% of households use the bush for sewage disposal while 14% use sumps, 11% use courtyards and 9% use cesspits, while 16% use unspecified modes of sewage disposal. Relative to Rwanda and Eastern Province, Bugesera District has less access to safe sewage treatment/disposal.

## Community Health and Safety

Bugesera has 15 health centres (one per sector) and a hospital at Nyamata. Despite the number of health centres the mean walking distance to a health centre in Bugesera District is 74.5 minutes<sup>54</sup>.

All district residents are mobilised to subscribe to health insurance services (mutuelle de santé) available in each health centre. Almost 90% of the population is now covered. This enables affordable access to diagnosis and treatment to be provided.

The Draft ESIA (2010) states that the leading causes of death in the Proposed Project Area are malaria, acute respiratory infections, diarrhoea, HIV/AIDS and pulmonary tuberculosis. These

<sup>54</sup> National Institute of Statistics of Rwanda EICV3 DISTRICT PROFILE East – Bugesera (undated)  
file:///E:/Projects/Rwanda\_Bugesera\_Airport\_ESIA/Scoping\_Report\_ToR/Social\_Baseline/EAST\_BUGESERA\_NOT%20READ.pdf

remain key threats despite improvements in prevention and treatment. The epidemiological profile of Rwanda is still dominated by communicable diseases, which constitute 90% of health complaints in health facilities. Apart from malaria and other communicable diseases, Rwanda has been experiencing an increasing threat from HIV/AIDs with a national prevalence estimated at 3% in the general population aged 15-49 years (2010 data). In Bugesera District, the HIV prevalence rate is not very high (1%).

The Bugesera District is also experiencing an emergence of non-communicable diseases such as cancer and diabetes associated with the development of high-risk behaviours and/or urbanisation/increasing affluence. Also, protein-energy malnutrition is a widespread problem. It primarily affects pre-school children who still represent the most vulnerable group. The malnutrition rate in this group is around 35%. In Rwanda the rate of acute malnutrition (wasting) measured by weight to height is relatively low at 3.6% and is within acceptable limits. Despite the success in reducing poverty, levels of chronic malnutrition among children aged 6-59 months remained very high over the last 20 years: 49% in 1992; 51% in 2005, 44% in 2010 and 43% in 2012,(NISR, MINAGRI, 2012)<sup>55</sup>.

#### 7.12.1.3 Summary

Despite a number of successes in dealing with its problems and sharing in the overall distribution of benefits from Rwanda's steady national-level socio-economic improvements; the Bugesera District has some key sensitivities, which are relevant for an assessment to identify the likely impacts of the Proposed Project:

- The district is relatively poor compared to other districts and the nation as a whole with about half of the population being poor, including 20% that is extremely poor;
- Approximately 30% of households still use an unimproved drinking water source;
- Less than 10% use electricity for lighting;
- Almost 70% of the households walk more than an hour to reach a health centre;
- Agriculture is the main economic activity and source of income, but most households (~70%) cultivate under 0.9 ha of land (which is the Food and Agriculture Organization's suggested land amount for Rwandan households to conduct sustainable agriculture), including 30% with under 0.3 ha of land;
- There is a relatively high-out migration rate indicating a lack of acceptable economic opportunities; and
- Employment status by sex indicates that females are more occupied in small-scale farm activities than males and less involved in other types of employment that provide high income such as independent non-farm or wage non-farm work.

#### 7.12.2 Sensitive Receptors

The key social receptors are:

- Communities in close proximity to the Expressway, the Airport Area and under the flight paths;
- Those individuals, households and communities which have experienced physical and economic displacement or are expected to experience one or both types of displacement as a result of the Proposed Project;
- Vulnerable individuals, households and groups (such as the very poor, elderly, disabled/chronic sick, female-headed households);
- Local businesses and service providers;

<sup>55</sup> [http://www.rdb.rw/uploads/tx\\_sbdownloader/EDPRS\\_2\\_Main\\_Document.pdf](http://www.rdb.rw/uploads/tx_sbdownloader/EDPRS_2_Main_Document.pdf)

- Road users; and
- Individuals, households and communities dependent on unimproved water sources (~30% of all households).

#### 7.12.2.1 Potential Impacts: Construction Phase

The key project-related activities that are expected to result in social impacts during the pre-construction enabling works phase are:

- Land acquisition;
- Relocation;
- Compensation; and
- Livelihood restoration measures.

The key project-related activities that are expected to result in social impacts or benefits are:

- Job creation;
- Local expenditures on goods and services;
- Provision of economic opportunities (attract in-migrants);
- Creation and operation of hazardous construction sites at the Proposed Project Area;
- Road widening, upgrading and maintenance resulting in temporary creation of ditches, borrow pits, spoil heaps and other hazardous changes to ground surface conditions;
- Increased vehicle movements, especially heavy goods vehicles and small light utility vehicles;
- Creation of open excavated areas such as trenches;
- Accidental spillages of chemicals;
- Inadvertent damage to infrastructure and disruption of utility services;
- Ground preparation and/or routine and/or accidental discharges affecting the local hydrological regime and water quality;
- Generation of elevated noise/vibration levels;
- Generation of elevated levels of air pollutants (including dust); and
- Behaviour of security personnel.

#### 7.12.3 Operation Phase

Many of the operation phase activities that will result in social impacts or benefits are similar to the construction phase. Only those that do not occur in the other phases are presented here:

- Attraction of manufacturing, storage, and logistics facilities to locate near the airport;
- Payment of taxes and other levies; and
- Community investment activities/projects.

#### 7.12.4 Potential Impacts

The proposed Project has the potential to cause social impacts within the defined Area of Influence (AoI). The AoI can be considered as the combination of a series of defined areas (sub-AoIs) nested within a spatial hierarchy (each area being the focus of a specific combination of impact types according to the location and type of project activities), as follows:

- **Rwanda:** is the AoI as the macro-level social and economic impact of construction and operation of the airport will affect receptors at the national level;
- **Certain linear 'corridors' within the Eastern, Kigali and Southern Provinces:** these 'corridors' potentially constitute a sub-AoI for noise impacts as aircraft taking off and landing will follow designated flight paths and for a limited period they will be flying at relatively low

altitudes and thus likely to impact receptors in the vicinity of these flight paths. As all flight paths will centre on the airport, which is located in the Eastern Province (but close to the borders with the other two Provinces), and given that the impacts will be most pronounced when/where aircraft are flying at low altitudes, these impacts are expected to be experienced not only primarily in the Eastern Province but also in the Kigali and Southern Provinces;

- **Bugesera, Nyarugenge, Kicukiro, Rwamagana and Ngoma Districts:** areas of these districts will fall within the Airport Footprint buffer zone (zone within a 10 km boundary of the Airport Area). This area is a sub-AoI as it will experience both direct and indirect environmental and social impacts from construction and, particularly, operation of the airport. This will be due to activities at the airport as well as land use planning restrictions that will be applied to safeguard the airport. Most of the impacts will be experienced within Bugesera District as the areas of the other districts that fall under the two buffer zones are relatively small. Also, a small section of the Expressway is located in Kicukiro District; and
- **Rilima Sector (3 cells and 24 villages) within Bugesera District:** will be a sub-AoI for most of the construction and operation impacts related to the Proposed Project, linked infrastructure (such as the Expressway) and Associated Facilities. The Proposed Project Area is approximately 2,500ha plus the area for the Expressway and is located almost entirely in the Rilima Sector. The Proposed Project occupies almost 30% of the land area in this sector.

Anticipated/potential impacts have been identified based on desktop work/secondary data/information and consideration of the AoI, the receptors and the activities associated with the airport pre-construction, construction and operation phases. This approach considered, also, typical impacts previously identified in ESIA Reports for similar projects. Tables 7-5 to Tables 7-7 below present broad impact 'issues' and then specific impacts that fall within the scope of each broad impact 'issue'.

There is a table for each of the pre-construction/enabling works, construction and operation phases. As there has been/will be both physical and economic displacement it is necessary to include the pre-construction phase to take account of the need to 'clear' the designated airport site of human habitation and land uses prior to groundwork. Inevitably, there is some overlap in impacts, especially between the construction and operation phases.

Table 7-5: Potential Impacts during Pre-Construction Enabling Works Phase	
Socio-Economic Issues	Pre-Construction Phase: Potential Impacts
Economic	<ul style="list-style-type: none"> <li>• Unplanned influx of people who hope to exploit the opportunities likely to be created by the proposed project and attendant: <ul style="list-style-type: none"> <li>– Pressure on physical and social infrastructure</li> <li>– Potential social tensions</li> </ul> </li> <li>• Land speculation</li> <li>• Localised inflation of asset prices and attendant effects on locals with low/fixed incomes</li> </ul>
Loss of land and natural resources	<ul style="list-style-type: none"> <li>• Reduction in livelihood status of local inhabitants through loss of land for crops and grazing, agricultural produce and access to natural resources</li> <li>• Physical relocation of people/households with accompanying impacts arising from adjustment to new location (such as psychological and physical health status especially amongst the elderly)</li> </ul>

Table 7-6: Potential Impacts during Construction Phase	
Socio-Economic	Construction Phase: Potential Impacts

Table 7-6: Potential Impacts during Construction Phase	
Issues	
Economic	<ul style="list-style-type: none"> <li>• Creation of new temporary and permanent direct jobs</li> <li>• Creation of new temporary and permanent indirect and induced jobs via the income and economic multiplier mechanism</li> <li>• Increased economic activity leading to enhanced local small medium enterprises (SME) viability/activity and creation of new SMEs</li> <li>• Local skills development through job-related training</li> <li>• Revenue increases for national and local government entities</li> <li>• Overall contribution to the Rwandan national economy</li> <li>• Creation of a growth pole, focused on the airport, due to location of facilities (hotels, depots, warehouses) and companies servicing the needs of the airport, passengers and freight and consequent impacts</li> <li>• Potential effect on local economies of any restrictions on land use in safeguarding zones established around the airport</li> </ul>
Loss of land and natural resources	<ul style="list-style-type: none"> <li>• Loss of resources or access to resources from potential effects on ecosystem services such as hydrological changes to rivers and lakes</li> </ul>
Loss or impaired access to social assets	<ul style="list-style-type: none"> <li>• Severance: resulting in loss of access or increase in time/difficulty to gain access to family/friends and social and physical infrastructure/facilities (such as health centres)</li> </ul>
Labour and working conditions	<ul style="list-style-type: none"> <li>• Increase in use of child labour and threat to educational attainment</li> <li>• Management of labour retrenchment resulting in conflict between BAC and workers (blockages, stoppages etc.)</li> <li>• Potential discrimination against migrant labour</li> <li>• Occupational health and safety</li> </ul>
Sense of place	<ul style="list-style-type: none"> <li>• Change in landscape impacting on people's well-being</li> </ul>
Social and cultural	<ul style="list-style-type: none"> <li>• Real or perceived lack, or unequal distribution, of the Proposed Project benefits (allocation of jobs to locals) leading to social tensions</li> <li>• Potential increase in crime rate if 'non-local' workers are employed</li> <li>• Influx of people wishing to share in the economic benefits competing with locals for jobs and access to social and social and physical infrastructure/facilities (such a health centres) resulting in social tensions)</li> <li>• Enhanced incomes leading to improved quality of life</li> </ul>
Community Health and Safety	<ul style="list-style-type: none"> <li>• Increased pollution (noise, air, water, soil) affecting human health and wellbeing</li> <li>• Increase in risks/exposure to communicable diseases (via influx and presence of non-local workforce)</li> <li>• Increase in road traffic accidents (deaths and injuries) as a result of increased number of vehicle movements and changes in vehicle composition</li> <li>• Increase in hazards at the airport construction site/s site and other sites where roads may be widened and pipelines laid</li> <li>• Lost or reduced access to health care provision (see also 'Severance' above)</li> <li>• Risk of conflict between community members and security personnel leading to injury</li> </ul>
Infrastructure/Community	<ul style="list-style-type: none"> <li>• Damage to infrastructure such as roads, irrigation structures etc.</li> <li>• Damage to structures (especially housing) from vibration</li> </ul>

<b>Table 7-6: Potential Impacts during Construction Phase</b>	
Facilities	<ul style="list-style-type: none"> <li>Effects on community facilities (schools, churches etc.) from traffic and other activities associated with construction of the airport and other linked/associated infrastructure</li> </ul>
Equity	<ul style="list-style-type: none"> <li>Differential distribution of impacts by receptor (which receptors experience mostly beneficial or adverse impacts)</li> </ul>

<b>Table 7-7: Potential Impacts during Operation Phase</b>	
<b>Socio-Economic Issues</b>	<b>Operation Phase: Potential Impacts</b>
Economic	<ul style="list-style-type: none"> <li>Creation of new temporary and permanent direct jobs</li> <li>Creation of new temporary and permanent indirect and induced jobs via the income and economic multiplier mechanism</li> <li>Increased economic activity leading to enhanced local SME viability/activity and creation of new SMEs</li> <li>Local skills development through job-related training</li> <li>Revenue increases for national and local government entities</li> <li>Overall contribution to the Rwandan national economy</li> <li>Creation of a growth pole, focused on the airport, due to location of facilities (hotels, depots, warehouses) and companies servicing the needs of the airport, passengers and freight and consequent impacts</li> <li>Potential effect on local economies of any restrictions on land use in safeguarding zones established around the airport</li> </ul>
Loss of land and natural resources	<ul style="list-style-type: none"> <li>Loss of resources or access to resources from potential effects on ecosystem services such as hydrological changes to rivers and lakes</li> </ul>
Labour and working conditions	<ul style="list-style-type: none"> <li>Increase in use of child labour and threat to educational attainment</li> <li>Potential discrimination against migrant labour</li> <li>Occupational health and safety</li> </ul>
Sense of place	<ul style="list-style-type: none"> <li>Change in landscape impacting on people's psychological health status and wellbeing</li> </ul>
Social and cultural	<ul style="list-style-type: none"> <li>Real or perceived lack, or unequal distribution, of Project benefits (allocation of jobs to locals) leading to social tensions</li> <li>Influx of people wishing to share in the economic benefits competing with locals for jobs and access to social and social and physical infrastructure/facilities (such a health centres) resulting in social tensions</li> <li>Enhanced incomes leading to improved quality of life</li> </ul>
Community Health and Safety	<ul style="list-style-type: none"> <li>Increased pollution (noise, air, water, soil) affecting human health and well-being</li> <li>Increase in non-communicable diseases through increased ability to make risk-increasing life-style choices (such as smoking)</li> <li>Increase in road traffic accidents (deaths and injuries) as a result of increased number of vehicle movements and changes in vehicle composition</li> <li>Risk of conflict between community members and security personnel leading to injury</li> </ul>
Infrastructure /Community Facilities	<ul style="list-style-type: none"> <li>Damage to infrastructure such as roads, irrigation structures etc.</li> <li>Effects on community facilities (schools, churches etc.) from traffic and other activities associated with operation of the airport</li> </ul>

**Table 7-7: Potential Impacts during Operation Phase**

Equity	<ul style="list-style-type: none"> <li>Differential distribution of impacts by receptor (which receptors experience mostly beneficial or adverse impacts)</li> </ul>
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## 7.12.5 Impact Assessment

### 7.12.5.1 Scope

The first task is to understand the current situation (and trends) in the Project AoI. This is followed by identifying, assessing and evaluating the potential impacts of the Proposed Project on the Project AoI and determining the necessary mitigation measures in order to address adverse impacts while at the same time considering enhancing beneficial impacts. Following consideration of the effect of the mitigation measures; residual impacts are evaluated. Finally, an overarching analysis is undertaken to determine the differential distribution of impacts.

### 7.12.5.2 Method

Impact identification will be based on:

- Consideration of project-related activities and the how they will affect, directly, the social baseline situation;
- Consideration of indirect social impacts that are mediated by an intervening environmental change such as an alteration in the ability for specific ecosystem services to continue to provide certain benefits to communities and/or certain community members;
- Results of stakeholder engagement;
- Past experience of the actual magnitude of impacts from projects of this type in similar socio-economic settings; and
- Professional judgment by local and international social specialists.

Impact assessment and evaluation will be based on the following factors inter alia:

- Value given to environmental and social receptors by stakeholders;
- National legal and policy provisions/standards; and
- Professional judgment by local and international social specialists.

Key characteristics of the impacts will be described as an input to the evaluation of the impacts. The significance of an impact will be determined, in part, by consideration of its characteristics (such as magnitude, extent, duration and reversibility) in the context of the above factors.

The allocation of significance is important for deciding whether measures are needed to avoid or reduce the severity of adverse impacts are necessary. Additionally, significant beneficial impacts or opportunities can be enhanced by supportive measures. Such measures will be identified and carried forward into preparation of various social management plans.

After consideration of the likely effectiveness of mitigating measures for adverse impacts a, residual impacts will be evaluated, taking into account the expected effect of the measures. Similarly, enhanced outcomes will be presented and/or opportunities identified.

A final step will be to ascertain the distribution of impacts and see "who benefits and who loses". In terms of communities, mapping distribution of impacts enables cumulative impacts to be assessed and potential "hotspots" identified. Such "hotspots" may be the focus of community investment activities as a way of sharing the benefits of the Proposed Project.

Cumulative impacts are those that result from the incremental impact of the Project when added to other existing, planned and reasonably predictable future projects and developments.

The IFC (2013) released a Guidance Note "Cumulative Impact Assessment and Management – Guidance for the Private Sector in Emerging Markets" in August 2013. The guidance note introduces a framework for identifying and assessing potentially significant cumulative impacts. The assessment of cumulative impacts will be undertaken in accordance with this Guidance Note.

#### 7.12.6 Mitigation/Monitoring

The selection and application of mitigating measures will follow the typical mitigation hierarchy (starting from, in order of preference from avoiding to reducing to compensating/offsetting). In selecting measures attention will be paid to those measures that have been effective in similar circumstances. Some mitigation measures can be 'built-in' to the Project design prior to construction whereas others can be only be implemented during construction and operation phases at specific times and places. These latter measures will be codified and included in a series of management plans; for the proposed airport and Expressway it is expected that such management plans will include, but need not be limited to:

- Resettlement Action Plan or Livelihood Restoration Plan (depending on the type of displacement that will occur);
- Stakeholder Engagement Plan (focusing on construction phase);
- Community Health, Safety and Security Management Plan;
- Security Management Plan;
- Employment and Workforce Management Plan (covering such topics as recruitment, labour and working condition issues (including occupational health and safety) relating to the Project sponsor and contractors) with attendant set of Policy/ies and Procedures; and
- Local Procurement Plan.

Furthermore, Ramboll Environ will conduct a Post Resettlement Audit of the GOV resettlement programme in order to confirm that the resettlement process was conducted in accordance with Rwanda requirements and international standards (i.e. IFC Performance Standards).



## 8. AREA OF INFLUENCE

As discussed in some of the previous sections, the minimum study area for conducting an ESIA for a project is defined as the Area of Influence (AOI) of the project. The AOI is generally larger than the Proposed Project Area in order to address potential impacts. In this context, the AOI is the geographic area that may experience impacts to the biological, physical or socio-economic environments from resettlement, earthworks, construction and operation of the project components. The Project AOI includes the land permanently and temporarily affected by the Proposed Project features.

Cognisance will also be taken of the Aerotropolis, which is a future extension of approximately 1,500 ha which will be established following the construction of the airport and will include Special Economic Zones, an entertainment area and theme park. The extent of the Aerotropolis is illustrated in Figure 8.1. The Entertainment Area will include general entertainment and a theme park and the Special Economic Zone will include commercial and light industry zoned areas.

For the ESIA, the AOI will be defined based on relevant requirements in IFC Performance Standard 1 (PS1) Assessment and Management of Environmental and Social Risks and Impacts, considering *“the area likely to be affected by: (i) the project and the client’s activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities’ livelihoods are dependent”*.

Table 8-1 summarises the Project indicative AOIs for different environmental and social topics. For all these topics, different spatial extents (study areas/AOIs) have been defined and studied in terms of baseline data collection and impact assessment. These will be confirmed during the ESIA process.

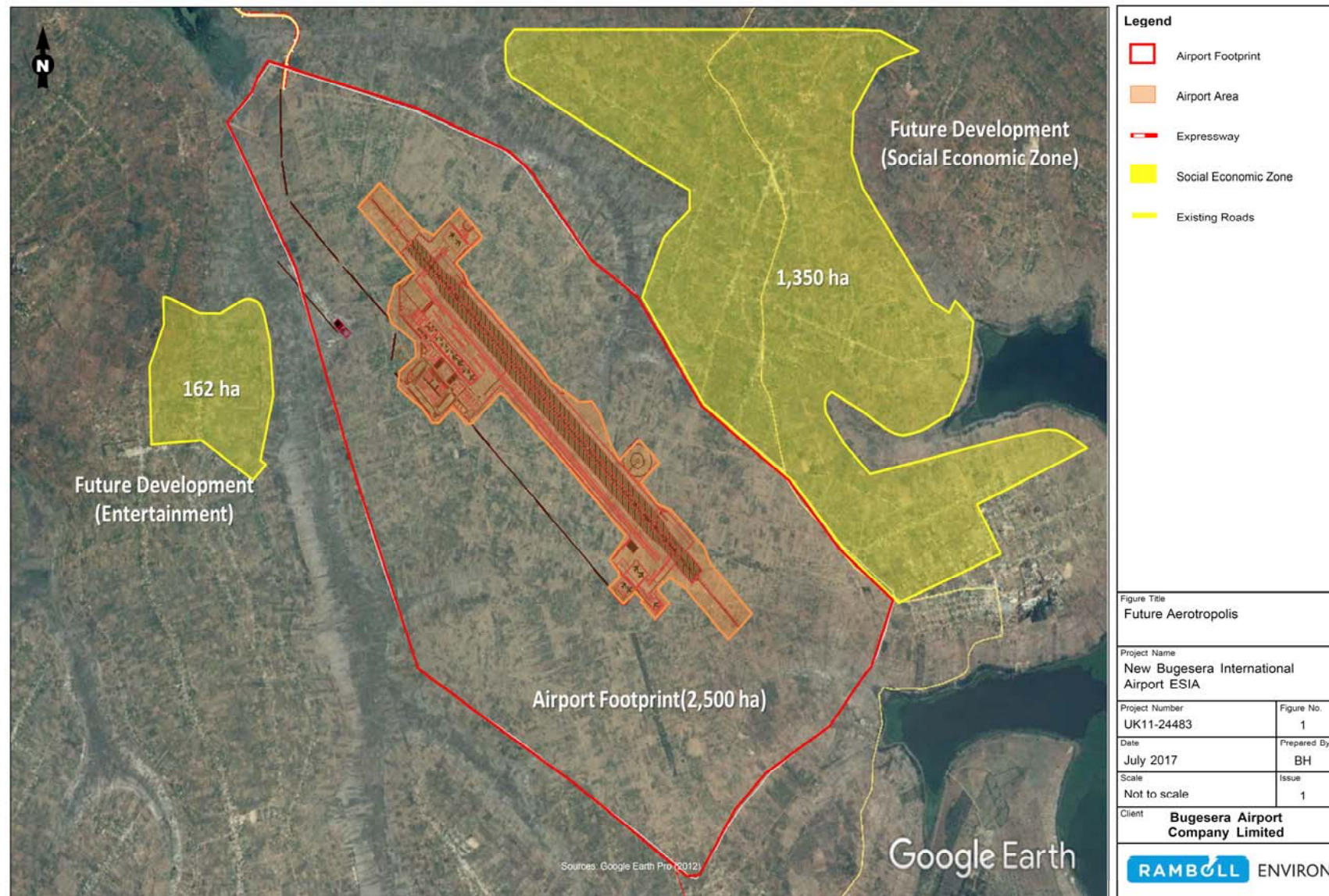


Figure 8-1: Future Aerotropolis (Source: Google Earth, 2012)

**Table 8-1: Indicative Areas of Influence**

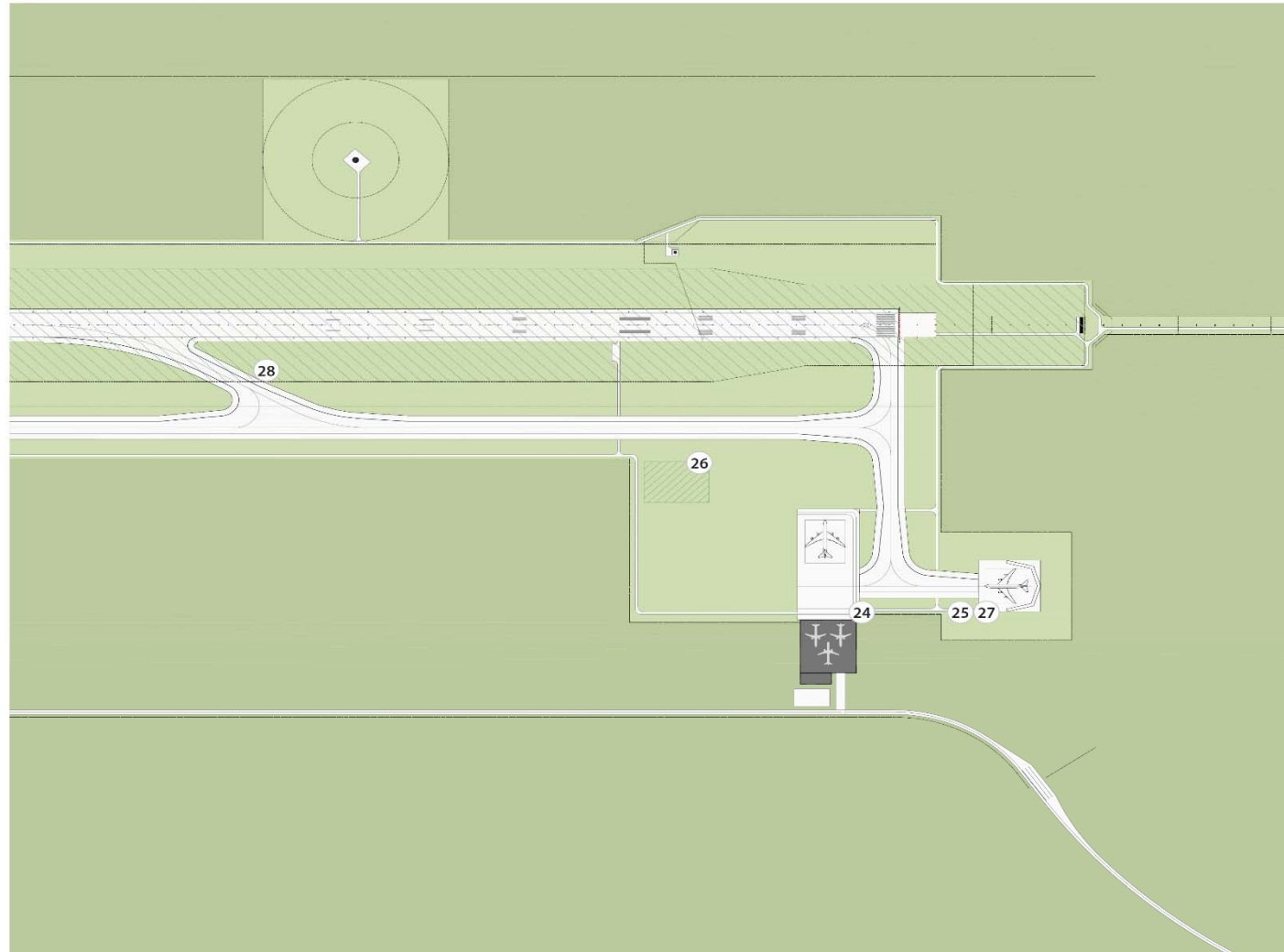
Topic	Issue	Boundary	Receptor	Comment
Environmental and social impacts within the Project Area	Design, build and operate within Airport Area	Project Area which includes Airport Area (and Airport Footprint within this), Water Pipeline corridor, quarry road upgrades and Expressway corridor	Natural resources and human settlements and facilities	
Air Quality	Air quality during construction and operation	5 km along take-off and landing routes, and within an area of 3 km around the Project Area	Population within the vicinity of the airport	The modelling studies will cover a greater area to assess the impacts on air quality.
Noise	Noise during construction and operation	5 km along take-off and landing routes, and within an area of 3 km around the Project Area	Population within the vicinity of the airport	The modelling studies will cover a greater area to assess the impacts of noise.
Water Quality		1 km of Project Area	Surface water bodies and groundwater	
Site drainage/stormwater discharge (construction and operation)		1 km of Airport Area		
Transport/Roads	Increased road traffic	5 km from Project Area	Local community, road users (highway and secondary roads)	

Table 8-1: Indicative Areas of Influence				
Construction Materials Sourcing	Requirement for quantities of construction aggregate	Locations of the material borrow areas	Quarries, regional economy, transport mechanism.	Locations of the material borrow areas to provide fill and construction material to the Project have been confirmed and were assessed.
Internationally Recognised Areas, Protected areas	Impacts to qualifying features	5 km of Project Area	Qualifying features	
Ornithology	Loss of habitat, disturbance, etc.	5 km of Project Area	Birds and their habitats	
Aquatic Ecology	Possible negative impacts of temporary Water Supply Pipeline and Expressway, including environmental emissions (such as sedimentation, noise and dust) on aquatic environment	5 km of Project Area	Aquatic species and habitats	
Terrestrial Flora and Fauna	Loss of habitat and species of conservation concern, disturbance, fragmentation, etc.	5 km of Project Area	Flora and fauna species and habitats	
Waste	Creation and management of wastes	Project Area for onsite waste handling and storage and waste management facilities in the region to receive the wastes generated due to project activities	Increased volumes of waste requiring handling and transport.	

## **APPENDIX 1**

### **NEW BUGESERA INTERNATIONAL AIRPORT LAYOUT**

## Phase 1: 2025



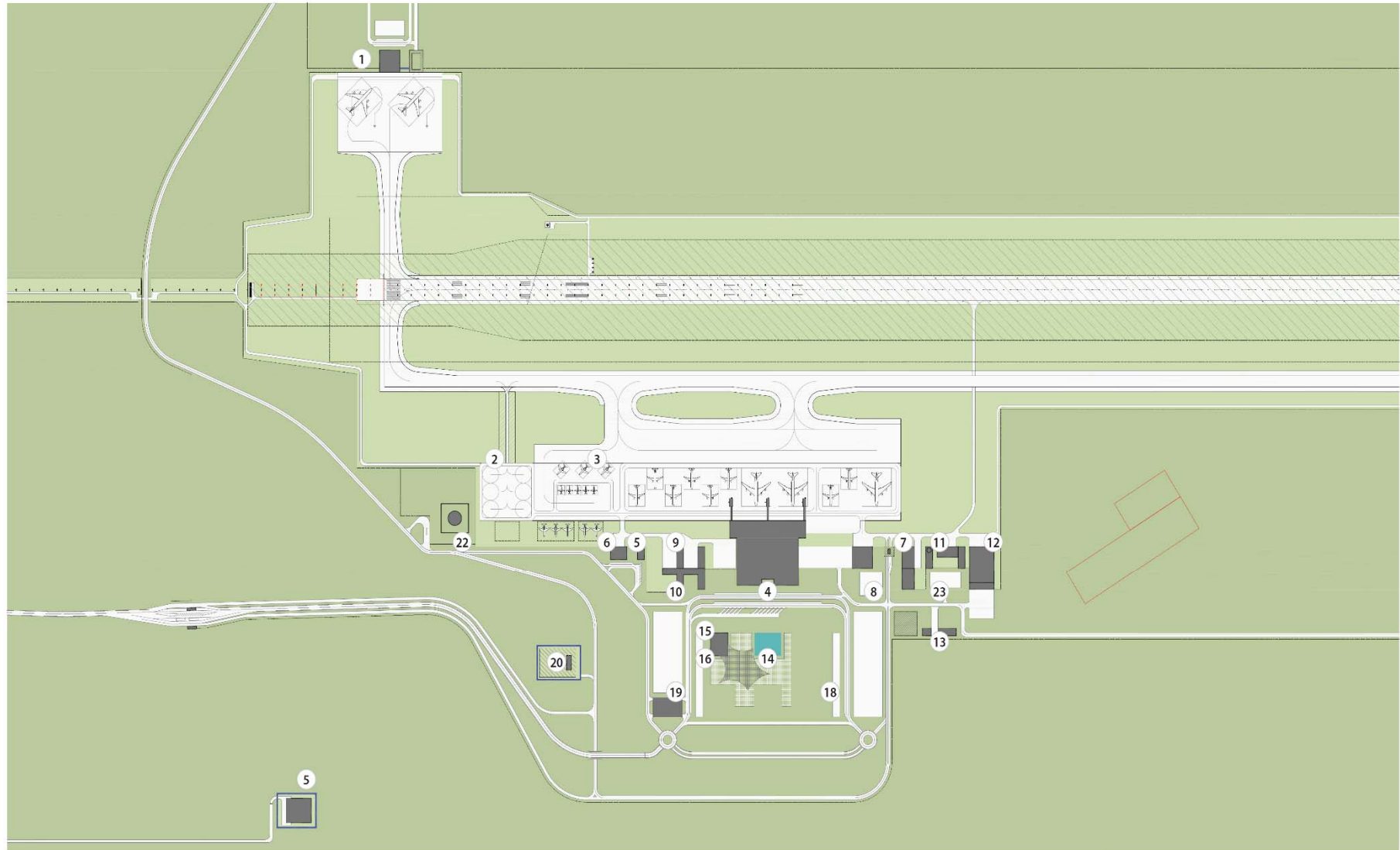
### 2.2 PHASE 1

Design Year	2025
MAP	1,77
DPH	856 PAX
Annual MVTs (excl. GA)	27.951 mvt's
Annual Cargo (incl. Mail)	13.803 t

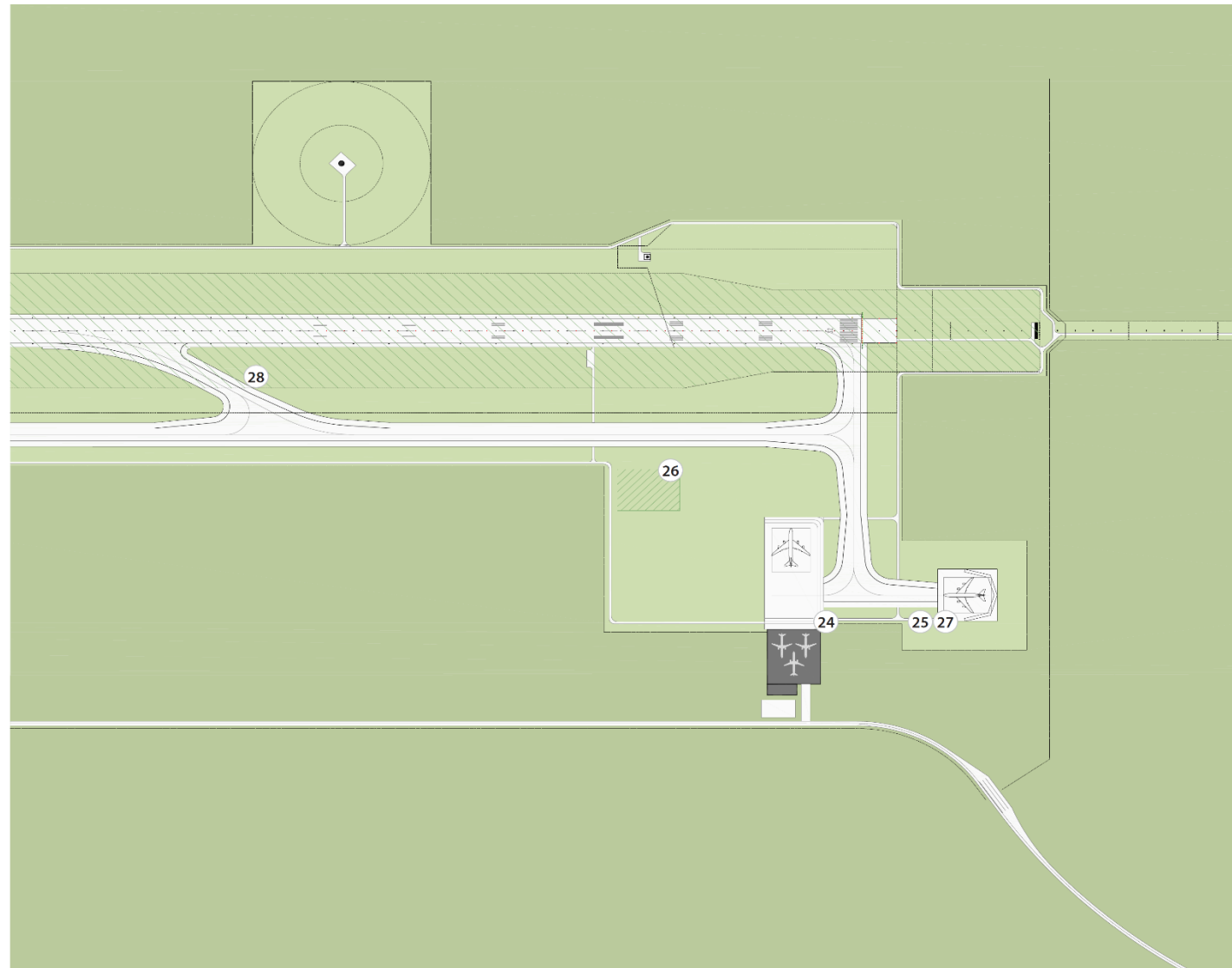
#### Legend

1. Presidential Terminal
2. Heliports
3. GA Apron
4. Passenger Terminal
5. Substation
6. GA Terminal
7. Police building / Anti-Terrorist Squad
8. Catering
9. GSE / Airport Maintenance – Garage
10. GSE / Airport Maintenance – Station
11. ARFF building
12. Cargo terminal & Forwarders
13. Solid waste
14. Water retention pool
15. Airport administration
16. Office building
17. Hotel
18. Landside development
19. Gas station
20. Waste water treatment
21. Airport access checkpoint
22. Fuel farm
23. ATC Tower
24. Aircraft maintenance hangar
25. Engine run up area
26. RFFS Training area
27. Isolated aircraft position
28. RET - Rapid Exit Taxiway





## Phase 2: 2030



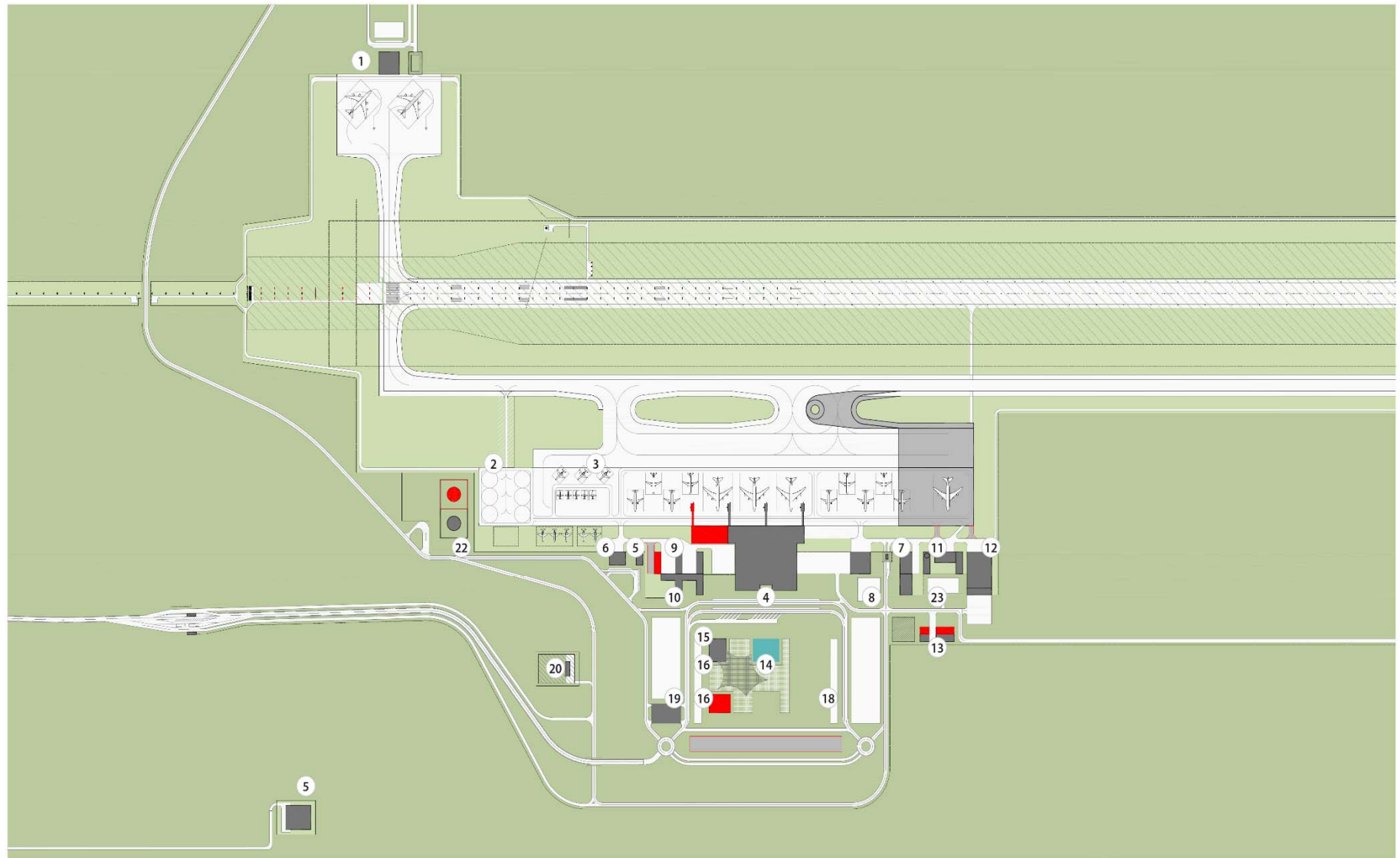
### 2.3 PHASE 2

Design Year	2030
MAP	2,52
DPH	1.157 PAX
Annual MVTs (excl. GA)	34.257 mvt's
Annual Cargo (incl. Mail)	19.542 t

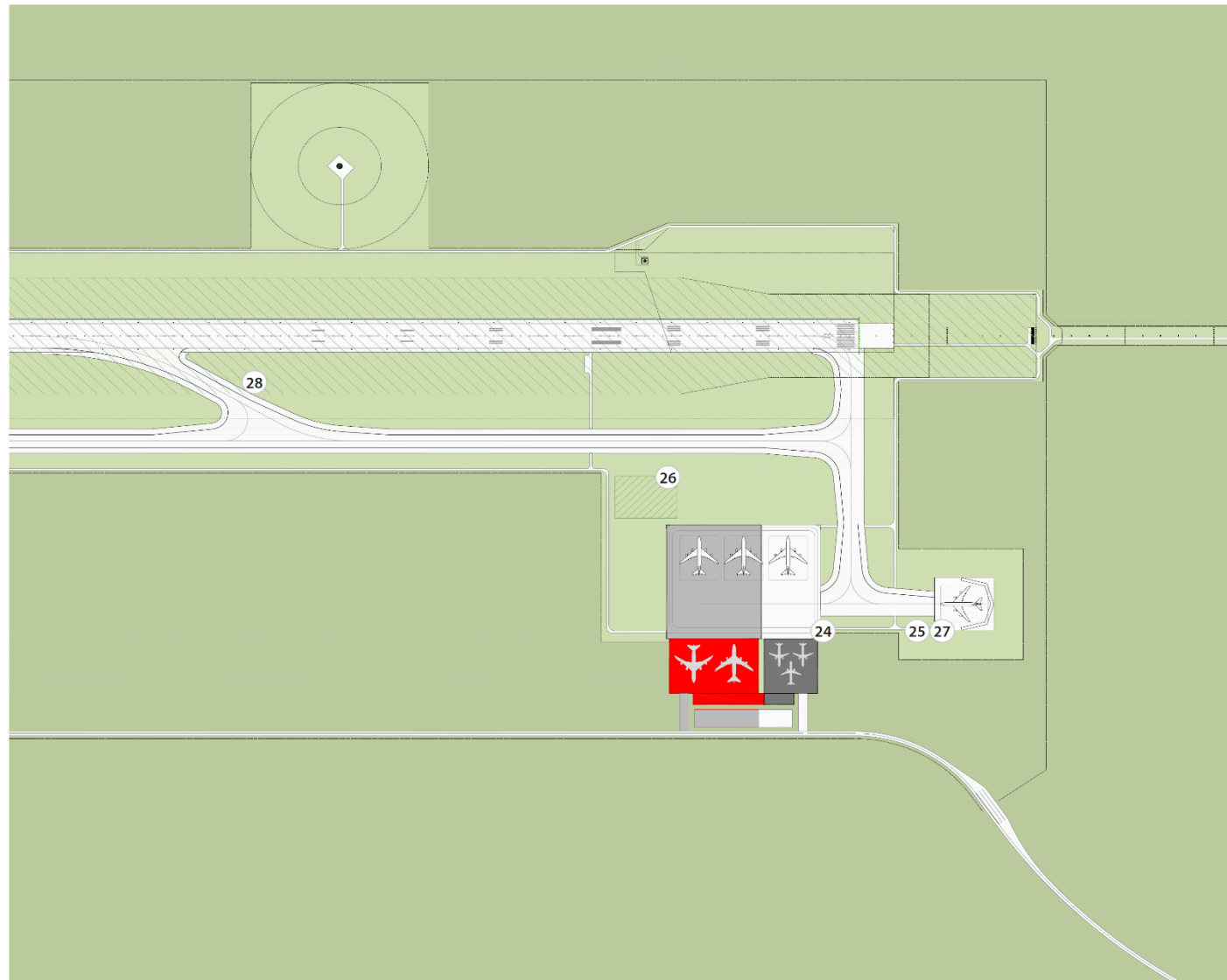
#### Legend

1. Presidential Terminal
2. Heliports
3. GA Apron
4. Passenger Terminal
5. Substation
6. GA Terminal
7. Police building / Anti-Terrorist Squad
8. Catering
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17. Hotel
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24. Aircraft maintenance hangar
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26. RFFS Training area
27. Isolated aircraft position
28. RET - Rapid Exit Taxiway





### Phase 3: 2035

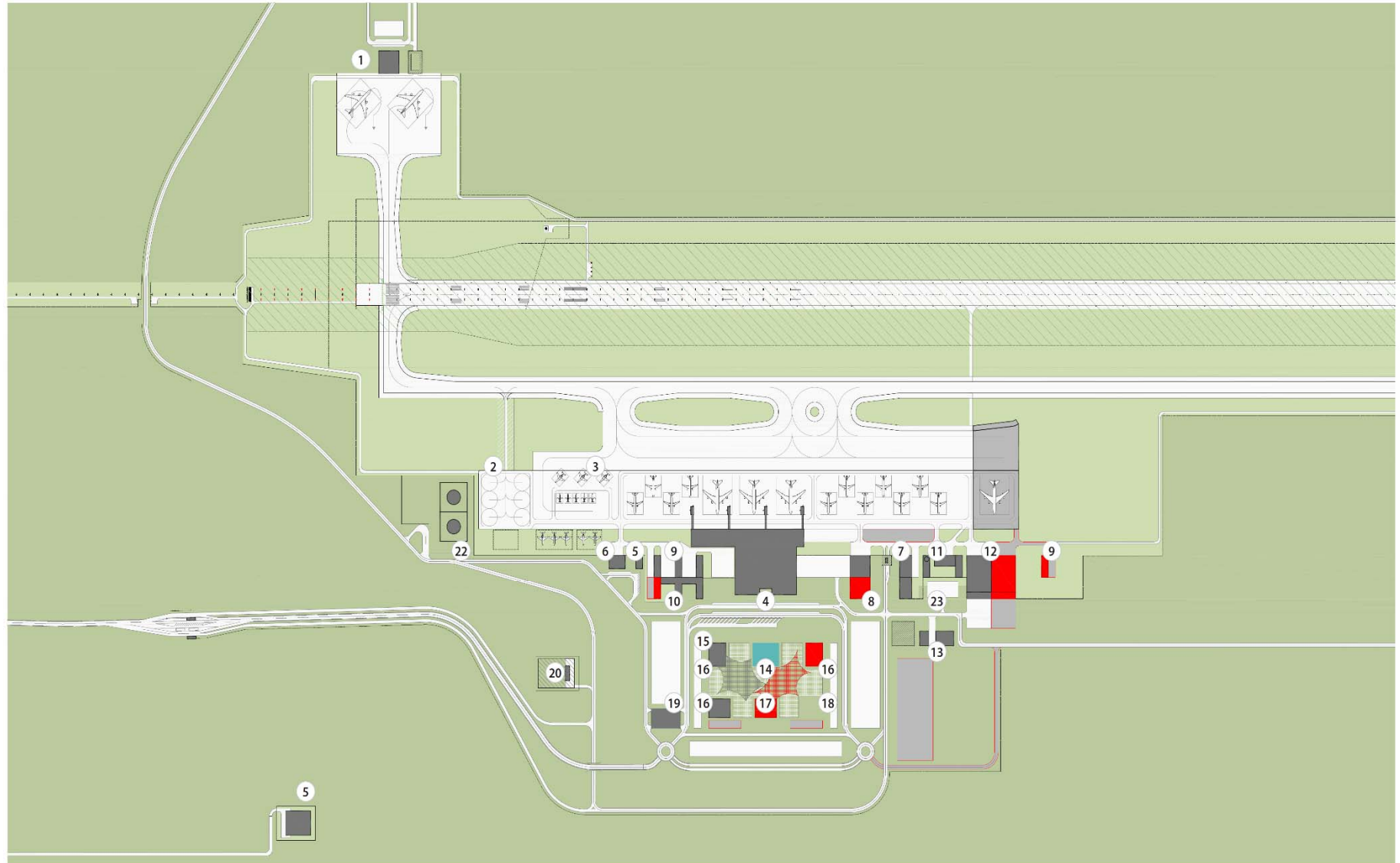


#### 2.4 PHASE 3

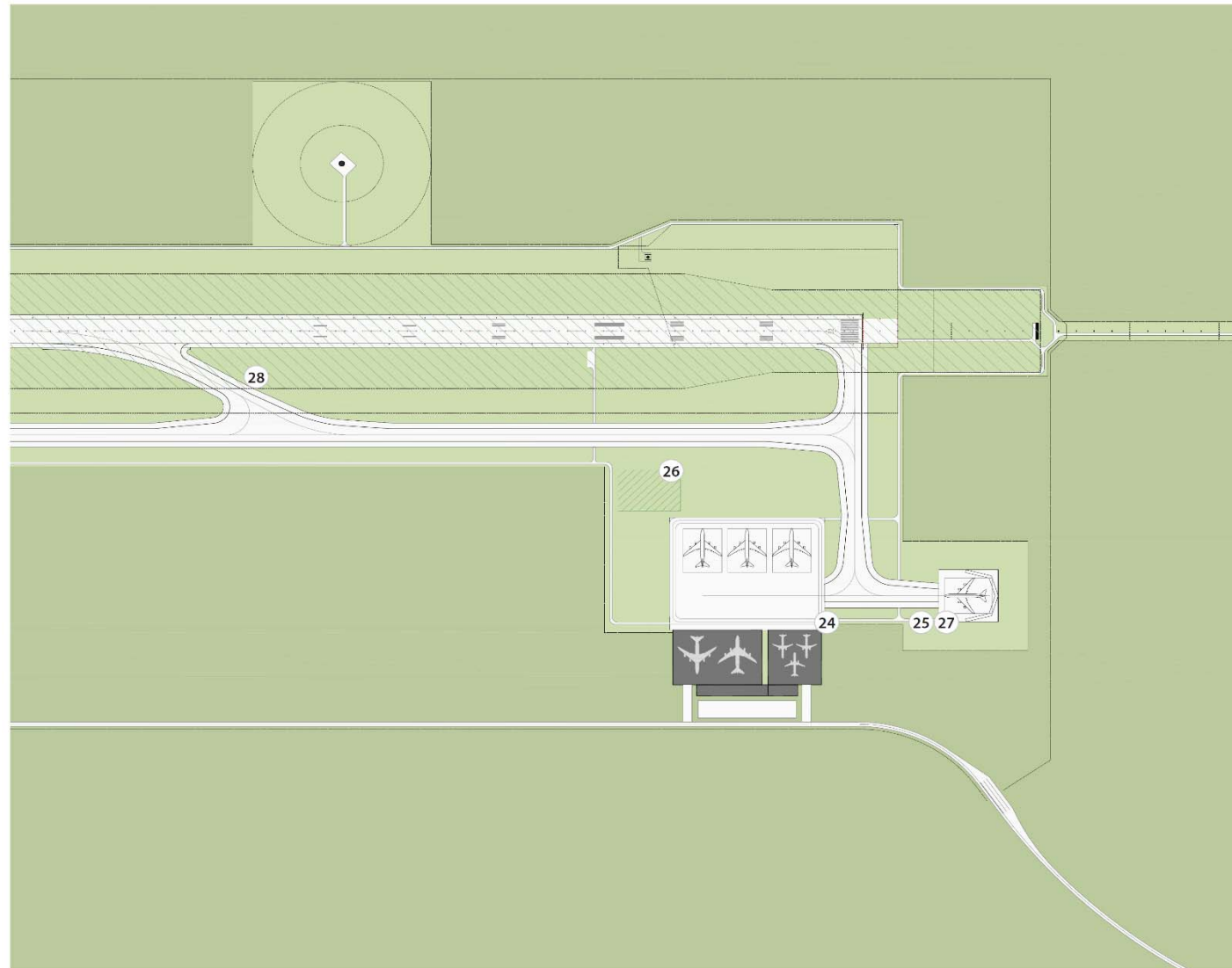
Design Year	2035
MAP	3,42
DPH	1,490 PAX
Annual MVTs (excl. GA)	41,733 mvt's
Annual Cargo (incl. Mail)	27,626 t

#### Legend

1. Presidential Terminal
2. Heliports
3. GA Apron
4. Passenger Terminal
5. Substation
6. GA Terminal
7. Police building / Anti-Terrorist Squad
8. Catering
9. GSE / Airport Maintenance – Garage
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23. ATC Tower
24. Aircraft maintenance hangar
25. Engine run up area
26. RFFS Training area
27. Isolated aircraft position
28. RET - Rapid Exit Taxiway



## Phase 4: 2040

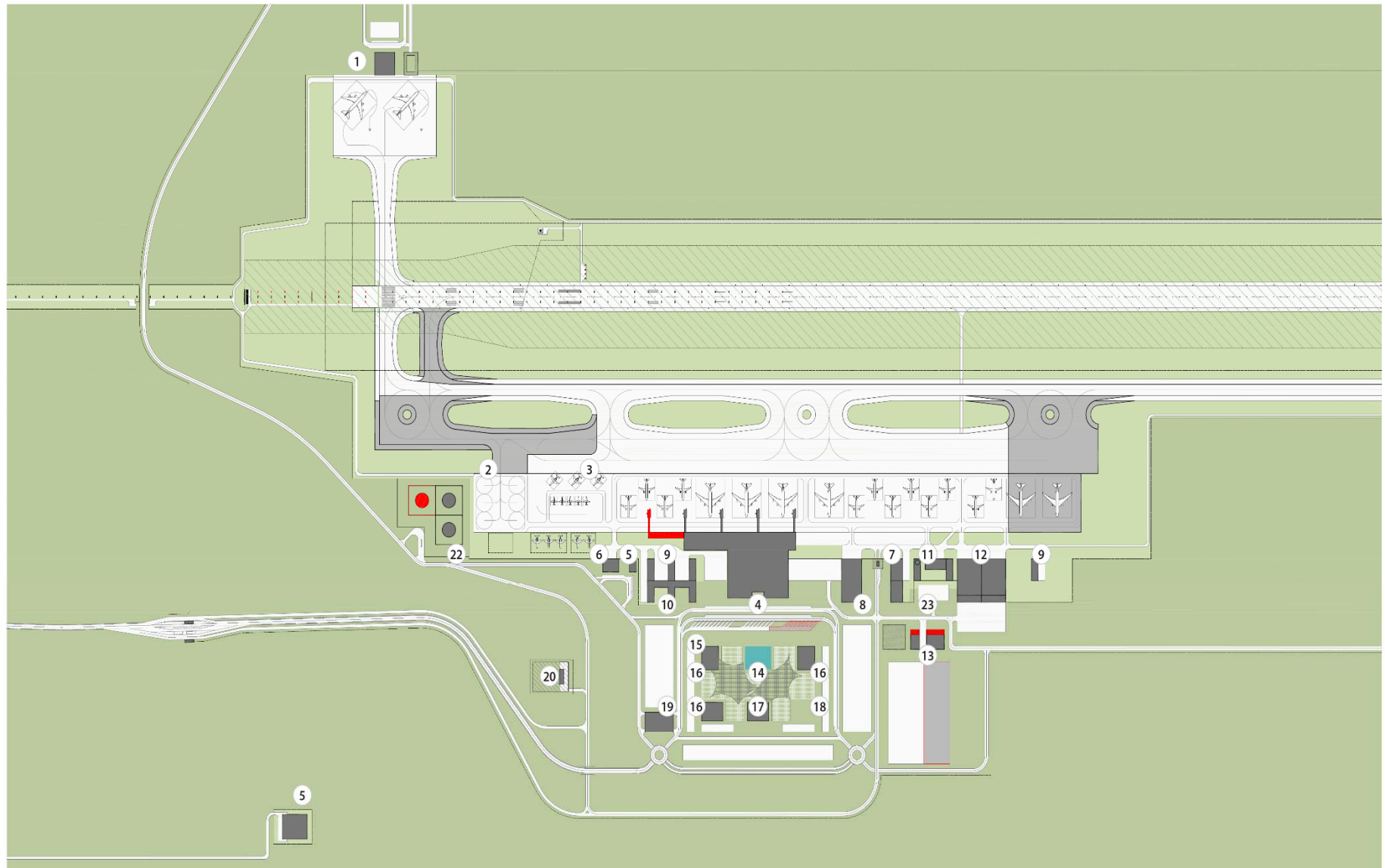


### 2.5 PHASE 4

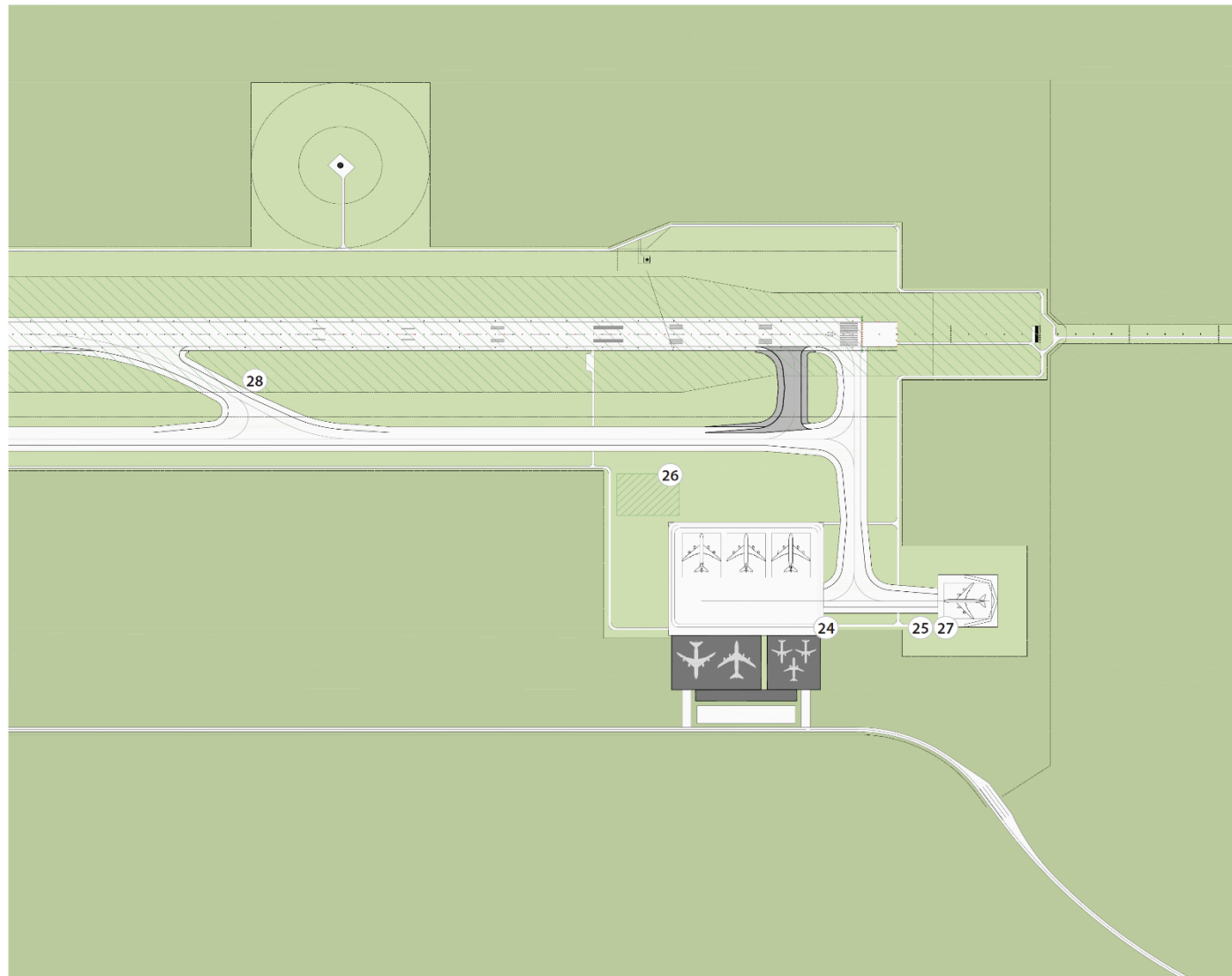
Design Year	2040
MAP	4,48
DPH	1,859 PAX
Annual MVTs (excl. GA)	50,066 mvt's
Annual Cargo (incl. Mail)	39,434 t

#### Legend

1. Presidential Terminal
2. Heliports
3. GA Apron
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6. GA Terminal
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23. ATC Tower
24. Aircraft maintenance hangar
25. Engine run up area
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27. Isolated aircraft position
28. RET - Rapid Exit Taxiway



## Phase 5: 2045



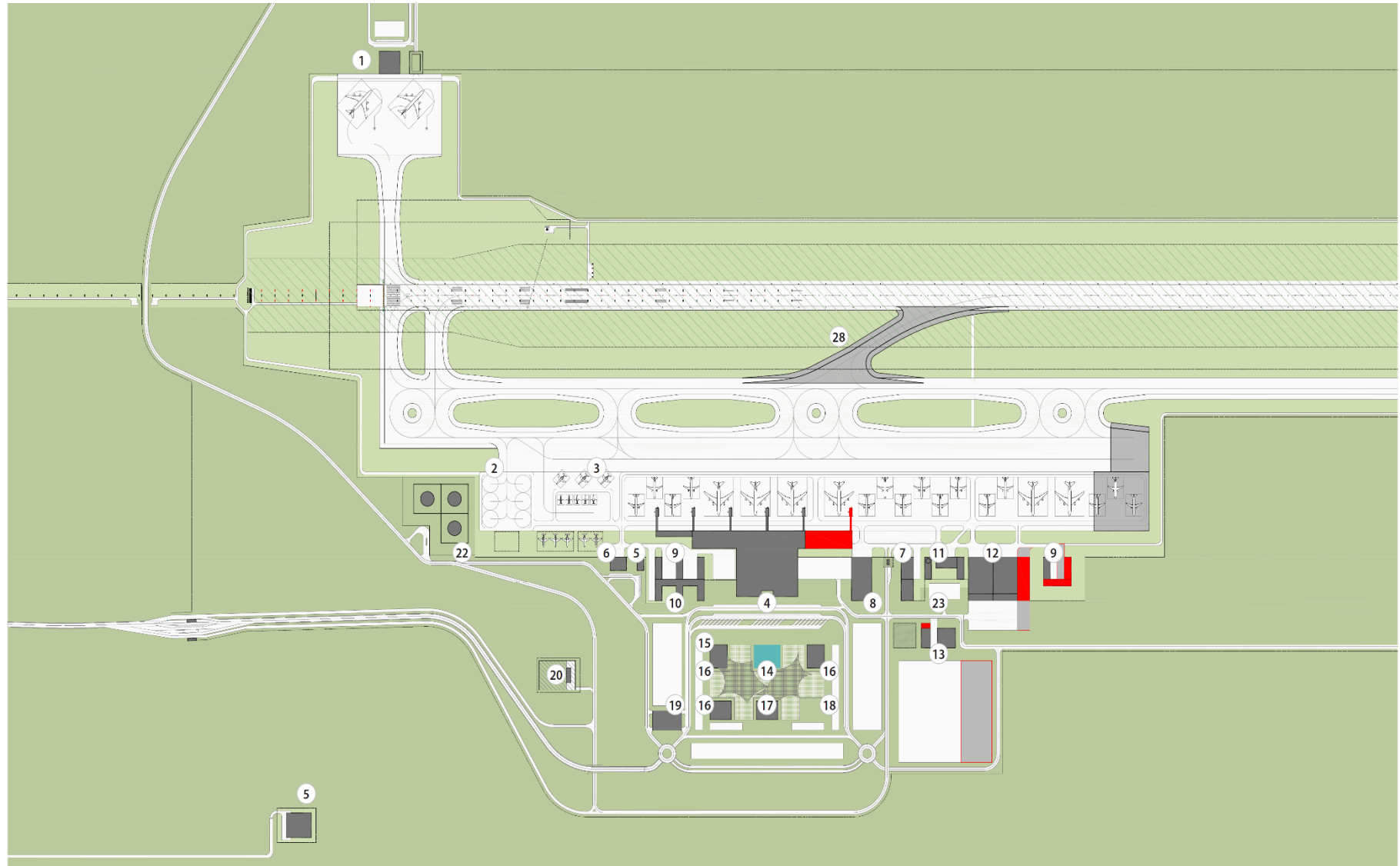
### 2.6 PHASE 5

Design Year	2045
MAP	5,72
DPH	2,253 PAX
Annual MVTs (excl. GA)	58,386 mvt's
Annual Cargo (incl. Mail)	56,416 t

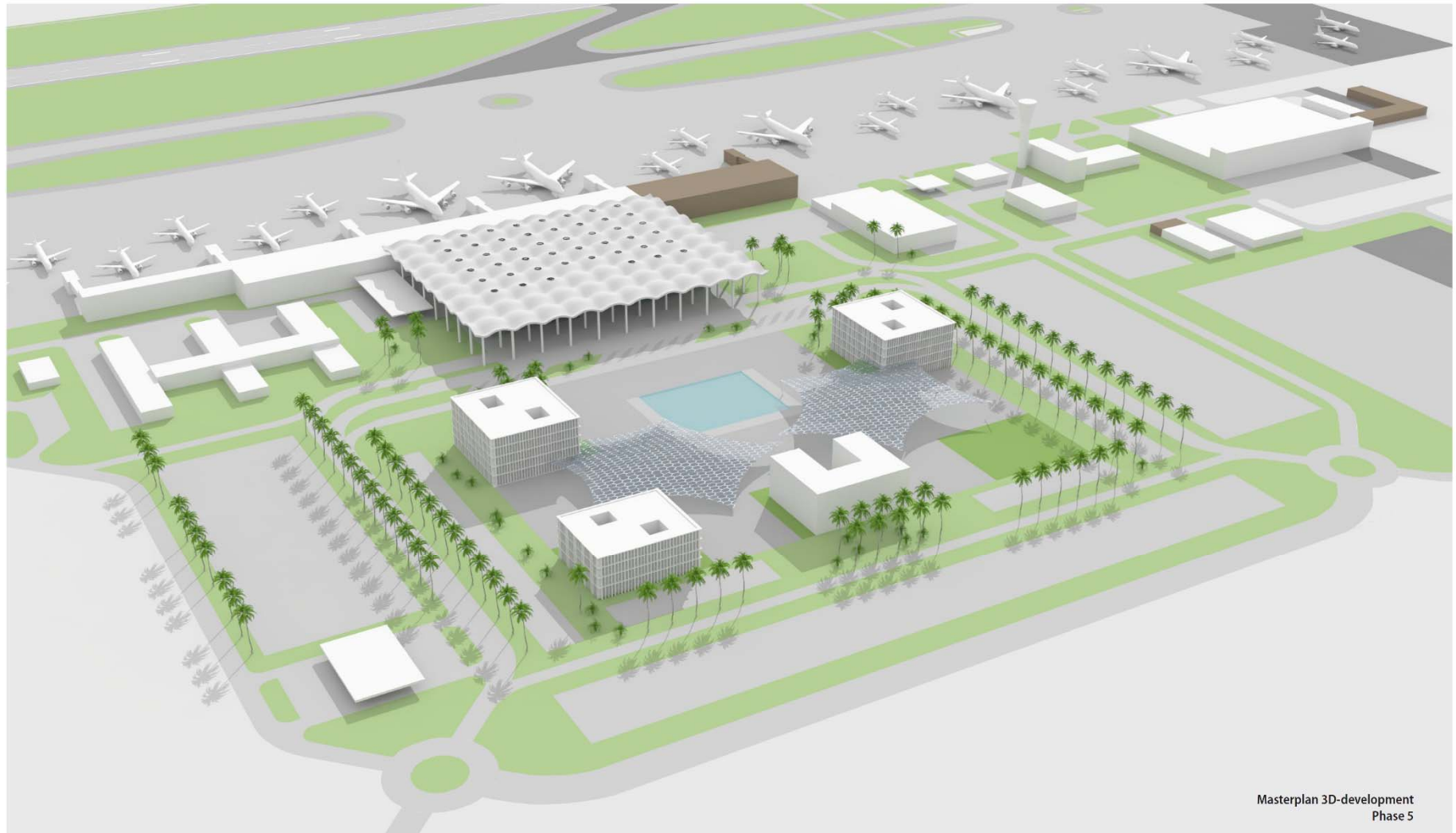
#### Legend

1. Presidential Terminal
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22. Fuel farm
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24. Aircraft maintenance hangar
25. Engine run up area
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27. Isolated aircraft position
28. RET - Rapid Exit Taxiway





### Masterplan Development 3-D Model: Phase 5





## **APPENDIX 2**

### **TABLE OF CONTENTS FOR THE ESIA REPORT**