ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

MASDAR INFINITY POWER HOLDING 200MW WIND POWER PROJECT IN GULF OF SUEZ

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FINAL

ECO Consult

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RCREEE
Regional Center for Renewable Energy and Energy Efficiency
المركز الإقليمي للطاقة المتجددة وكفاءة الطاقة

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LIST OF ABBREVIATIONS

AC	Alternating Current
BOO	Build, Own and Operate
CAAs	Competent Administrative Authorities
CAPMAS	Central Agency for Public Mobilization and Statistics
CBO	Community Based Organization
CRM	Collision Risk Modelling
DC	Direct Current
DEM	Digital Elevation Model
E&S	Environmental and Social
EBRD	European Bank for Reconstruction and Development
EEAA	Egyptian Environmental Affairs Agency
EETC	Egyptian Electricity Transmission Company
EHS	Environment, Health, and safety
EHSS	Environmental, Health, Safety and Social
EIA	Environmental Impact Assessment
EMU	Environmental Management Unit
EPC	Engineering, Procurement, and Construction
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GDP	Gross Domestic Product
GOE	Government of Egypt
GoS	Gulf of Suez
IBA	Important Bird Area
IEA	International Energy Agency
IFC	International Finance Corporation
IFIs	International Financial Institutions
IRENA	International Renewable Energy Agency
ISES	Integrated Sustainable Energy Strategy
ISO	International Organization for Standardization
Km	Kilometre
kWh	Kilowatt Hour
LoS	Line of Sight

MS	Management System
MSB	Migratory Soaring Birds
MV	Medium Voltage
MW	Megawatt
NREA	New and Renewable Energy Authority
NGO	Non-Governmental Organization
NTS	Non-Technical Summary
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OHTP	Occupational Health and Safety Plan
OHTL	Overhead Transmission Line
PPA	Power Purchase Agreement
PPS22	Planning Policy Statement 22
PR	Performance Requirement
PSs	Performance Standards
RCREEE	Regional Center for Renewable Energy and Energy Efficiency
SCA	Supreme Council of Antiquities
SCADA	Supervisory Control and Data Acquisition
SEP	Stakeholder Engagement Plan
SESA	Strategic and Cumulative Environmental and Social Assessment
ToR	Terms of Reference
TSP	Total Suspended Particulate
VP	Vantage Points
WGS	World Geodetic System
WTG	Wind Turbine Generator
WWTP	Wastewater Treatment Plant

1 INTRODUCTION

1.1 Background

The energy sector is a key driver for the socio-economic development of Egypt, representing around 13% of current GDP and thus making economic growth in the country contingent upon the security and stability of energy supply.

Since 2007, Egypt has experienced an energy supply deficit due to the rapid increase in energy consumption and the depletion of domestic oil and gas resources, shifting its position as a net hydrocarbon exporter for the last three decades to that of a net importer.

This has brought a set of challenges to the energy sector, including electricity shortages, caused in part by the decline of domestic gas production, as natural gas is the main source of electricity, accompanied by highly subsidized energy prices, with negative financial implications for already dwindling government revenues.

In response, the Government of Egypt (GoE) has taken bold steps to adopt an energy diversification strategy with increased development of renewable energy and implementation of energy efficiency, including assertive rehabilitation and maintenance programs in the power sector (IRENA, 2018).

To this extent, in 2013, the Arab Republic of Egypt (through the Ministry of Electricity and Renewable Energy) had developed and adopted the Integrated Sustainable Energy Strategy (ISES) 2015 – 2035, which provides an ambitious plan to increase the contribution of renewable energy to 20% of the electricity generated by the year 2022, of which 12% of wind power plants is foreseen, mostly in the Gulf of Suez (GoS) due to the wind characteristics in the area.

In that respect, the GoE issued the Renewable Energy Law (Decree Law 203/2014) to support the creation of a favourable economic environment for a significant increase in renewable energy investment in the country. The law sets the legal basis for the Build, Own and Operate (BOO) scheme to be implemented. Through the BOO mechanism, the Egyptian Electricity Transmission Company (EETC) invites private investors to submit their offers for solar and wind development projects, for specific capacities and the award will be made to that bidder with the lowest Kilowatt Hour (kWh) price. In addition, the GoE (through the New and Renewable Energy Authority (NREA)) provides the land for the investors.

Through the BOO mechanism, Infinity Power Holding (IPH) (hereafter referred to as 'the Developer'), has been selected for the development of a 200-Megawatt (MW) Wind Power Project (hereafter referred to as 'the Project'). The Project is located in the GoS on a land area of 37.5 km^2 provided by NREA.

1.2 Project Location and Components

The Project is located in the Red Sea Governorate of Egypt, around 250km to the southeast of the capital city of Cairo. More specifically, the Project is located near the Red Sea shoreline and within the Ras Gharib District of the Red Sea Governorate, where the closest residential areas include Ras Gharib city (located 18km to the east) refer to the figures below.

The Project is located within a 300km^2 Strategic Area that has been allocated by NREA for wind farm development Projects with a total capacity of 1,500 MW. Refer to Figure 3 for the Strategic Area location in relation to the Project site. A strategic ESIA study has been undertaken for the 300km^2 area known as the "ESIA for an Area of 300km^2 at the Gulf of Suez" (Lahmeyer & Ecoda, 2013) (hereafter referred to as "Strategic ESIA"), where this Strategic ESIA investigated the E&S issues at cumulative and strategic level. Within this, a land area of 37.5 km^2 (presented in blue in the figures below) has been allocated to the Developer by NREA for the development of this Project.

Figure 1: Project Site in Relation to the Capital City of Egypt

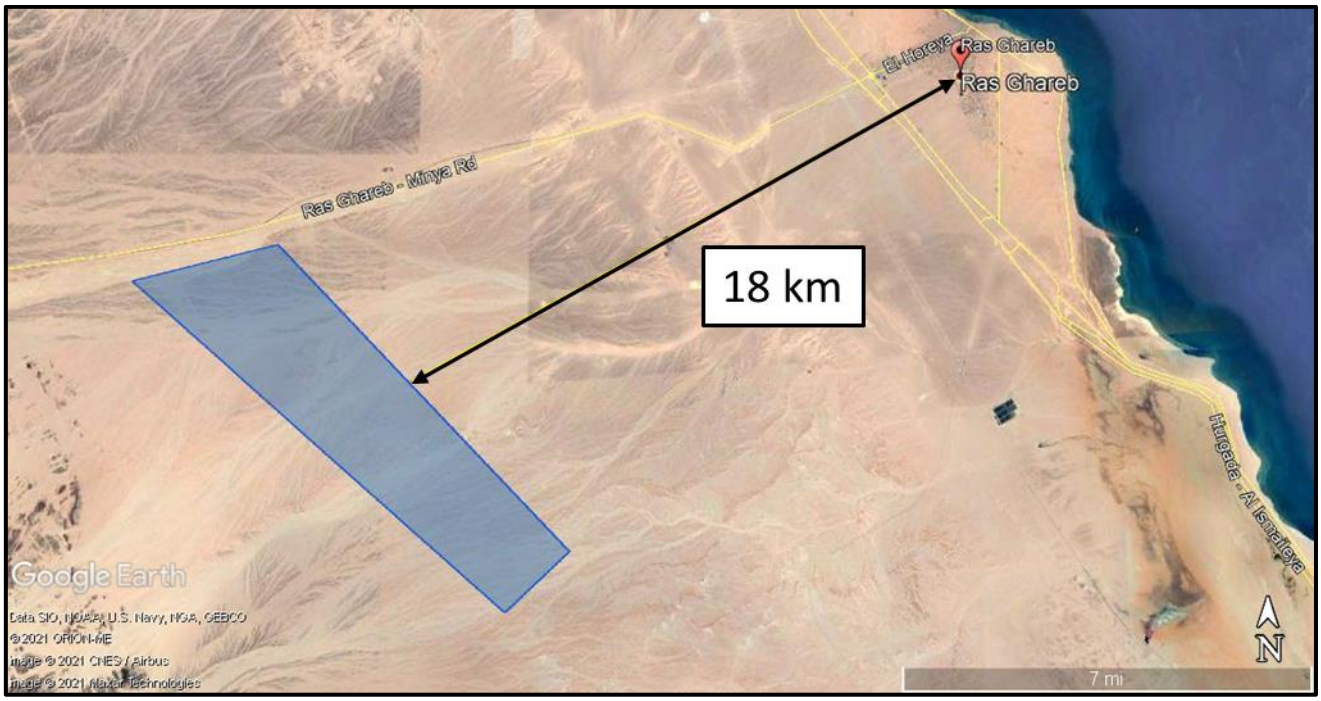


Figure 2: Project Site and Closest Villages

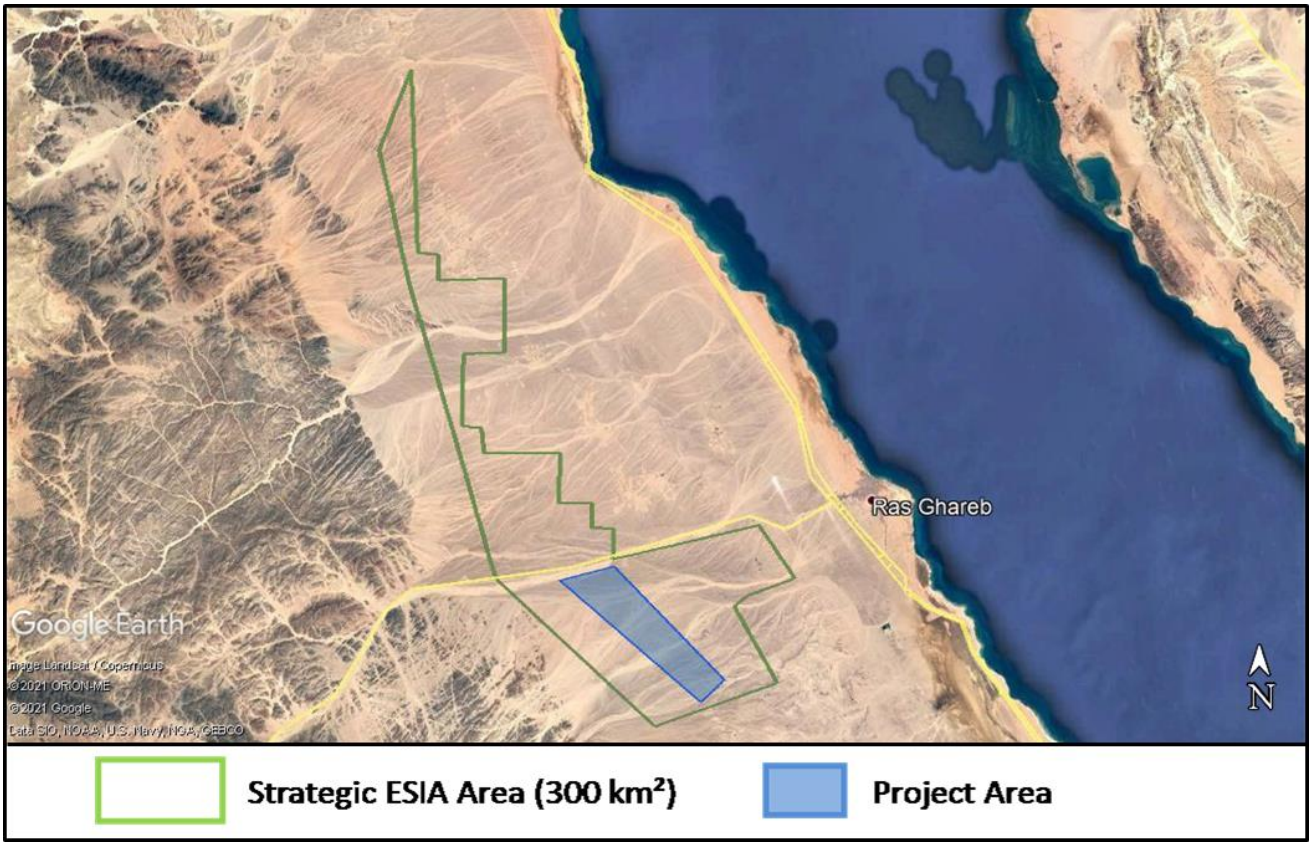


Figure 3: Project Site as Part of the 300km^2 Area Allocated for Wind Farm Developments

1.3 Environmental and Social Impact Assessment Report

The environmental clearance for this Project is governed by the Egyptian Environmental Affairs Agency (EEAA) as stipulated by "Law No. 4 of 1994 – Law on Protection of the Environment". Executive Regulations 1995 (Prime Ministers Decree 338) issued in accordance with the Law, classifies wind farm developments of such nature and capacity (i.e. this Project) as "Category C", requiring a comprehensive Environmental and Social Impact Assessment (ESIA) in order to obtain the environmental clearance and permit, in order to commence with construction and operational activities.

The Project will be seeking financing from International Financing Institutions (IFIs) and therefore the Developer wishes to design and manage the Project in accordance with Good International Industry Practice (GIIP), which also includes the ESIA that will be developed. This ESIA will be developed based on the following GIIP requirements:

- European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy (2019) and associated Performance Requirements (PR); and
- International Finance Corporation (IFC) Policy on Environment and Social (E&S) Sustainability (2012), IFC Performance Standards (2012), and IFC Environment, Health and Safety (EHS) Guidelines including the IFC EHS Guidelines for the Wind Sector.
- Japan International Cooperation Agency (JICA) Guidelines E&S Standards

This report is the ESIA report to be submitted by the ESIA Practitioner (EcoConServ and Eco Consult) to EEAA. This ESIA is undertaken in accordance with the "Law No. 4 of 1994" and its amendments as well as GIIP requirements specified above. There are other complementary studies submitted as standalone documents which include the following:

- Nom-Technical Summary (NTS)
- Stakeholder Engagement Plan (SEP)
- Cumulative Effects Analysis (CEA)
- Critical Habitat Assessment (CHA)
- Health, Safety, Social and Environmental (HSSE) Management System (MS) Manuel.

1.4 Document Structure

The following table provides an overview of the Chapters within this ESIA document. The ESIA includes a standalone Non-Technical Summary (NTS) a Stakeholder Engagement Plan (SEP).

Table 1: ESIA Document Structure

Chapter	Description of Content
Chapter 2 – Project Description	Provides a detailed description of the Project in relation to its location, the key Project components and an overview of the proposed activities that are to take place during the various Project phases.
Chapter 3 – ESIA Approach and Methodology	Presents the methodology and approach that was adopted for the ESIA study.
Chapter 4 – Project Stakeholders and Consultations	Discusses in detail the stakeholder consultation and engagement plans which were undertaken as part of the ESIA process for the Project and provides an overview of the findings. In addition, this Chapter also discusses the future stakeholder engagement and consultation plans which are to take place at a later stage.
Chapter 5 – Policy, Legal, and Administrative Framework	Provides an overview of the environmental and social regulatory and policy framework applicable to the Project.
Chapter 6 – Analysis of Alternatives	This chapter investigates several alternatives to the Project development and the reasons for the preferred choice. This includes alternatives in relation to the Project site, selected technology, Project design, and finally investigates the 'no action alternative' – which assumes that the Project development does not take place.
Chapter 7 – Existing Physical, Biological, and Social Environment	This Chapter presents the baseline conditions within the Project site and surroundings. This includes the following: Landscape and Visual (section 7.1), Land Use (section 7.2), Geology/Hydrology/Hydrogeology (section 7.3), Biodiversity (section 7.4), Birds (section 7.5), Bats (section 7.6), Archaeology and Cultural Heritage (section 7.7), Air Quality and Noise (section 7.8), Infrastructure and Utilities (section 7.9), Occupational Health and Safety (section 7.10), Public Health and Safety (section 7.11), and Socio-economics (section 7.12).
Chapter 8 – Impact Assessment	This Chapter assesses the anticipated impacts from the Project throughout its various phases on such a receptor. For each identified impact a set of mitigation and monitoring requirements have been identified which aim to eliminate the impact and/or reduce it to acceptable levels. This includes the following: Overview of Strategic Environmental and Economic Impacts (section 8.1), Landscape and Visual (section 8.2), Land Use (section 8.3), Geology/Hydrology/Hydrogeology (section 8.4), Biodiversity (section 8.5), Birds (section 8.6), Bats (section 8.7), Archaeology and Cultural Heritage (section 8.8), Air Quality and Noise (section 8.9), Infrastructure and Utilities (section 8.10), Occupational Health and Safety (section 8.11), Public Health and Safety (section 8.12), Socio-economics (section 8.13), Summary of Anticipated Impacts (section 8.14), and Assessment of Cumulative Impacts (section 8.15).
Chapter 9 – Framework Environmental and Social Management Plan (ESMP)	Presents the framework Environmental and Social Management Plan (ESMP) for the Project; which mainly summarizes the impacts identified as well as the mitigation measures and monitoring requirements to be implemented throughout the various Project phases. In addition, this Chapter describes the institutional framework and procedural arrangement for the ESMP implementation.

Chapter 10 – Assessment of Associated Facilities	Presents the outcomes of the E&S assessment undertaken for the associated facilities of the Project which includes the Overhead Transmission Line (OHTL).

1.5 Key Involved Entities

Different entities are involved in the planning and implementation of the Project. The responsibilities of each key entity which is of relevance to the ESIA are listed in the text below along with a general description of their roles.

- *Infinity Power Holding (IPH):* The owner and developer of the Project (hereafter referred to as 'the Developer');
- *Egyptian Environmental Affairs Agency (EEAA):* the official governmental entity responsible for protection of the environment in Egypt. The EEAA is responsible for approval of the Environmental and Social Impact Assessment (ESIA) and making sure it complies with the "Environmental Protection Law No. 4 of 1994" and granting the environmental clearance for the Project;
- *International Financing Institutions (IFIs):* entities that will provide financing to the Developer for the development of the Project. Such IFIs will ensure that the Project is developed in accordance with GIIP requirements. At this stage, the IFI will include EBRD as well as the Japan International Cooperation Agency (JICA) and Groupe Agence Francaise De Developpement (PROPARCO).
- *Engineering, Procurement, and Construction (EPC) Contractor:* will be responsible for preparing the detailed design and layout of the Project; supply of the material and equipment (e.g. wind turbines); construction of the Project and its various components (turbines, internal roads, building infrastructure, and, etc.). The EPC Contractor for this Project has not been assigned yet;
- *Owner's Engineer (OE):* engineering company appointed by the Developer to ensure EPC Contractor develops the Project with the required technical specifications. Owner's Engineer is also responsible for supporting the Developer in ensuring EPC Contractor adherence to E&S requirements and obligations.
- *Independent Environmental and Social Consultant (IESC):* consultant that is engaged by and on behalf of the IFIs to ensure that the Project is being developed in accordance with their E&S requirements.
- *Project Operator:* responsible for Operation and Maintenance (O&M) of the Project. The Project Operator has not been assigned at this stage;
- *Egyptian Electricity Transmission Company (EETC):* will be the off taker of electricity and is the entity that signed the Power Purchase Agreement (PPA) with the Developer. In addition, they will also be responsible for designing, building and operating the associated interconnection facilities. This will include the Overhead Transmission Line (OHTL) that will connect from the Project site to the existing national grid.
- *National Renewable Energy Authority (NREA):* is entity responsible for allocation of the land for the development of the Project;
- *Consultant (EcoConServ and Eco Consult):* hereafter referred to as the 'ESIA Team' who is the ESIA Practitioner and the consultant commissioned by the Developer to prepare the ESIA for the Project in accordance with the requirements of the "Law No. 4 of 1994" as well as GIIP requirements.

2 PROJECT DESCRIPTION

This chapter provides a detailed description of the Project in relation to its location, the key project components and an overview of the proposed activities that are to take place during the construction, operation, and decommissioning phase.

2.1 Administrative Set-up and Project Location

Egypt is divided into 27 Governorates. The Project site is located within the Red Sea Governorate that is bordered by the Red Sea Cost to the east and Beni Suef, Minya, Assyut, Sohag, Qena, Luxor and Aswan Governorates to the west, Suez Governorate to the North, and North Sudan to the south (refer to figure below). Red Sea Governorate's total area is around 120,000 km^2, forming 11.9% of the country's total area.

Administratively, the Red Sea Governorate is divided into 7 Cities (also known as Districts), each headed by a Local City Council. The capital of the Governorate is Hurghada that is located around 100km south of the Project site.

The Project site is located within the Ras Gharib City (or District) and therefore administratively is under the Ras Gharib City Council. The Ras Gharib District is further divided into Ras Gharib town as well as 2 rural (village) local units (Zaafarana and Wadi Dara). The closest community settlement to the Project site is Ras Gharib city (located 18km to the east).

Ras Gharib City is the second-largest city in the Red Sea Governorate, and the most important Egyptian city in terms of oil production.

As discussed earlier, the Project is located within a 300km^2 area that has been allocated by the GoE to NREA for development of wind farms. Within this, a land area of 37.5km^2 has been allocated to the Developer by NREA for the development of this Project.

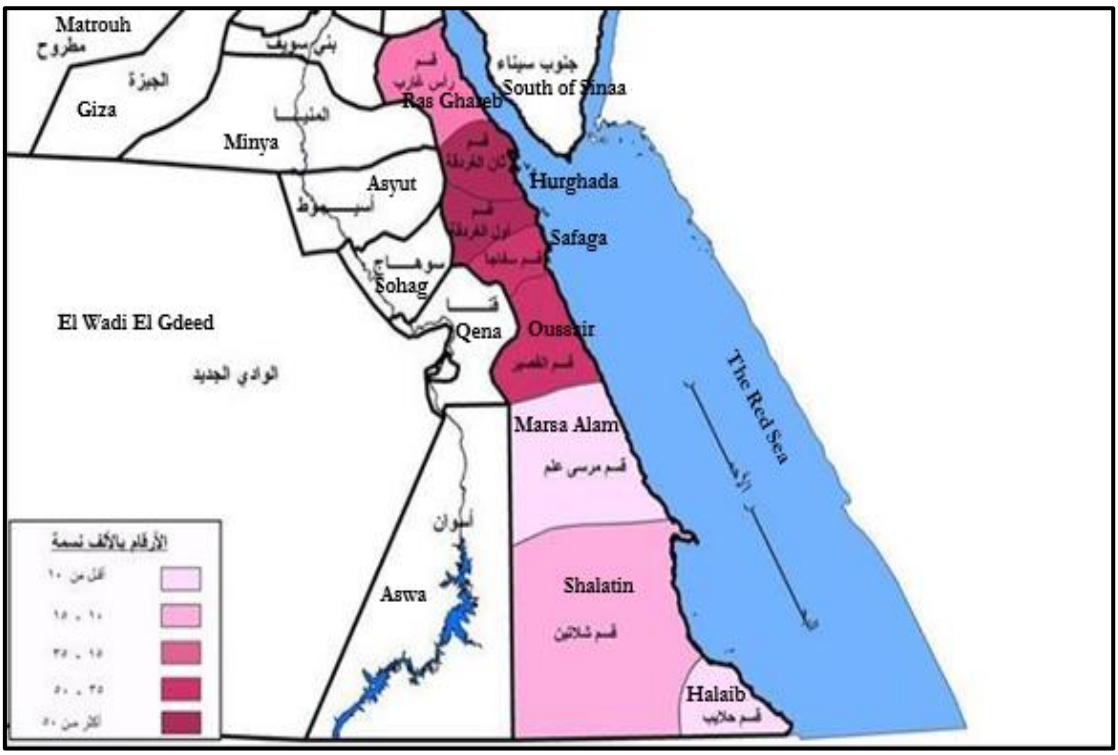


Figure 4: Administrative Borders of the Red Sea Governorate

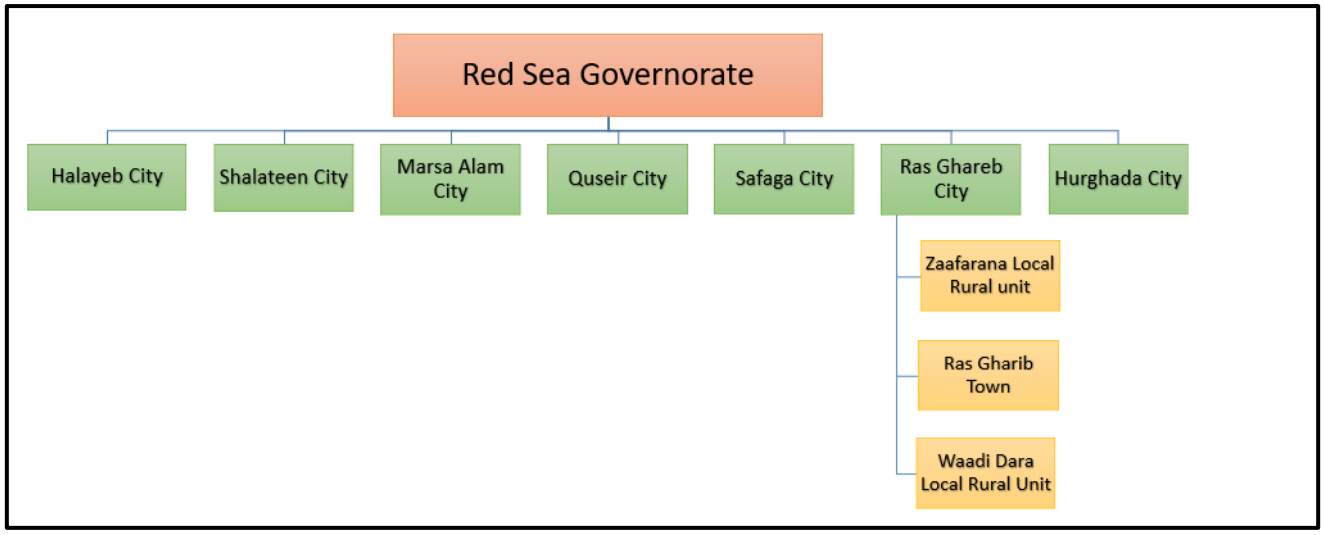


Figure 5: Administrative Division of Red Sea Governorate

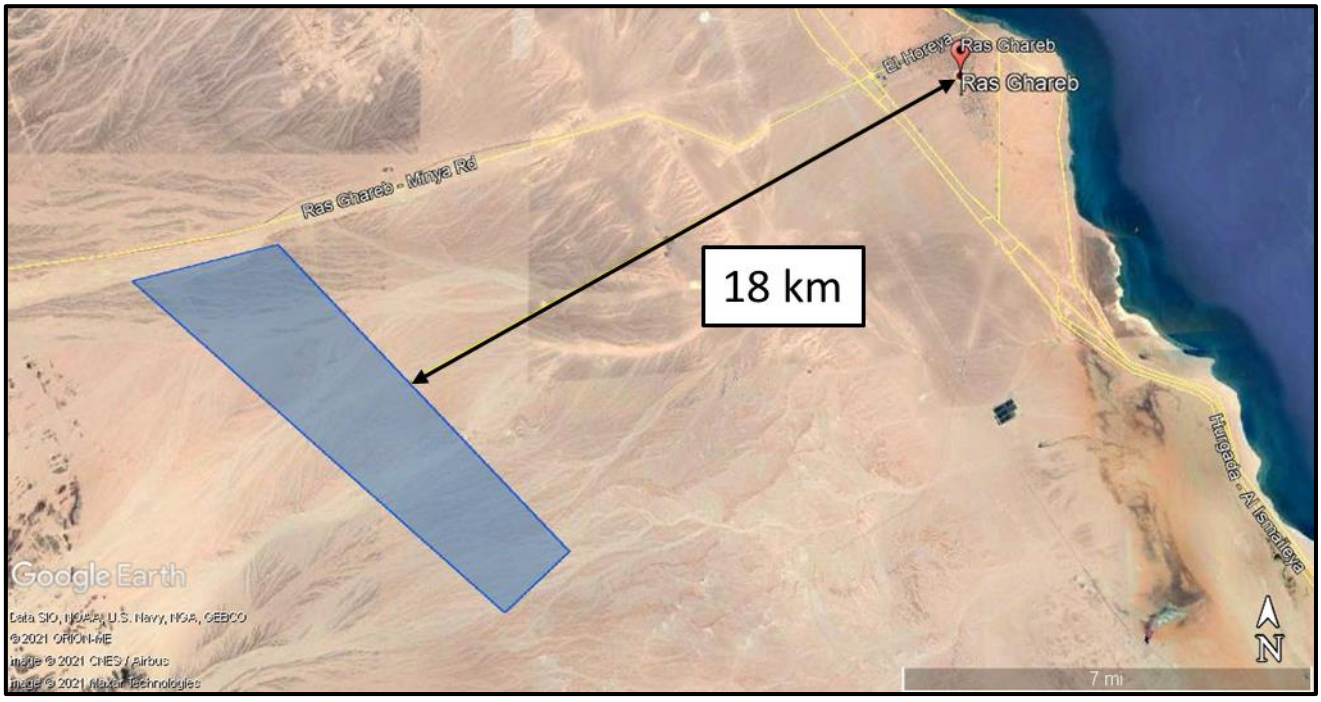


Figure 6: Project Site and Closest Village

Table 2: Project Site Coordinates

Point	WGS Coordinates	
	Latitude	Longitude
1	28°17'53.90"N	32°50'33.20"E
2	28°18'28.91"N	32°52'40.47"E
3	28°14'0.95"N	32°58'11.68"E
4	28°13'1.15"N	32°56'59.95"E

2.2 Outline of Wind Turbine Technology

Wind turbine technology relies on harvesting the kinetic energy in wind (i.e. movement of wind) and turning it into mechanical energy which in turn is used for electricity generation. To capture wind, turbines consist of rotor blades which are elevated from the ground using towers to take advantage of faster and less turbulent wind. As

wind speed increases, the rotor blades begin to rotate which then spins a shaft that is connected to a generator thereby converting wind energy to electricity.

Wind turbines produce electricity at a certain voltage which must be matched to the grid it connects to. Therefore, transformers are used to convert the output from the wind turbines to a higher voltage that matches the grid.

2.3 Project Components

The table below provides a summary of the key Project components, along with a detailed description of each of those components to follow. It is important to note that the final selection of wind turbines will depend on an ongoing feasibility study as well as a technical and economical evaluation being undertaken by the Developer.

Table 3: Summary of Key Project Components

Component	Description
Project Generation Capacity (MW)	200
Technology Type	Wind Energy
Number of Wind Turbines	26 – 28
Rated Power per Turbine (MW)	7.2 – 7.8
Rotor Diameter (m)	182
Hub Height (m)	110
Tip height (m)	201
Project area to be covered	37.5km^2
Infrastructure and Utilities	This includes: (i) internal road network; (ii) underground MV cables; (iii) warehouse and offices; (iii) substation; and (iv) associated facilities such as the high voltage overhead transmission line.

2.3.1 Wind Turbines

Generally, a wind turbine consists of a foundation, tower, nacelle, rotor blades, a rotor hub, gearbox, generator and a transformer (refer to Figure 9 below). The foundation is used to bolt the tower in place. The tower contains the electrical conduits, supports the nacelle, and provides access to the nacelle for maintenance. Typically, three (3) blades are connected to the hub which then connects with the nacelle; the box-like component that sits atop the tower and which most importantly contains the gearbox (which steps up the revolutions per minute to a speed suitable for the electrical generator) and the generator (which converts the kinetic energy into electricity).

Foundations will be constructed to bolt the tower of the turbine in place (one for each turbine); where in general each foundation will consist of a circular footing of around 20m diameter and a depth of around 3m. The foundation will be built with concrete reinforced with structural corrugated steel. In addition, each turbine is equipped with a transformer that converts/steps up the output from the turbine to a higher voltage (from 11kV to 33kV) to meet a specific utility voltage distribution level that is appropriate for connection with a substation (explained in details below).

In addition, next to each turbine will be a crane pad to accommodate cranes for the installation of the wind turbines and for maintenance activities during operation. The crane pads will be suitable to support loads required for the erection, assembly an operation and maintenance of the turbines. Generally, crane pads have an area of around 1,500m^2. There will be no fencing deployed at each turbine.

The Developer is currently undergoing a selection process for the EPC Contractor whom will be supplying the wind turbines and preparing the detailed design of the Project. The final selection of the EPC Contractor and turbine will depend on the feasibility study, techno-economic evaluation, amongst other conditions. In addition, based on the above, the turbine layout will be developed which will take into account technical criteria as well

as any Environmental and Social (E&S) constraints or considerations (based on the outcomes of the ESIA study as per the methodology identified throughout this document).

Currently, there are two (2) options for the EPC Contractor and turbine specifications. A summary is provided in the table below, while the figure that follows presents the layout for both options as well.

Table 4: Turbine Specifications for Goldwind and Envision Turbines

Parameter	Goldwind	Envision
Model	GWH182 7.2MW	EN182 7.8MW
Rated Capacity	7200kW	7800kW
Hub Height	110m	110m
Rotor diameter	182m	182m
Blade Chord Length	4.85m	5.08m
Maximum tip Speed	89m/s	89m/s
Number of WTGS	28	26

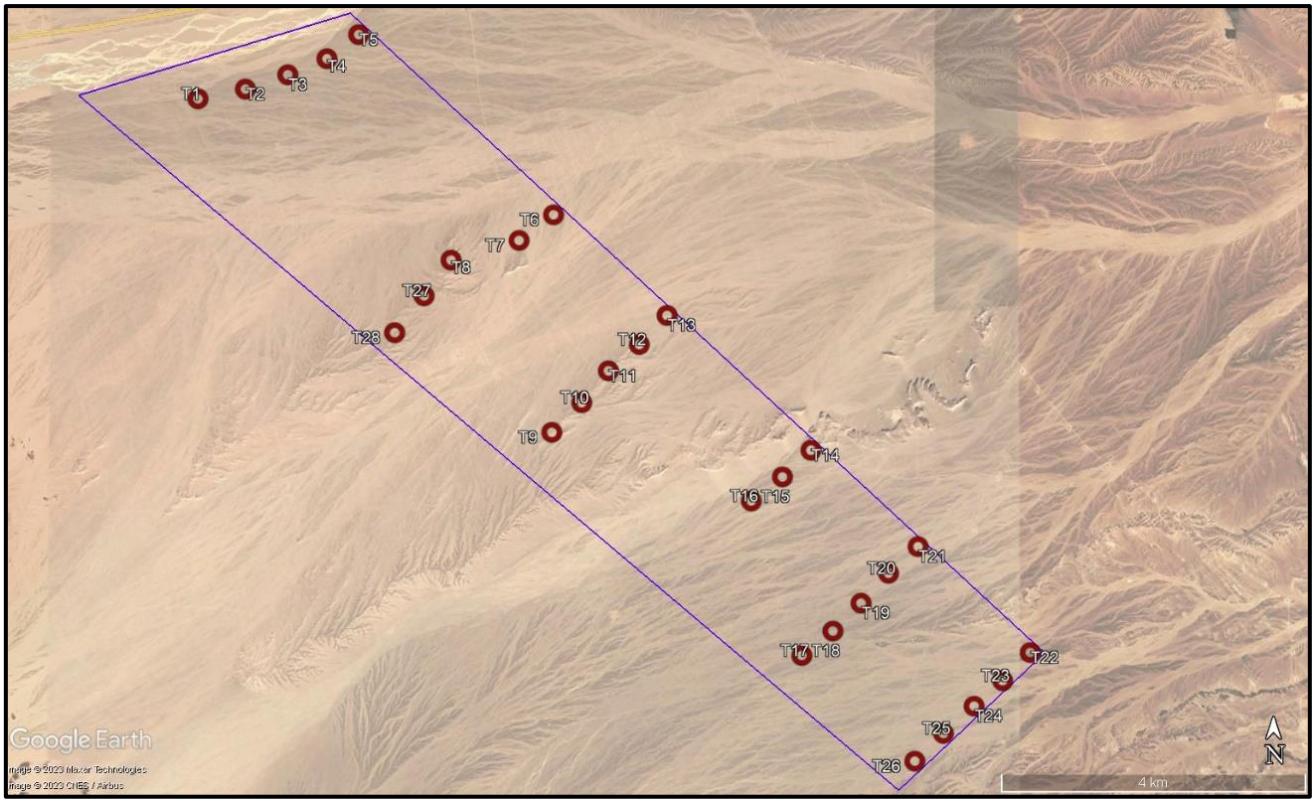


Figure 7: Goldwind Layout

Figure 8: Envision Layout

2.3.2 Infrastructure and Utilities

The following highlights the infrastructure and utilities requirements of the Project.

- Medium Voltage (MV) Cables: The wind turbines will be connected through medium voltage cables (33kV) to an onsite substation (discussed below). The connection between the turbines and the substation will be made using underground transmission cables buried in the ground inside trenches.
- Communications Network: The Project will have a Supervisory Control and Data Acquisition (SCADA) system for the remote operation of the facilities. A communication network will be installed which will consist of fibre optic cables connecting the turbines together to the SCADA system at substation. The communication system will be installed in the same trenches as the MV cables discussed above.
- Substation: The substation includes several high voltage transformer units that collect and convert the output from the turbines to a higher voltage (from 33 kV to 220 kV) that is appropriate for connection with the High Voltage National Grid (220 kV). The substation also includes all the control and protection equipment, like circuit breakers, relays, disconnectors, VTs, CTs, surge arrestors.
- Building Infrastructure: Onsite building infrastructure will be required for the daily operation of the Project. Such buildings could include an administrative building (offices) used for normal daily operational related work, control room, workshop and a warehouse for storage of equipment and machinery such as spare parts, oil cartridges, fuel, lubricants, etc. The figure below presents location of camp and offices;
- Road network: A road network will be required for installation of the turbines during the construction process and for ease of access to the turbines for maintenance purposes during operation. The figure that follows presents the layout for the road network.

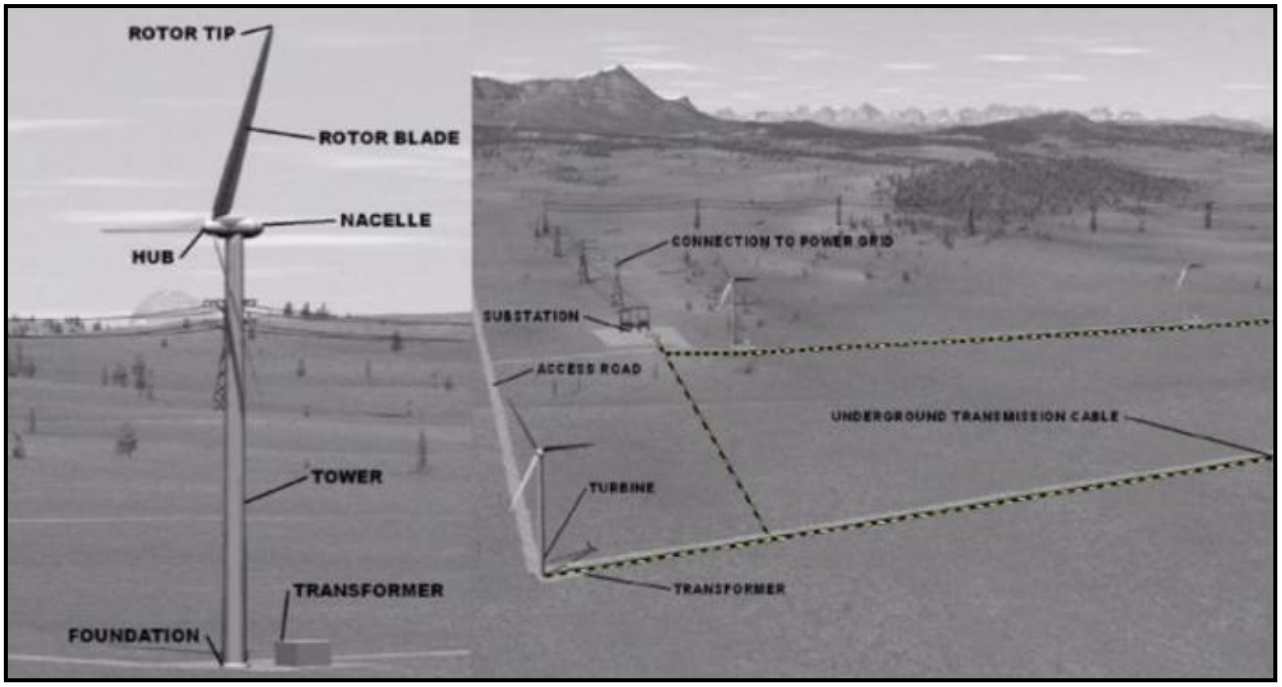


Figure 9: (a) Typical Structural Components of a Wind Turbine, (b) Typical Components of a Wind Farm (Source: EHS Guielines for Wind Energy, IFC)

Figure 10: Typical 33/220kV Substation

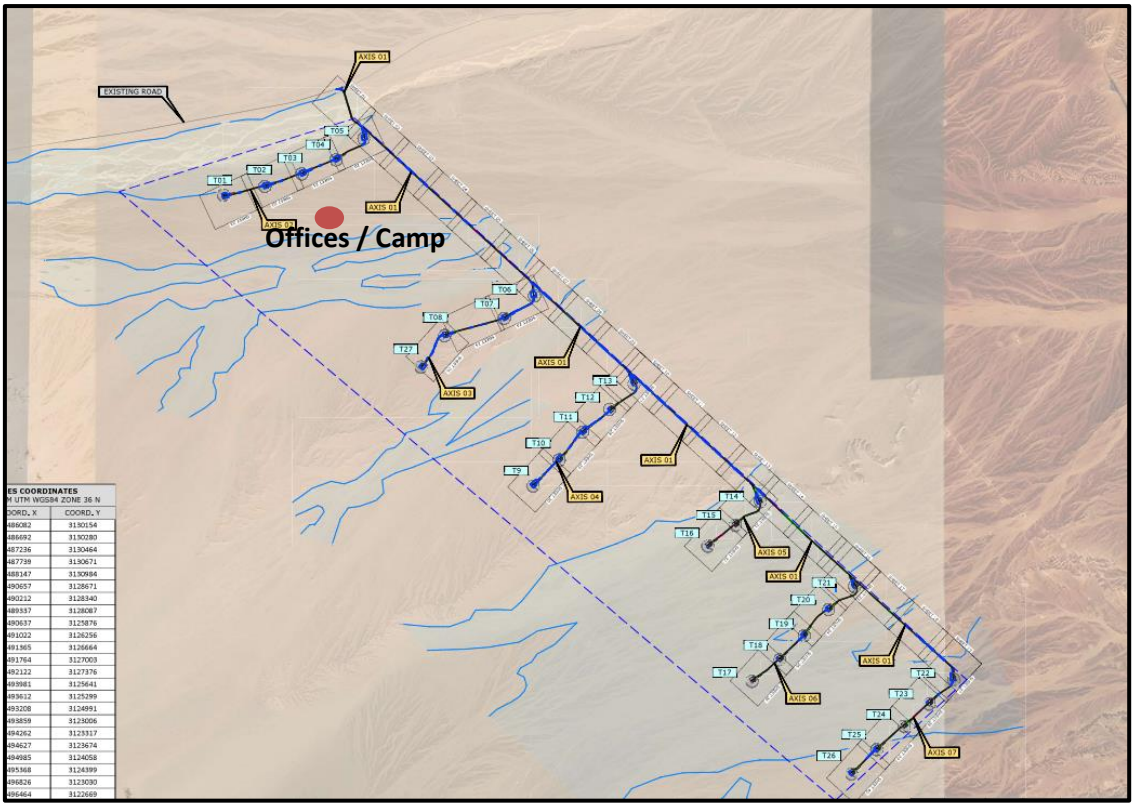


Figure 11: Camp, Offices and Access and Internal Road Network

2.3.3 Associated Facilities

As discussed earlier, the EETC will be responsible for offsite connection works from the onsite substation to the National Grid. EETC will be responsible for preparing the detailed design (including identification of the OHTL route), construction activities as well operation and maintenance activities of the OHTL.

Additional details on the associated facilities are provided under “Chapter 10”. As noted in the figure below, there are to (2) possible options for the OHTL route with a total length between 12.6 – 13.6 km. The figure also presents the location of the substation.

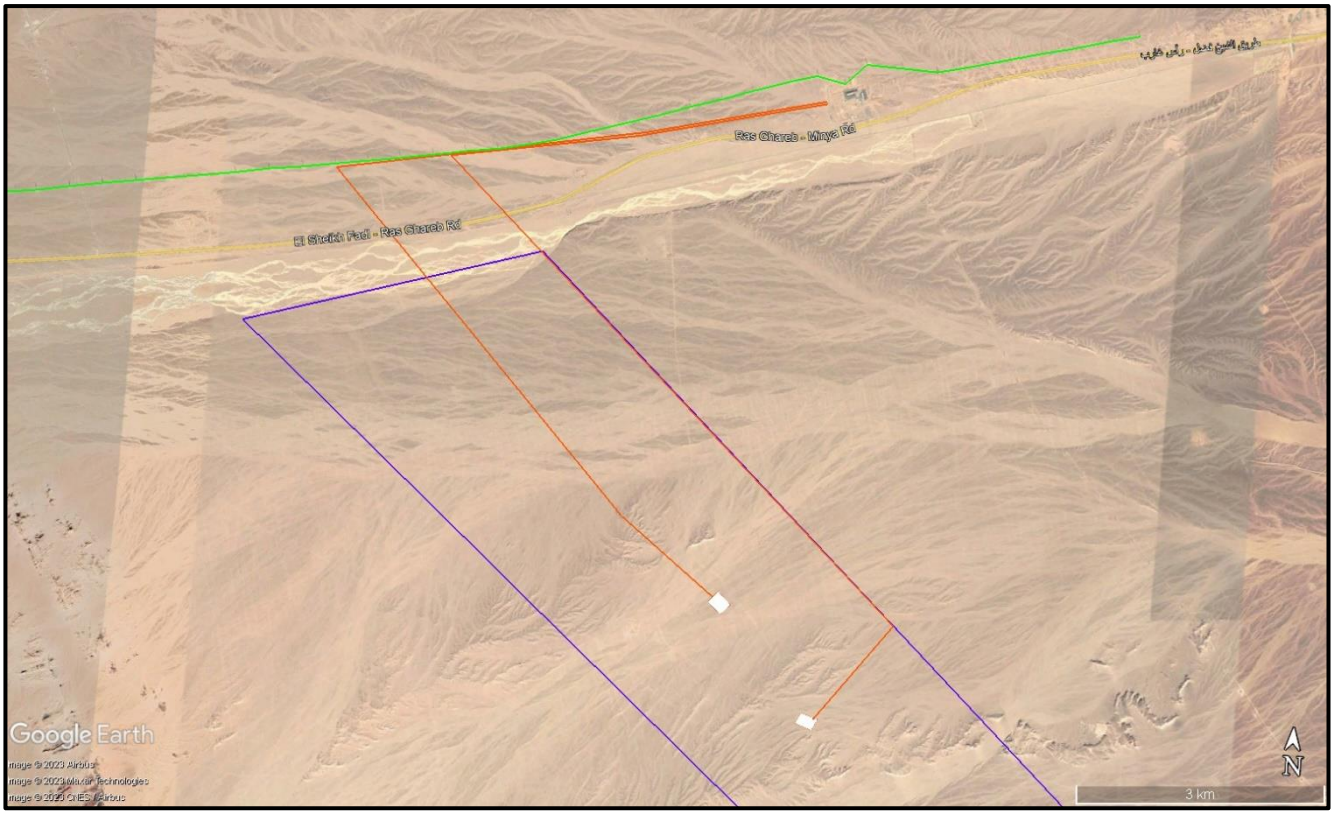


Figure 12: Existing Infrastructure and Utility Elements within the Project Area

2.4 Footprint of the Project Components

This section provides an estimate on the footprint of the Project taking into account the components discussed in the previous section and based on assumptions made by the ESIA team to determine footprint values. The turbine layout of Goldwind was chosen to calculate the footprint as it contains more wind turbines than the others and therefore presents the maximum footprint out of all. As noted in the table below, the total area of disturbance for the Project is significantly small, calculated at less than 1% of the total boundary of the Project area (which is 37.5km^2).

Table 5: Footprint of the Project Components

Component	Footprint	Description
Turbines	0.05km^2	Typically, each crane pad is around 1,500m^2 in area, whereas each foundation typically consists of a circular footing of 20m diameter.
Substation and Warehouse and Storage facilities	0.05km^2	Typically, footprint for substation and building facilities is around 0.05km^2.
Trenches for MV cables and communication cables	0.03km^2	This includes trenches with a calculated length of around 25km and a width of 1m.
Road networks	0.2km^2	This includes the road network with a total length of 25km and a width of 6m.
Total Project Footprint	0.33km^2	
Total Project site Boundary Area	37.5km^2	Project footprint is less than 1% of the total boundary of the Project area.

2.5 Overview of Project Phases

This section presents the likely activities to take place during the Project development and which will include three distinct phases: (i) planning and construction, (ii) operation, (iii) decommissioning and (iv) project schedule each of which is summarized below.

(i) Planning and Construction Phase

The typical activities that will take place during the planning and construction phase for wind farms include the following:

- Preparation of the detailed design and layout of wind turbines within the Project site in addition to the various other infrastructure/utility elements (buildings, roads, substation, etc.);
- Transportation of wind turbine components to the Project site. The components are expected to be transported to the closest marine port and then transported by road to the Project site;
- Site preparation of the turbine foundation. Such activities are limited to relatively small individual footprints of the foundations and will include excavations and land clearing activities for building the foundations;
- Installation of turbine components to include tower assembly, hub, rotor, blades and nacelle lift and rotor assembly which most likely will occur through onsite mobile cranes;
- In addition to the erection of each turbine, there is additional construction work (which could include excavations, land clearing activities, electrical work, etc.) that must be conducted to connect each turbine to the power grid, this could include the installation and laying of transmission and communication cables, installation of substations, and installation of project transmission line; and
- Other construction works (which could include excavations, land clearing activities, etc.) for the potential access road construction or upgrade and for the building infrastructure (warehouse and offices).

(ii) Operation Phase

Wind turbines generally require limited operational activities as this mainly includes the following:

- Commissioning tests of the wind farm which usually involves standard electrical tests for the electrical infrastructure as well as the turbine, and inspection of routine civil engineering quality records. Careful testing at this stage is vital if a good quality wind farm is to be delivered and maintained. Commissioning of an individual turbine can take little more than two days with experienced staff;
- Normal daily operation of the wind farm. The long-term availability of a commercial wind turbine is usually in excess of 97 percent (i.e. 97% of the time, the turbine will be available to work); and
- Maintenance will also take place through a dedicated team. Typical routine maintenance time for a modern wind turbine is 40 hours per year. Non-routine maintenance may be of a similar order. Although minimal, maintenance activities may include turbine and rotor maintenance, lubrication of parts, washing of blades, maintenance of electrical components, full generator overhaul, etc.

(iii) Decommissioning Phase

According to the PPA agreement, the Project is expected to be operational for 20 years. In the case of complete decommissioning of a wind turbine, the tower and blades of the removed wind turbine will be taken down by crane, disassembled into components, and then the turbine will be refurbished at source and used elsewhere for another Project. The base will typically be left in place and covered by gravel and peat or loam. Tracks used for maintenance vehicles will be restored and can be kept as agricultural routes. Gates and fences will be removed.

(iv) Project Schedule

According to the current timeline information available by the Developer, construction of the Project is anticipated to commence around April 2024, and will require approximately 18 months for construction and commissioning (i.e. till January 2026). Operation of the Project is therefore anticipated to commence in 2026 for a period of 20 years based on the PPA signed.

2.6 Workforce

According to information provided by the Developer, the Project will require the following workforce throughout the construction and operation phase:

- Around 250 job opportunities at peak during the construction phase for a duration of approximately 18 months. This will mainly include around skilled job opportunities (to include engineers, technicians, consultants, surveyors, etc.) and unskilled job opportunities (mainly labourers but will also include a number of security personnel).
- Around 24 job opportunities during the operation phase for a duration of 20 years. This will include skilled job opportunities (such as engineers, technicians, administrative employees, etc.) and unskilled job opportunities (such as security personnel, drivers, etc.).

Taking the above into account, the Developer is aiming to hire local community members to the greatest extent possible throughout the construction and operation phase for skilled and unskilled jobs. The Developer is committed to adhering to transparent recruitment procedures which includes local community members as discussed in further details in "Section 8.14".

3 ESIA APPROACH AND METHODOLOGY

This chapter of describes the approach and methodology that was adopted for the ESIA study including the following:

- Approach for the analysis of alternatives;
- Approach to stakeholder engagement;
- Approach to determining the spatial and temporal study area;
- Methodology for assessment of the baseline environmental and social conditions;
- Methodology used to assess the potential environmental and social impacts of the Project - including the approach to determining significance, development of mitigation measures and the assessment of residual effects;
- Approach used for the assessment of cumulative effects; and
- Approach for development of an Framework ESMP.

3.1 Analysis of Alternatives

The Egyptian Regulations to include the "Guidelines of Principles and Procedures for Environmental Impact Assessment" (EEAA, 2009) requires that the ESIA identify and analyse alternatives and present the main reason for the preferred choice. The examination of alternatives is also considered to be a key element of the ESIA process under good international practice, to include but not limited to the: (i) IFC Performance Standard 1 (IFC, 2012) and the associated "IFC Guidance Note 1" (IFC, 2012); and (ii) EBRD Performance Requirement 1.

The analysis of alternatives is presented in "Chapter 6". The chapter discusses and compared several alternatives to the Project development in relation to: (i) the Project site, (ii) the chosen technology, (iii) the Project design, and finally investigated the 'no action alternative' - which assumes that the Project development does not take place.

3.2 Stakeholder Engagement

Stakeholder consultation and engagement is an essential part of the ESIA process, and has been carried out in accordance with the regulatory requirements in Egypt and the requirements of IFC and EBRD. The previous and future stakeholder consultation and engagement for the Project are summarized below and discussed in detail in "Chapter 4".

The Project to date has included extensive stakeholder consultation and engagement with various stakeholder groups such as national governmental entities, local governmental entities, non-governmental organizations, and other as appropriate. This has been undertaken through bi-lateral meetings, e-mail communication, phone communication, formal letters, and other.

"Chapter 4" also discusses future stakeholder engagement and consultations which are to take place at a later stage. This mainly includes: (i) a public disclosure session with stakeholders to present the findings and recommendations proposed within the ESIA; and (ii) implementation of the Stakeholder Engagement Plan (SEP) by the Developer which describes the planned stakeholder consultation activities and engagement process' to take place after the ESIA approval.

3.3 Delineation of Study Boundaries and Scope of Assessment

3.3.1 Definition of Area of Influence (AOI)

The overall Area of Influence (AOI) for the ESIA represents the potential area of influence of the Project. This is 'the area over which significant effects of the Project could reasonably occur, either on their own, or in combination with those of other developments and projects'.

In general terms, the AOI for the Project ESIA includes the footprint of Project disturbance as demarcated in the figure below. This includes the Wind Farm Project Site with a total area of 37.5 km^2.

However, for certain environmental and social parameters (such as landscape and visual, noise and shadow flicker, infrastructure and utilities, socio-economics, etc.), the AOI goes beyond the actual footprint of the Project site, and therefore an appropriate thematic study area is determined for each theme on a case-by-case basis. Such a thematic AOI is clearly identified within the relevant chapter it relates to throughout this ESIA.

In identifying this thematic AOI, the type and degree of the potential direct and indirect effects were taken into consideration. The core area where direct effects are likely to occur was determined, as well as the wider area of influence where indirect, combined and cumulative effects are likely to occur on the surrounding areas and communities.

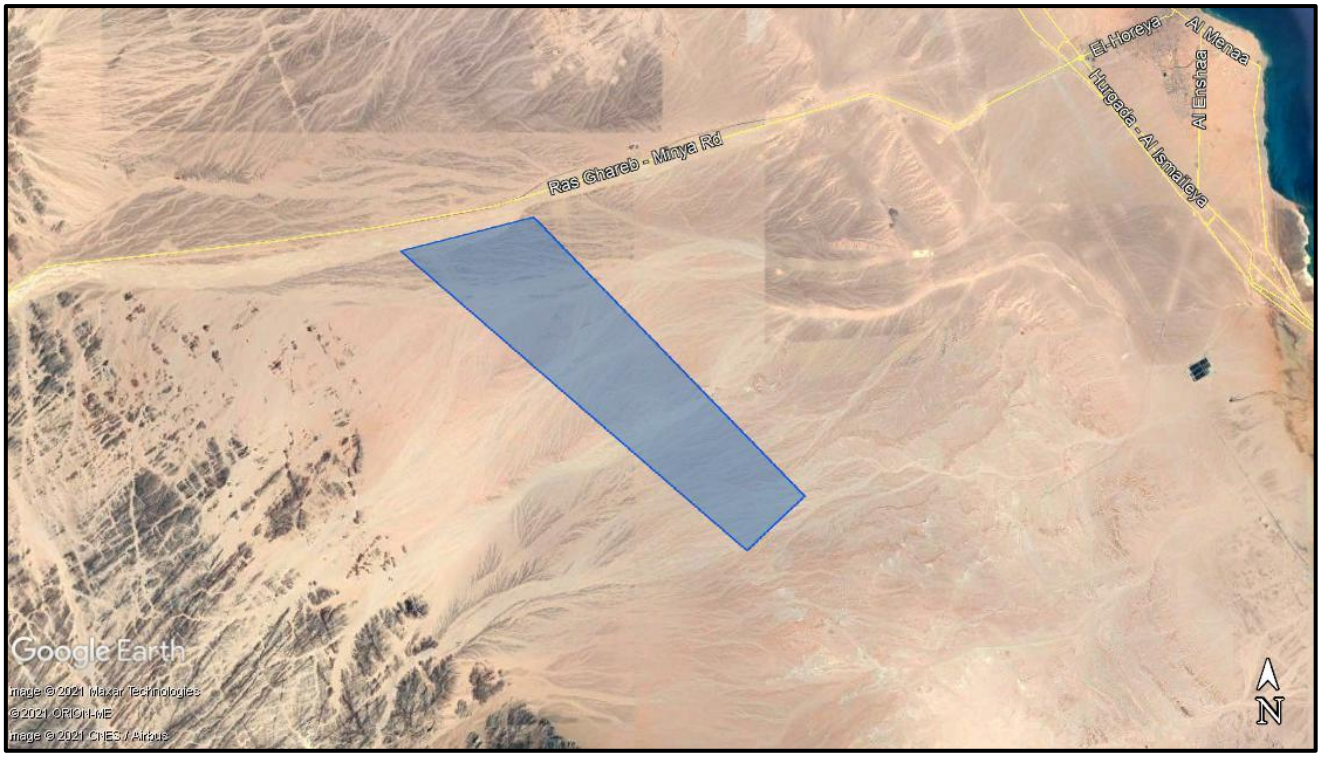


Figure 13: Study Area

3.3.2 Temporal Scope of the Assessment

The Project will be developed in a three-phase sequence as follows. The potential impacts are assessed throughout the various Project phases.

- Planning and Construction Phase;
- Operation Phase; and
- Decommissioning Phase.

(i) Planning and Construction Phase

This includes onsite construction activities which will be undertaken by the EPC Contractors under the guidance of the Developer. This mainly includes preparing the detailed design and layout of the turbines, transportation of Project components onsite, construction of the substation, as well as onsite site preparation and construction activities for installation of wind turbines.

(ii) Operation Phase

This includes activities to be undertaken by the Project Operator. Activities expected to take place mainly include the normal daily operation of the Project and the routine maintenance activities.

(iii) Decommissioning Phase

Generally, the anticipated impacts throughout the decommissioning phase are similar in nature to impacts assessed during the construction phase – and specifically in impacts related to soil and groundwater (from improper management of waste streams), air quality and noise, and occupational health and safety. Therefore, the assessment of impacts for those receptors and mitigation identified during the construction phase is assumed to apply to this phase in particular without the need to reiterate or emphasize this throughout subsequent chapters.

3.4 Environmental and Social Baseline Conditions

As part of the ESIA process, the baseline environmental and social conditions of the study area were established. Describing the baseline includes identifying and defining the importance and sensitivity of the various environmental and social resources and receptors likely to be impacted, i.e. within the AOI. Understanding the value or sensitivity of the resources and receptors to impacts and changes is an important consideration when determining the significance of effects, and allows for better identification of the most appropriate measures that could be employed to avoid impacts, and to mitigate any adverse impacts.

The description of environmental and social baseline conditions has considered a wide range of data and information gathered from various sources, including:

- Desk-based studies and literature reviews;
- Data from statutory and non-statutory stakeholders; and
- Field surveys and site investigations.
- These studies have covered all the environmental and social aspects related to the Project. The baseline conditions are treated as those conditions which would prevail in the absence of the Project.

Studies of the environment and social baseline are described in "Chapter 7" to include the following: landscape and visual; land use; geology/hydrology/hydrogeology; biodiversity; birds (avifauna); bats; archaeology and cultural heritage; air quality and noise; infrastructure and utilities; and socio-economic conditions. Within each chapter, the methodology which was undertaken for assessment of the each of those baseline conditions is described in detail. The baseline assessments were undertaken throughout 2021 and 2023. This also included accounting for seasonal factors for biodiversity, avifauna, and bats – refer to each Chapter for additional details on timing of surveys undertaken.

3.5 Impact Assessment Methodology

Given the scale and type of the Project, the ESIA commences with an assessment of the positive environmental and economic impacts on the strategic and national level given the current challenges the energy sector in Egypt faces – as highlighted in "Section 8.1 ".

It then moves forward into the main body of the ESIA undertaking the assessment of impacts on environmental and social parameters for each receptor under the relevant chapter, from "Section 8.2" to "Section 8.14". The following section provides a description of the approach, methodology and process adopted for the impact assessment presented within this ESIA.

3.5.1 Approach to Assessment of Impacts

The adverse and beneficial environmental and social impacts of the Project have been identified and assessed against the established baseline. A consistent approach to the assessment of impacts was followed to enable environmental and social impacts to be broadly compared across the ESIA. A set of generic criteria were used to determine significance (see below) which were applied across the various environmental social and environmental parameters.

As far as possible, environmental and social impacts were quantified. Where it was not possible to quantify impacts, a qualitative assessment was conducted using professional experience, judgment and available knowledge, and including the consideration of stakeholder views. Where there were limitations to the data, and/or uncertainties, these have been recorded in the relevant chapters, along with any assumptions that were taken during the assessment.

In order to determine the significance of each impact, two overall factors are considered:

- The importance and/or sensitivity of the environmental and social receiving parameter, as determined during the assessment of baseline conditions; and
- Magnitude and Nature of the impact.

3.5.2 Sensitivity of the Receiving Parameter:

Receiving parameter sensitivity was determined using information taken from the baseline description on the importance, significance or value of the social or environmental component under examination. It is important to understand the sensitivity of the receiving parameter, as this is a measure of the adaptability and resilience of an E&S parameter to an identified impact. The following categories of sensitivity were applied to the assessment:

- High: The E&S parameter/receptor is fragile and an impact is likely to leave it in an altered state from which recovery would be difficult or impossible.
- Medium: The parameter/receptor has a degree of adaptability and resilience and is likely to cope with the changes caused by an impact, although there may be some residual modification as a result; and
- Low: The parameter/receptor is adaptable and is resilient to change.

3.5.3 Magnitude and Nature of the Impact:

The magnitude of the impact is the scale of change which the impact may cause compared to the baseline and how this change relates to accepted thresholds and standards. The following categories were applied to the assessment:

- High: a large change compared to variations in the baseline. Potentially a clear breach of accepted limits;
- Medium: change which may be noticeable and may breach accepted limits; and
- Low: when compared with the baseline, change which may only just be noticeable. Existing thresholds would not be exceeded.

Furthermore, in determining the magnitude of the impact it is important to take into account and consider several other factors which define the nature of the impact. This includes the following:

Type of Impact

- Positive: applies to impacts that have a beneficial E&S result, such as enhancement of conditions; and
- Negative: applies to impacts that have a harmful aspect associated with them such as loss or degradation of environmental resources.

Type of Effect

- Direct: applies to impacts which can be clearly and directly attributed to a particular E&S parameter (e.g.

generation of dust directly impacts air quality); and

- Indirect: applies to impacts which may be associated with or are subsequent to a particular impact on a certain E&S parameter (e.g. high levels of dust could affect occupational health and safety).

Duration (how long the stressor or its effect last)

- Short Term: applies to impacts whose effects on the environment will disappear within a 1-year period, or once construction activities are completed;
- Medium Term: applies to impacts whose effects on the environment will disappear within a 5-year period; and
- Long Term: applies to impacts whose effects on the environment will disappear in a period greater than 5 years.

Reversibility

- Reversible: applies to impacts whose significance will be reduced and disappeared over time (either naturally or artificially), once the impacting activity ceases; and
- Irreversible: applies to impacts whose significance will not be reduced nor disappeared over time (either naturally or artificially), once the impacting activity ceases.

3.5.4 Assessing the Significance of the Impacts

The concept of 'significance' is central to the ESIA process and aids the identification and categorization of E&S effects. As noted, in order to determine impact significance, the sensitivity of each E&S parameter/receptor is considered in combination with the magnitude of the impact. The table below demonstrates how these parameters are considered in the assessment of significance.

Table 6: Determination of Significance

Magnitude of Impact / Sensitivity of Receiving Parameter/Receptor	Low	Medium	High
Low	Not significant	Minor	Minor
Medium	Minor	Minor	Moderate
High	Minor	Moderate	Major

While the above matrix provides a framework for the determination of significance, and enables comparison across E&S parameters, a degree of professional judgement must be used and some parameter-specific factors to be considered in making the determination of significance. Below provides additional guidance to the degrees of significance used in this ESIA. Note that positive impacts are defined, but are not rated for significance.

- *Major significance*: requires thorough investigation in the ESIA. These impacts have been studied extensively by consulting expertise in the areas of the identified impacts to design needed mitigation and environmental management measures. Moreover, conducting specific studies and assessments to some of the key issues identified;
- *Moderate significance*: requires reasonable investigation in the ESIA. These impacts have been studied by expertise in the areas of the identified impacts to design needed mitigation and environmental management measures.
- *Minor significance*: must be listed, and addressed in some way, but which did not require detailed assessment in the ESIA.

- *Not significant*: for completeness, impacts which have been included in the assessment but determined not to be significant, are rated formally as 'not significant'.

3.5.5 Management Measures

Based on the impact assessment undertaken a set of management measures are identified for each impact which aims to address it. Management measures include the following:

- *Additional Requirements*: those are generally regulatory requirements which have been identified and which must be taken into account at a later stage.
- *Additional Studies*: for certain E&S receptors additional studies must be undertaken at a later stage. Such studies and their scope, timing, etc. have been highlighted were relevant.
- *Mitigation Measures*: a vital step in the ESIA process is the identification of measures that can be taken to ensure that impacts are mitigated or reduced to acceptable levels. The ESIA will firstly consider the significance of any impacts caused by the Project and then assigned mitigation options through applying the following hierarchy:

- Avoiding or 'designing out' impacts wherever possible;
- Considering alternatives or modifications to the design to reduce the impacts wherever possible;
- Applying measures to minimize and manage impacts on the receptor; then
- As a last resort, identifying fair compensation, remediation and offsetting measures to address any potentially significant residual effects.

Some negative impacts can be easily mitigated, whilst others cannot or are too difficult and costly to mitigate. The various potential impacts are described in this ESIA, along with the provision of 'feasible mitigation measures' that can be implemented.

- *Recommendations*: for positive impacts it is not possible to identify mitigation measures, but rather recommendations have been identified which aim to enhance the positive impact.

3.5.6 Assessment of Residual Significance

If there are mitigation measures it is then necessary to make an assessment of the 'residual significance' after mitigation has been taken account. A re-assessment of Project impacts is then made, taking into account the effect of the proposed mitigation measures in order to determine the significance of the residual effects. Residual effects are discussed for each E&S theme in the ESIA chapters, and their significance determined and summarized in an Impact Assessment Table in "Section 8.15".

3.6 Assessment of Cumulative Impacts

For each of the impacts assessed, the ESIA investigates the cumulative impacts which could result from incremental impacts from other known existing and/or planned developments in the area, and based on currently available information on such existing/planned developments. Assessment of cumulative impacts is presented in "Section 8.16".

In addition, a Cumulative Effects Analysis (CEA) was undertaken and which is presented as a standalone document.

3.7 Development of Environmental and Social Management Plan (ESMP)

Based on the results of the impact assessment, development of management measures, and development of monitoring plan, a framework ESMP was compiled into a single table that details all of the above. The framework ESMP will be a key document and will list the environmental/social requirements and detail the procedures necessary for managing the significant environmental/social issues connected to proposed Project activities. The framework ESMP will be developed specifically to provide flexibility in the nature and exact location of operations, while ensuring all potential impacts are identified and properly mitigated and monitored throughout the later stages of the Project. This framework ESMP can be used as a stand-alone document during the different phases of the Project by Developer, EPC Contractors, EEAA, and other responsible parties.

The framework ESMP which aims to provide high level mitigations and requirements for managing the environmental and social risks anticipated from the Project.Throughout the Project's construction and operation phase an Environmental, Health, Safety and Social Management System (EHSS-MS) must be implemented by all relevant parties (i.e. Developer, EPC Contractor and Project Operator). The EHSS-MS must be project and site specific and must build on and take into account the requirements of the framework ESMP presented throughout this document. The development and implementation of an EHSS-MS is considered a key requirement under IFC PS1, in addition the EHSS-MS must also be in line with the IFC PSs.

The ESIA also identifies the overall framework, structure and key requirements for the EHSS-MS for the key entities involved in the Project.

3.8 Assessment of Associated Facilities

The key component related to the associated facilities would be the Overhead Transmission Line (OHTL) which will run from the Project site (from substation area) to the connection point with the National Grid. As discussed earlier, the design, construction and operation of the OHTL will be responsibility of EETC.

Additional details on the associated facilities are provided under "Chapter 10", including an E&S assessment for the OHTL.

It is important to note that while the Developer could exert some leverage on the associated facilities, they will be not under the direct control of the Developer.

4 STAKEHOLDER CONSULTATION AND ENGAGEMENT

This Chapter discusses in details the stakeholder consultation and engagement plans which were undertaken as part of the ESIA process for the Project and provides an overview of the findings. In addition, this Chapter also discusses the future stakeholder consultation and engagement plans which are to take place at a later stage of the ESIA process as well the Project development.

4.1 Introduction

Stakeholder engagement is an integral part of ESIA good practice and is a statutory requirement of the national EIA legal framework in Egypt and within under good international practice, to include IFC and EBRD requirements. The Developer is committed to a technically and culturally-appropriate approach to consultation and engagement with all stakeholders affected either directly or indirectly by the Project. The consultation program for the Project is based on informed consultation and participation in line with good international practice requirements with affected people, and is designed to be both fair and inclusive. Consultation activities have been an ongoing process since the commencement of the ESIA study in March 2021.

Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively.

Stakeholders may include: (i) locally affected communities or individuals and their formal and informal representatives, (ii) national or local government authorities, politicians, religious leaders, civil society organisations and groups with special interests, (iii) the academic community, or other businesses.

Stakeholder consultation is an inclusive process for sharing information that enables stakeholders to understand the risks, impacts, and opportunities of a development or project, allowing them to express their views and articulate their perceptions towards it.

4.2 Objectives

The objective of stakeholder consultation is to ensure that a participatory approach takes place, which in turn documents concerns of all stakeholder groups and makes sure that such concerns are considered, responded to, and incorporated into the decision-making process of the development. Stakeholder consultation needs to be a two-way communication process that imparts information to stakeholders, but also obtains additional and on-the-ground information from them. Stakeholder consultation and engagement must take place at the inception phase of the ESIA process and implemented all through the study period.

The specific objectives of this chapter are to:

- Summarize national and international legal & policy requirements for stakeholder engagement;
- Describe and identify the stakeholders affected and/or with an interest in the Project;
- Summarize stakeholder engagement and consultation conducted to date. In addition, describe how the views and issues raised have informed and influenced the development of the Project; and
- Outline the future plans and approach to stakeholder engagement.

4.3 Requirements for Stakeholder Engagement

Egyptian Legislation Requirements

Stakeholder consultation and engagement under the Egyptian requirements, is primarily linked to the Environmental and Social Impact Assessment (ESIA) study as stipulated in the "Law of Environment No. 4 of 1994 and its amendments in Law No. 9 of 2009". According to the last updated executive regulation and the ministerial decree No. 26 of 2016, the ESIA system classifies the projects into four categories based on different levels of ESIA requirements according to severity of possible impacts and location of the establishment and its proximity to residential settlements.

In specific, wind farm development projects in general are categorized as "Category C'' (projects which require a comprehensive ESIA study) and which require consultations under two (2) phases as part of the ESIA study: (i) environmental and social scoping phase which requires targeted consultations; and (ii) disclosure phase which requires a public disclosure session for ESIA outcomes.

The scoping should include targeted stakeholder consultations with key stakeholders as relevant to the Project, while the public disclosure consultation must include the following entities:

- Representatives of the Egyptian Environmental Affairs Agency (EEAA)
- Related governmental authorities
- Representatives of the Governorate and local units where the project is located
- Affected groups including local businesses and communities
- Non-governmental Organization (NGOs) and civil society groups

The EEAA guidelines methodology identifies the following articles covering the guidelines on conducting the public consultation as part of the ESIA study are as follows:

- Paragraph 6.4.3.1 Scope of Public Consultation
- Paragraph 6.4.3.2 Methodology of Public Consultation
- Paragraph 6.4.3.3 Documentation of the Consultation Results
- Paragraph 7 Requirement and Scope of the Public Disclosure

Financing Requirements

Stakeholder engagement activities undertaken as part of the ESIA meets international best practice requirements to include the relevant environmental and social requirements of IFIs as follows:

- European Bank for Reconstruction and Development (EBRD) Performance Requirements (PR) to include:

- PR 1: Assessment and Management of Environmental and Social Risks and Impacts; PR 2: Labour and Working Conditions; PR 4: Health, Safety and Security; and PR 10: Information Disclosure and Stakeholder Engagement

- International Finance Corporation (IFC):

- Performance Standards (PS) (2012) to include PS 1: Assessment and Management of Environmental and Social Risks and Impacts; PS 2: Labour and Working Conditions; and PS 4: Community Health, Safety and Security

- EHS Guidelines to include: General EHS Guidelines (2007); EHS Guidelines for Wind Energy (2015); and EHS Guidelines for Electric Power Transmission and Distribution (2007)

The EBRD "PR 10: Information Disclosure and Stakeholder Engagement" addresses stakeholder engagement and sets our the following requirements:

- Ensure that stakeholders are appropriately engaged on E&S issues that could potentially affect them through a process of information disclosure and meaningful consultation.
- Maintain a constructive relationship with stakeholders on an ongoing basis through meaningful engagement during project implementation
- Stakeholder Engagement is an on-going process that may involve: stakeholder identification and analysis, information disclosure, meaningful consultation, and external and ongoing reporting to Affected Communities.
- A Stakeholder Engagement Plan (SEP) must be developed and implemented that is scaled to the project risks and impacts and development stage, and be tailored to the characteristics and interests of the Affected Communities.
- Affected Communities will be provided 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.
- When Affected Communities are subject to identified risks and adverse impacts from a project, a process of consultation will be undertaken in a manner 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.
- The extent and degree of engagement should be commensurate with the project's risks and adverse impacts and concerns raised by Affected Communities.
- The consultation process will be tailored to language preferences of Affected Communities, their decision-making process, and the needs of disadvantaged or vulnerable groups.
- For projects with potentially significant adverse impacts, the client will conduct an informed consultation and participation.
- A grievance mechanism will be established to receive and facilitate resolution of Affected Communities' concerns and grievances about the client's environmental and social performance.

In addition, the IFC Performance Standard (PS) 1 "Assessment and Management of Environmental and Social Risks and Impacts" identifies similar requirements to those of EBRD identified above.

4.4 Stakeholder Identification and Analysis

The purpose of stakeholder identification is to identify and prioritise Project stakeholders for consultation. Stakeholder identification is an ongoing process, and thus key stakeholders will be identified during different stages of the Project. A systematic approach is used to map the stakeholders based on the Project zone of impacts. In this approach, by mapping the zone of social impacts, stakeholders are identified by the impact area.

As a result of the stakeholder mapping, Project stakeholders are categorised into the following main categories:

1. People and groups who will be directly or indirectly affected by the project (such as local communities);

2. People and groups who may participate in the implementation of the project (such as investors and lenders);

3. People and groups who are not affected by the project development per se may but have a possibility to influence and make decisions on implementation of the Project (such as Ministries or regulatory agencies).

The main groups of stakeholders identified so far are listed in the table below. The list can be updated and modified in the course of the Project development and as a result of cooperation of the parties.

Vulnerable Groups

The stakeholder list also includes vulnerable groups and is defined as groups that are expected to be disproportionally affected by project impacts due to their race, color, sex, language, religion, political opinion, national or social origin, gender, ethnicity, culture, physical or mental disability, and other. Vulnerable groups are context-specific and depend on a range of issues which must be understood such as project location, socio-economic, historical, and demographic context, as well as the nature of the development and type of impacts anticipated.

The vulnerable groups within this context were identified to include:

- Women groups of the local community. Cultural norms in Egypt and within the local communities, in specific, could limit their participation in decision-making in general as well as their employment opportunities as opposed to their male counterparts. Even though such cultural norms are considered applicable within local communities, however Bedouin women in particular are considered much more vulnerable than mainstream women in Upper Egypt.
- Disabled Groups: are considered vulnerable groups mainly due to physical disability which could limit their access to information on the Project and could limit their participation in decision-making in general as well as their employment opportunities as opposed to able-bodied groups.
- Elderly Groups: are considered vulnerable groups mainly due to age limitations which could limit their access to information on the Project and could limit their participation in decision-making in general.

Given the nature and location of the Project there are no additional groups considered as vulnerable that would require special consideration throughout the consultation process.

Table 7: Stakeholder Identification

Level of Stakeholder interest in/involvement to the Project
1. Stakeholders who may be directly or indirectly affected by the Project
Residents of the nearby villages of the Project to include Ras Gharib Town which are administratively under Red Sea Governorate and Ras Ghareb City (or District). For the above, this includes the following groups within the local communities in specific: ▪ Community Members: local community members have a vested interest in the project due to mainly potential for job opportunities. In addition, local community members could be impacted by other potential negative impacts (e.g. worker influx, noise & shadow flicker, etc.). Such impacts are discussed and identified within the ESIA. ▪ Community Leaders: They are socially active members and known figureheads for local community members, who may or may not hold government positions. Community leaders involved in the project are the heads of affected communities ▪ Business Community (local subcontractors): such groups have a vested interest in the project due to mainly potential for procurement opportunities such as subcontracting works (e.g. civil works, provision of food and amenities, etc.)
Women groups within local communities, such groups have a vested interest in the project due to mainly potential for job opportunities. In addition, such groups could be impacted by other potential negative impacts (e.g. worker

influx, Gender Based Violence and Harassment (GBVH), etc.) Such impacts are discussed and identified within the ESIA
Bedouin Groups: the key Bedouin group known in the area are the Tabbna and Hamadin and Khoshman. Tabbna and Hamadin settle permanently in key cities such as Ras Ghareb, Zaafarana. The Khoshman are nomadic groups that settle within the mountain ranges located west of the area in general. All these Bedouin groups apply a type of customary ownership within the Project area lands which is known as 'Urfi Contracts' and 'Ghafra System'. Such tribes would be helpful in providing security and protection and could also have a vested interest in employment and procurement opportunities (such as security guards, provision of raw materials, provision of food supplies and water to the workers, etc.).
2. Stakeholders who may Participate in Implementation of the Project
Investor/Lender: entities that will provide financing for the Project development. In particular, they have interest in ensuring that the Project is developed and implemented in accordance with their E&S requirements and standards, and will monitor the compliance of the Project against such requirements.
Workers: This includes all Project workforce to include but not limited to workers from Developer team, workers from EPC Contractor, Project Operator and any involved subcontractor(s).
3. Stakeholders who may have a possibility to influence and make decisions on implementation of the project and/or may have an interest in the Project
Central Government
The Egyptian Environmental Affairs Agency (EEAA): state body regulating environmental management. For this Project, this will include review and approval of ESIA, issuance of environmental permit, monitoring implementation of Environmental and Social Management Plan (ESMP) and compliance with other conditions, as applicable.
Egyptian Electricity Transmission Company (EETC): off-taker and entity that signed the Power Purchase Agreement (PPA) with Developer. They will also be responsible for designing, building, and operating the associated interconnection facilities (i.e. Overhead Transmission Line).
New & Renewable Energy Authority (NREA): national focal point for expanding efforts to develop renewable energy technologies to Egypt in coordination with other concerned national institutions. In addition, NREA also the entity responsible for allocation of the land for the development of the Project.
Ministry of Labor: official governmental entity responsible for setting labor policies and legislations as well as ensuring protection of labor rights and working conditions. Has a vested interest in ensuring that labor rights and proper working condition are maintained for the Project in accordance with Egyptian laws and regulations.
Ministry of Civil Aviation: Official governmental entity responsible for civil aviation management in Egypt and responsible for issuing permits for projects with specific height requirements.
Armed Forces Operations Authority: Official governmental entity responsible for military aviation management in Egypt and responsible for issuing permits for projects with specific height requirements.
Ministry of Tourism and Archeology The ministry is the entity responsible for the preservation and protection of the heritage and ancient history of Egypt, under which operates all inspector offices in the governorates.
Ministry of Interior: The Ministry is responsible for national and local security, as well as approving emergency response and firefighting plans for establishments/projects.
General Petroleum Company: a national State-owned company engaged in exploration, production, and development of hydrocarbons, is responsible for the management of oil and gas exploration and production activities on behalf of the State. It is one of the subsidiary companies affiliated to the Ministry of Petroleum. It has the right of concession for petroleum exploration in some parts of the Project area and adjacent areas and represents the main investment activity in the Project area.
National Telecom Regulatory Authority: Responsible for overall regulation and administration of the telecommunication sector in Egypt including interface with telecommunication companies and their infrastructure

elements such as broadcasting towers. Given that project could impact such infrastructure elements, approvals are required.

Telecommunication Operators: Could own and operate telecommunication infrastructure within the area. This includes mainly Orange, Etisalat and Vodafone. Given that project could impact such infrastructure elements, approvals are required.

Radio and Television Union: Responsible for overall regulation and administration of the radio and television sector in Egypt including infrastructure elements. Given that project could impact such infrastructure elements, approvals are required.

Local Governmental Agencies

Red Sea Governorate: Governorate's main role is supporting the Project in all aspects as required to include providing required permissions. They key departments of the Governorate that are related to the Project include the following:

- Environmental Administration that is responsible for monitoring compliance to environmental requirements along with EEAA;
- Labor Office that is responsible for overall management of the labor force in Red Sea Governorate, monitoring recruitment by development projects within the Governorate, monitor labor grievances and other;
- Roads Directorate: responsible for services and development of external roads in the governorate and issuing permits for any construction work on the external roads
- Public Health Directorate: provide the health services and facilities to the local districts and ensure overall local community health and safety

Ras Gharib Local City Council: main role is supporting the Project in all aspects as required to include providing required permissions. In addition, the Council is also responsible for supervision and follow-up for monitoring compliance to environmental requirements along with EEAA and Red Sea Governorate, and also has overall responsibility for solid waste management and disposal within their area of influence.

Directorate of Social Solidarity Ras Gharib: official governmental entity that acts as the overall management, organization and registration of local community associations, foundations, and NGOs. They could have a vested interest in obtaining updates on employment and procurement opportunities provided by the Developer as well as any social responsibility programs.

Red Sea Water and Wastewater Company: official entity that is responsible for water and wastewater management within the Governorate. In addition, it will be the entity that will be responsible for providing the Project's requirements of water as well as disposal of wastewater.

Red Sea Governorate Antiquities Inspector Offices: Official governmental entity representing the Ministry of Antiquities within the Red Sea Governorate. They will be responsible for protection and management of archaeology and cultural heritage resources in the area as well as implementation of chance find procedures by development projects.

Non-Governmental Organizations (NGOs) and Other Organizations

NGOS are Organizations with direct interest in the Project, and which may have useful data or insight into local issues of relevance to the Project. These organizations can also influence the views of others regarding the Project, both nationally and international and in general NGOs are responsible for sharing information with the community. The key NGOs active within the area are summarized below.

NGOs/ CBOs	**Scope**
Orban El-Saharaa	Social Development
Association for the Conservation of the Environment in Red Sea (HEPCA)	Environmental protection
Red Sea Ecotourism	Social and cultural services
Environmental protection in the Red Sea	Environmental protection
Ababdeh Sons Association in Ras Ghareb	Community Development

Resala Association	Social and family services
Firdous Association	Social and family services
Egyptian Red Crescent	Community Development

Nature Conservation Egypt (NCE): this is considered one of the most important and key NGOs in Egypt that is involved in biodiversity protection and conservation. NCE is also the Egyptian partner of the Bird Life International. They have a vested interest in the impacts of the Project on biodiversity in general and avifauna in particular and they key mitigation and monitoring programs that will be implemented.

Education providers (in particular technical / vocational training institutes): Provides knowledge and skills required for various occupations, including renewables and solar power in specific that is delivered through formal, non-formal and informal learning processes. The education curriculum in undergraduate, postgraduate, or Technical and Vocational Education and Training (TVET) could be reviewed and revised to match the market and workforce requirements.

Media (Newspaper, Television, Internet): They could disclose potential information and updates about the Project.

Regional Center for Renewable Energy and Energy Efficiency (RCREEE): responsible for managing certain aspects of the overall development process on behalf of the Developer. This includes in specific the overall management of the ESIA process with the Consultant. In addition, during the operation phase, RCREEE will be responsible in particular for the implementation of the Active Turbine Management Plan (ATMP).

4.5 Targeted Consultations

As part of the scoping process of the Project, targeted consultations were undertaken with key stakeholders that are relevant to the Project to include but not limited to: (i) central governmental entities; (ii) local governmental entities; (iii) key Non-Governmental Organizations (NGOs); and other.

The objective of such consultations was to:

- Introduce project (rationale, objective, location, key components, etc.)
- Explain and discuss overall methodology for ESIA study
- Explain and discuss key anticipated impacts as relevant
- Identify and determine additional requirements or key issues of concern to be taken into account for the ESIA study

Throughout the consultations a handout was prepared and distributed to such stakeholder groups with key information to include but not limited to rationale for Project, Project location and setting, key components and activities of the Project and other as applicable.

The table below presents summary for the outcomes of the stakeholder consultations undertaken.

Table 8: Summary of Consultations Undertaken during ESIA Process

No.	Entity	Objective	Outcomes
1	EEAA	Introduction of project and location, discuss overall methodology for ESIA, key anticipated impacts, and determine any key issues of concern and/or additional requirements to be taken into account as part of the study.	▪ Expressed their support to renewable energy projects ▪ Adherence to all environmental standards during construction and operation ▪ Stressed on the importance of undertaking environmental baseline studies for the site to include in particular a bird migration studies by a specialist given the importance of the area ▪ Importance of adhering to community consultation sessions with representation of the local community and project stakeholders, in accordance with the EEAA guidelines for ESIA studies. ▪ The impacts of the surrounding environment on the Project should be studied which includes in particular impacts resulting from natural factors such as floods. ▪ Impacts resulting from development activities in the area as well as assessing current and previous use of the land of the Project site and its surrounding. It was noted that there is a dumpsite near the Project site belonging to the Ras Gharib city council that will be removed to another alternative area that is currently being selected.
2	EETC		▪ Expressed their support to the Project ▪ ESIA study should include the Overhead Transmission Line (OHTL) of the Project. ▪ Indicated the importance of continuous consultation by the Developer with EETC during the various stages of the Project until the completion of ESIA study and up to the operational stage.
3	NREA		▪ Stressed the importance of studying the OHTL ▪ ESIA should consider the applicable environmental standards when constructing OHTL, as well as the Project site to include in particular impacts on bird migrating in the area. ▪ There should be communication with local communities through stakeholder engagement activities, which provide information about the project to know their expectations and concerns about wind energy projects.
4	Ministry of Electricity and Energy		▪ Explained that the Egyptian government is currently moving towards produce clean energy projects, in a way that does not affect the environment or natural resources. ▪ Stressed on importance of ESIA study including consideration of the potential risks to bird migration. ▪ Discussed on importance of consulting with stakeholders after preparing the ESIA draft for discussion.
5	Ministry of Communication	Same as above but with focus on telecommunication and radio/TV infrastructure and broadcasting towers in the area and potential impacts from Project on such facilities.	▪ Stated the importance of holding a meeting with officials in the National Telecom Regulatory Authority (NTRA), as the national authority competent to regulate and administer the telecommunications sector. An official letter was sent to conduct a meeting with officials in NTRA. ▪ In addition, the consultant has conducted meetings with officials of the telecom companies Vodafone, Etisalat and Orange. ▪ Officials in the telecommunications companies explained that the presence of communication towers in the region means that there are other towers at a distance of not less than 5 km. Such towers are connected through microwave connections. Connections need to be empty from any obstacles along with a width of at least 30m to maintain the effectiveness of the network and the continuity of the connection. ▪ The ESIA Consultant is currently following up with NTRA to identify the official procedures to be followed to obtain approval from these entities and/or identify key requirements to be taken into account. ▪ NTRA final response was that communication for the Project should be through NREA and not through the Consultant.

6	Ras Gahreb Radio and TV Unit		▪ The radio and television towers connection that are close to the Project site extend from Zafarana to Ras Gharib to Hurghada, in addition to other towers in the direction of Sheikh Fadl Road. The distance between each tower is about 60 km, depending on the terrain of the area ▪ The existing radio and television towers are used for receiving and transmitting the microwave signal, and for radio waves FM, In addition to TV In addition to TV waves, VHF waves, ▪ They explained that to determine the impacts on radio and television towers; the Radio and Television Union in Cairo should be contacted. ▪ The Radio and Television Union in Cairo provided an official response indicating that they have studied the Project and there will be no impacts on the radio and TV infrastructure in the area.
7	Ministry of Tourism and Archaeology	Same as 1 above but with focus on archaeology and cultural heritage methodology and impacts for the ESIA and any issues of concern related to that.	▪ Explained that there are no archaeological discoveries sites close to the Project site. However, a field survey for the Project site should be conducted to ensure that there are no archaeological sites. ▪ The archaeological sites closest to the Project site can be identified through the database of the Geographic Information Systems Department at the Ministry of Tourism and Antiquities, as well as through the archaeology departments closest to the project site (the closest antiquities directorate to the project site is in Safaga City).
8 9	Key national and local E&S NGOs	Same as 1 above but with focus on biodiversity, birds and bats methodology and impacts for the ESIA and any issues of concern related to that.	▪ Explained that positioning the turbines could have a negative effect on birds and therefore there needs to be a balance between risks and benefits and minimize any adverse environmental impacts. This must be taken into account in the design phase of the Project. ▪ Discussed the existence of a dumpsite near the Project site and which is considered an attraction area for birds. This should be taken into account in choosing an alternative site for the dumpsite. Coordination should be made with the Nature Protection Sector in the Red Sea Governorate to follow up on choosing a suitable site for the dumpsite that takes into account the potential risks to birds in the area. ▪ Stressed on the importance of having corridors for migratory birds between the turbines as part of the design of the Project. ▪ Stated that wind farms projects are in general environmentally friendly. The establishment of the Project does not conflict with protecting the environment in Red Sea Governorate, as it is definitely better than establishing coal-fired power plant. ▪ Pointed out that investment projects in the area should communicate with local communities to support the local development projects in Ras Gharib city (through CSR activities) and should also give priority to youth from the local community for job opportunities.
10	Ras Gharib Local Council	Same as 1 above but with focus on land use, infrastructure and utilities and socio-economic methodology and impacts and any issues of concern related to that.	▪ Officials welcomed the Project and explained that wind energy projects are the best investment in Ras Gharib ▪ City Council officials confirmed that the dumpsite is located near the Project site and will be relocated to another alternative site that is currently being studied. ▪ Officials at the Urban Planning Department confirmed that the Project area does not include any future urban planning, and was not part of any previous urban planning. The area is mainly allocated within exploratory sites belonging to the General Petroleum Company. ▪ Clarified that the dumpsite near the Project site is the only dump area in Ras Gharib. It is leased to a contractor whom employs 6 workers to sort and collect garbage; they are the contractor's workers, not the city council workers.

11	Red Sea Governorate		▪ Officials made it clear that the project area does not fall within the scope of residential projects or any residential or industrial activities, as it is intended for energy projects only, in addition to the areas allocated for the exploration of the General Petroleum Corporation. ▪ The importance of the ESIA studying migratory birds and identifying proper mitigation and monitoring requirements. ▪ The issue of relocating the dumpsite to another alternative site was discussed where he mentioned that engineering studies are currently being conducted to choose a suitable site for the new landfill.
12	Red Sea Water and Wastewater Company	Same as above but with focus on water supply and wastewater management for the Project area. and any issues of concern related to that.	▪ Explained that the current Project site does not conflict with any existing facilities (water / sanitation). ▪ Explained that Ras Gharib Water Company is able to provide the Project's needs for water and sanitation services, but through contractors; because the company does not have trucks to transport water or sanitary waste.
13	Petroleum Facilities and companies in the area	Same as above but with focus on land use issues and their key activities undertaken within the area.	▪ Indicated that there are exploratory wells in the Project land and nearby sites. Exploration wells are currently closed, in order to access more information about the number of exploration wells, and the possibility of re-exploring them again; It will require coordination through the head office in Cairo. ▪ The consultant sent an official letter to Chairman of the Board of the General Petroleum Company to arrange for an interview. ▪ The company required that the Developer/NREA (and not Consultant) communicate with them to obtain additional details and requirements to be considered during the planning and design phase of the Project.
14	Ras Gharib citizens	Same as above but with focus on land use and socio-economic methodology and impacts. Key local community representatives will be identified through the Ras Gharib City Administration and key local NGOs in Ras Gharib.	The Consultant conducted Focus Group Discussion (FGD) and meetings with representatives of the local community in Ras Gharib. Key local community representatives will be identified through the Ras Gharib City Administration and key local NGOs in Ras Gharib. Community members explained that Ras Gharib is a small city that lacks many services, in addition to limited job opportunities. They hoped that investment projects as this one would help provide job opportunities for all including in particular youth which would have a direct impact on the local community. No specific concerns were raised by the local community members on the Project development. On the contrary, they made it clear that the Project site is a great distance from the city centre, and they do not foresee any direct negative impact on the local community, whether in the construction or operation stage. Other issues raised include ▪ They do not feel a direct economic benefit from investment projects in the field of wind energy to date as they believe Developers in general do not depend on the city of Ras Gharib for supplies and contracting work despite the availability of construction contractors and supplies. ▪ They stated that the City Council has lists of officially registered companies, local contractors and supply companies ▪ They suggested that job opportunities can be announced through the city council as well and indicated that the city's labour office also has the available workforce according to different specializations.
15	Bedouins residing near the project area	Same as above but with focus on land use and socio-economic methodology and impacts. Consultations will be undertaken with head of tribal leader.	Meetings were held with heads of tribal leaders of Bedouin families. The results indicated the following: ▪ There are no stable Bedouin communities in or near the Project site. The only settled villages in the desert for Bedouin families are in Zaafarana and Wadi Dara Which is at least 50 km away from the Project site, ▪ The Project site or the surrounding areas does not have any key land use activities for them such as grazing or farming activities. However, the area in general is subject to their Ghafra System that is divided between two families, the Tabbna and the Hamadin families.

4.6 Future Stakeholder Engagement and Consultation

Future stakeholder engagement and consultations will mainly include the following, each of which is discussed in further details.

4.6.1 Disclosure of the ESIA document

The below documents will be disclosed on the Developer's as well as EBRD's website for a minimum of 60 calendar days to allow any stakeholder to review the studies and comment on the scope of work undertaken, key issues identified and any other issues of concern they might have. At the end of the disclosure period, all received comments will be addressed and taken into account and an updated as appropriate.

- Environmental and Social Impact Assessment (ESIA)
- Non-Technical Summary (NTS)
- Stakeholder Engagement Plan (SEP)
- Cumulative Effects Analysis (CEA)
- Critical Habitat Assessment (CHA)
- Biodiversity Management Plan (BMP)
- Flood Risk Assessment
- Health, Safety, Social and Environmental (HSSE) Management System (MS) Manuel

4.6.2 Public Disclosure Session

A public disclosure session will be undertaken. The list will involve targeted stakeholders that will be identified by the "ESIA Team" in coordination with EEAA and other authorities. The session will be undertaken in the GoS primarily targeted for local governmental institutions and local communities – this session will be announced through newspaper advertisement at least one week in advance. The objective of the sessions is to:

- Introduce the Project to stakeholders;
- Identify the key anticipated impacts;
- Present the methodology for the ESIA study;
- Present key outcomes and conclusions; and
- Comments on scope of work undertaken, key issues identified and any other issues of concern.

As discussed earlier, once the public disclosure session is completed (and at the end of the 60-day disclosure period), all received comments will be addressed and taken into account and an updated ESIA will be submitted.

4.6.3 Stakeholder Engagement Plan

Stakeholder Engagement is an on-going process that involves: stakeholder analysis & planning, disclosure & dissemination of information, consultation & participation, grievance mechanism, and on-going reporting to Affected Communities. A Stakeholder Engagement Plan (SEP) is developed and implemented that is scaled to the Project risks and impacts and development stage, and be tailored to the characteristics and interests of the Affected Communities and key stakeholders.

The SEP for the Project describes the planned stakeholder consultation activities and engagement process and includes the following:

- Define the Project's approach to future stakeholder engagement;
- Identify stakeholders within the area influenced by the Project;
- Profile identified stakeholders to understand their priorities;
- Propose an action plan for future engagement with identified stakeholders; and
- Set out the grievance/project complaints mechanism.
- The Developer is committed to implementing the requirements of the SEP throughout the lifetime of the Project. The SEP is provided as a standalone document.

5 REGULATORY AND POLICY FRAMEWORK

This chapter first provides an overview of the environmental clearance process for the Project. The Chapter then discusses the regulatory context which is directly related to environmental compliance which must be adhered to by all parties involved in the Project throughout the planning and construction, operation, and decommissioning. The Chapter goes on to summarise the relevant international agreements and conventions to which Egypt is a signatory.

Finally, as the Project is seeking financing from IFIs, this Chapter highlights the E&S policies and requirements of the IFIs which must be adhered to by the Developer.

5.1 Egyptian Environmental Institutional Framework

Egyptian Environmental Affairs Agency (EEAA)

The EEAA is an authorised state body regulating environmental management issues. Egyptian laws identify three main roles of EEAA:

- A regulatory and coordinating role in most activities, as well as an executive role restricted to the management of natural protectorates and pilot projects.
- The responsibility of formulating the Environmental Management (EM) policy framework, setting the required action plans to protect the environment and follow their execution in coordination with Competent Administrative Authorities (CAAs).
- The responsibility of EEAA in reviewing and approving the ESIA studies for new projects/expansions undertaken as well as monitoring the implementation of the ESMP.

Environmental Management Unit (EMU)

The Environmental Management Unit (EMU), at Governorate and district level, is responsible for the environmental performance of all projects/facilities within the Governorates premises. The Governorate has established EMUs at both Governorate and city/district levels. EMUs are responsible for the environmental protection within the Governorate boundaries. They are mandated to undertake both environmental planning and operation-oriented activities. EMU is mandated to:

- Follow-up the environmental performance of the projects within the Governorate during both construction and operations phases to ensure the project is in compliance with the laws and regulations as well as with the mitigation measures included in its ESIA approval.
- Investigate any environmental complaints filed against projects within the Governorate.
- EMUs are administratively affiliated to the Governorate, yet technically to EEAA. EMUs submit monthly reports to EEAA with their achievements and inspection results.
- The Governorate has a solid waste management unit at Governorate and district level. The units are responsible for the supervision of solid waste management contracts.

Competent Administrative Authorities (CAAs)

The Competent Administrative Authorities (CAAs) are the entities responsible for issuing licenses for project construction and operation. The ESIA is considered one of the requirements of licensing. The CAA for this project is NREA. NREA is thus responsible for receiving the ESIA studies, checking the information included in the documents concerning the location and for the suitability of the area to the project activity. It is also responsible for ensuring that the activity does not negatively impact the surrounding activities and that the location is in compliance with the ministerial decrees related to the activity. NREA forwards the documents to EEAA for

review and to issue its response in 30 days period. They are the main interface with the project proponents in the ESIA system. The CAA is mandated to:

- Provide technical assistance to Project Proponents
- Ensure the approval of the Project Site
- Receive ESIA Documents and forward it to EEAA
- Follow-up the implementation of the ESIA requirements during post construction field investigation (before the operation license).

Other related national government & permitting authorities

Table 9: Other Related National Government & Permitting Authorities

Entity	Scope
Egyptian Electricity Transmission Company (EETC)	Purchase of electrical energy produced from power plants, which authorizes local and foreign investors to create, and sell them on the ultra-effort networks. The implementation of projects for the electricity transmission
New & Renewable Energy Authority (NREA	NREA act as the national focal point for expanding efforts to develop and introduce renewable energy technologies to Egypt on a commercial scale together with implementation of related energy conservation programs. NREA is entrusted to plan and implement renewable energy programs in coordination with other concerned national and international institutions within the framework of its mandate
General Petroleum Company	A national State-owned company engaged in exploration, production and development of hydrocarbons, is responsible for the management of oil and gas exploration and production activities on behalf of the State. It is one of the subsidiary companies affiliated to the Ministry of Petroleum It has the right of concession for petroleum exploration in some parts of the project area and adjacent areas. Represents the main investment activity in the project area
Ministry of Defence: Army Intelligence force, Border guards	They also provide permissions to get into the desert area. Secure and support the project.
Red Sea Governorate	The main role of the governorate is supporting the project by providing the various permissions needed, and infrastructure maps in case if needed.
Ras Gharib City Council	Involved in several requirements to include: (i) provide permits for any construction activities within their area of jurisdiction; (ii) supervision and follow-up from the Environmental Department in Ras Gharib City Council during the construction phase; and (iii) provide services related to solid waste collection and disposal.
Water and wastewater Company in Ras Ghareb	Provide the project needs of water and wastewater disposal during the construction phase; through the construction contractors (In the case of contracting with them).
Public Health: Directorate of Health in Red Sea Governorate, Ras Ghareb General Hospital	They provide the health services and facilities to the local districts.
Manpower Directorate: Labour Office in Red Sea Governorate	Data of the labour force in Suez Governorate and complaints of workers. Monitor labour recruitment standards during construction.
Roads Directorate in Red Sea Governorate	Services and development of external roads in the governorate. Issuing permits for any construction work on the external roads.
Ministry of Interior	MI is responsible for national and local security, as well as approving emergency response and firefighting plans for establishments/projects.

Entity	Scope
EEAA	Issues the Environmental approval for the project. Monitors the compliance with the conditions of approval.
Ministry of Electricity and Renewable Energy	The ministry of electricity is the responsible entity for the generation, transmission and distribution of electricity in Egypt, under which operates NREA, Egyptian Electricity Holding company and EETC.
Ministry of Environment	The ministry of Environment is the entity responsible for the formulation of environmental policies. The preparation of necessary plans for environmental protection and environmental development projects and following up on the implementation of all of the above. Under the ministry, the EEAA and the Nature protection bureau operate.
Ministry of petroleum and mineral resources	The ministry of petroleum is the entity responsible for the supervision of the exploration, production, marketing and distribution of oil, gas and other natural resources
Ministry of Antiquities	The ministry of antiquities is the entity responsible for the preservation and protection of the heritage and ancient history of Egypt, under which operates all inspector offices in the governorates
Red Sea Governorate antiquities inspector offices	First contact in case of any chance finds during construction. Responsible for protecting and managing antiquities in the area.
Ministry of Civil Aviation	Civil aviation approval might be necessary for large-scale wind farms. The impact of wind turbines on air traffic control systems, radar, and aircraft operations is evaluated by the civil aviation authority.
Ministry of Transportation	Provide the necessary permissions and approvals related to potential traffic disruptions during the construction phase, such as the transportation of blades.

5.2 Egyptian Environmental Clearance Process

The ESIA is governed by the Law No. 4 of 1994 and its amendments, the Law on Protection of the Environment and its Executive Regulations 1995 and its amendments (Prime Ministers Decree 338). According to Law 4 of 1994, applications for a license from an individual, company, organization or authority, an assessment of the likely environmental impacts of development projects should be undertaken. An ESIA is required for all electricity generation projects including renewable energy projects.

Based on the categorisation of development projects included within the Guidelines for EIA issued by the EEAA in 2009, wind farm projects are considered under Category C projects (projects with high potential impacts) which require undertaking a full ESIA study.

The involvement of the public and concerned entities in the EIA planning and implementation phases is mandatory for Category C projects through the public consultation process with concerned parties. Consultation is undertaken twice during the EIA process the first in the phase of identifying the scope of the project EIA, and the second is after the preparation of the draft EIA.

Before the public consultation on the draft EIA, the draft technical summary in Arabic should be disclosed to all concerned parties. After the EIA process is complete, the EIA report will be stored at EEAA's central library or that of the RBO of the projects region. Moreover, the executive summary of the final EIA will be available at EEAA website. The project proponent should identify in a letter attached to the EIA the parts that he/she does not wish to disclose. These include sections that may have sensitivity related to trade, technology, or security.

An individual chapter in the EIA should be prepared for public consultation including:

- Methodologies used to inform and involve concerned parties in the EIA process
- Analysis of the data and information gathered and feedback acquired.
- Table with all aspects that have been discussed during the public consultation meetings and how the project will address or mitigate the aspects
- Methodologies followed by the project proponent to ensure the continuity of the consultation process during the construction and, operation phases and until the project reaches the closure phase.
- Commitments of the project owner to improve surrounding environment and support the neighboring community

An Annex in the EIA should be prepared for public consultation including: Documentation of public meetings and meetings including dates, name of attendees as well as agenda and topics of discussion.

The ESIA process is set according to the guidelines issued by the EEAA including: EIA Guidelines (2009), and the Environmental Impact Assessment Guidelines and Monitoring Protocols for Wind Energy Development Projects along the Rift Valley/Red Sea Flyway with a particular reference to wind energy in support of the conservation of Migratory Soaring Birds (MSB) (2013). The ESIA process is stipulated in the figure below.

The key requirements for a full ESIA as per the requirements above include the following:

- Environmental and Social (E&S) Regulatory and Legal Review
- Project Description
- Description of the Baseline Environment (physical, biological, social)
- Identification and Analysis of Impacts
- Analysis of Alternatives
- Public Consultation (on the draft ESIA)
- Environmental Management Plan (EMP) (mitigation measures, monitoring program, institutional arrangements)
- Upon submission of the ESIA report by the ESIA Practitioner to the CAA in charge of issuing licences, sends the ESIA to EEAA for evaluation. The EEAA shall review the ESIA and provide comments or feedback within 30 days. The CAA in charge of issuing licences in case of wind power projects is the NREA.
- After submission of an ESIA for review, EEAA may request revisions in the ESIA report within 30 days, including additional mitigation measures, before issuing the report approval.

5.3 Egyptian E&S Regulatory Context

This section lists those legislations that are directly related to environmental and social compliance that must be adhered to by all parties involved in the Project throughout the planning and construction, operation, and decommissioning phase. These legislations include: (i) those issued by EEAA (laws, regulations and instruction), and (ii) the relevant national legislations issued by other line ministries (laws, regulations, instructions, standards).

The table below lists the key relevant legislation and regulator/entity relevant to each of the environmental and social parameter being studied and assessed within this ESIA. Throughout the following Chapters, reference to the requirements set out within those legislations is provided under each relevant parameter.

Table 10: National Legislation and Guidelines Governing the E&S Compliance for the Project during all Phases

Legislation	Relevant Article	Requirements
Land Use		
Electricity Law 87/2015	Article 53	▪ Stipulates the right of proper compensation for the affected persons due to the establishment of Electricity projects
	Article 55	▪ Identifies the Right of Way that should be avoided for the OHTL and the underground cables: - 25 meters from the centre for extremely high voltage OHTL - 13 meters from the centre for the high voltages OHTL - 5 meters for the medium voltage OHTL - 5 meters for the high and extremely high voltage cables - 2 meters for low and medium voltage cables ▪ The Owner of the land should be compensated in case of land acquisition. The right of way stated in article 55 should be abided by
Law 10/1990	The project will not entail any land acquisition activities	▪ The main site is located on a state-owned land which does not trigger any expropriation activities, according to law no. 10/1990.
Law 577/1954	Law 577/54, later amended by Law 252/60 and Law 13/162	▪ Establishes the provisions pertaining to the expropriation of real estate property for public benefit and improvement. ▪ The project will not entail any land acquisition activities
Civil code 131/1948	Articles 802-805	▪ Recognises private ownership right. - Article 802 states that the owner, pursuant to the Law, has the sole right of using and/or disposing his property. - Article 803 defines what is meant by land property - Article 805 states that no one may be deprived of his property except in cases prescribed by Law and would take place with an equitable compensation. ▪ Land for the Project was allocated by NREA and was not previously owned and thus no compensation would be needed
Unified Building Law No. 119 of year 2008	Article 39	▪ Apply and a receive the construction permit before start of the implementation ▪ Ensure that all designs abide by the building codes of Egypt
Geology, hydrology, hydrogeology		
Law 4/1994	Article 33 of the Executive regulations of Law 4/1994	▪ The owner of the project is responsible to decontaminate the area/soil in case of relocation or decommissioning
Management of solid waste and hazardous waste generated from the facility during generation, handling, transportation and disposal		

Law 4/1994 amended by Law 9/2009 and ER 1095/2011 amended by Decree 710/2012)	Articles 28, 29, 33, 37, 39	▪ Identification: Using the HW lists issued by the competent authority. ▪ Minimization: strive to reduce quantitatively and qualitatively the generation of the HW ▪ Segregation: HW is to be separated from other types of non-hazardous waste. In addition, the different types of HW must not be mixed together. ▪ On site Storage: HW is to be stored in a designated area, and containers must be made of suitable materials and be properly sealed to avoid any leakages or spills into the surroundings. ▪ Off-site transportation: HW is to be submitted to authorized HW contractors. ▪ Obtaining a license from the competent authority to handle Hazardous waste
	Article 22 and Article 17 of the Executive Regulations	▪ The establishment should maintain an environmental register in accordance with Annex 3 of the Executive regulations
	Article 39 and Article 41 of the Executive Regulations	▪ Article 39: The establishment should maintain the cleanliness of garbage bins and vehicles. Garbage collection bins shall be tightly covered and waste shall be transported at suitable intervals. ▪ Article 41: The establishment shall undertake necessary precautions to secure the safe storage and transportation of waste. These precautions include the following: ▪ Construction waste storage is to be carried out at site such that it does not obstruct movement of vehicles and personnel. ▪ Waste subject to emission should be covered to avoid air pollution ▪ Waste is to be submitted to authorized waste contractors
	Articles 26, 28 and 29 of the Executive regulations	▪ The establishment should maintain a register for the hazardous waste should be maintained as well as record for the hazardous substances used
Law 202/2020 on waste management and its executive regulation 722/2022	Article 10	▪ The waste generators or holders shall safely dispose of the wastes of their establishment or their projects or entities after the delivery or initial operation of the new or renovated projects, or after the completion of the works from which wastes are generated, whatever their purpose, within a period not exceeding twenty days starting from the date of delivery or initial operation of the project or works, in the event that these wastes are located outside the boundaries of these establishments. or projects. The generators or possessors of the waste shall also abide by the measures and requirements set out in the appendices attached to this regulation.
	Article 36	▪ All entities and individuals, when carrying out demolition and construction works, are obligated to manage safe transportation, recycling and final disposal through entities licensed and authorized to do so.
	Article 50	▪ The owner of the facility or the person in charge of its management whose activity produces hazardous waste, in accordance with the provisions of the law, must keep a paper or electronic record, or both, of these wastes, and how to dispose of them, as well as the parties contracting with them for any management operations of these wastes, and in the event that the activity of the facility is transferred or suspended The owner of the facility or the person responsible for its management must clean it and the soil in which this activity was carried out, in accordance with the requirements and standards set out in Appendix No. (8) attached to this regulation.
Control of the wastewater discharge into the sewage system and public network.		
Ministerial Decree	Article 14	▪ The law prohibits the disposal of domestic, industrial and commercial wastewater, treated or untreated, in public drainage system without obtaining a prior approval.

44/2000, Decree of Law 93/1962		▪ Article 14 of the executive regulations set the parameters required regarding the quality of the wastewater discharged to the public sewage network. ▪ The owner of the project should abide by the limits stated in article 14 of the Executive regulations of Law 93/1962
Biodiversity, Birds, and Bats		
Law 4 of 1994	Article 28, as amended by Law 9 of 2009. Annex 4 of the Executive Regulations of law 4/1994, amended by Prime Minister Decree 1095 of 2011	▪ Defines fauna and flora which are forbidden to be hunted or disturbed. ▪ Ensure that no species are being disturbed and implement all mitigation measures needed to reduce the impact on any fauna and flora in the vicinity of the project
Environmental Impact Assessment Guidelines and Monitoring Protocols for Wind Energy Development Projects along the Rift Valley/Red Sea Flyway with a particular reference to wind energy in support of the conservation of Migratory Soaring Birds (MSB)	Section One Guidelines for Environmental Impact Assessment for Wind Energy Development in Egypt 1.5 Description of EIA Study Components for Wind Farm Projects – 0.7 Project Environmental Setting	▪ Defines the ecological components of plant, animals and their habitats, including threatened species and areas that have been identified as protected areas or IBAs and requests the review IUCN Red List of Threatened Species. ▪ Defines baseline information requirements for birds at Wind Farm Projects.
	Section Two Guidelines on Mitigation, Monitoring and Training 2.2 Monitoring Protocols	▪ Defines standard methods and models to predict risk for migratory birds. ▪ Define standard methods used in pre- and post-construction studies of Wind Energy Facilities are focused on assessing impacts on birds. ▪ Define standard protocol to be implemented building on results of species recorded and numbers of passage birds recorded during studies.
Archaeology and cultural heritage		
Law 117/1983	Article 1	▪ Defines a monument as a building or movable property produced by different civilizations or by art, sciences, literature and religions from prehistoric era and during successive historical eras until a hundred years ago or historical buildings.
	Article 2	▪ States that any building or movable property that has an historical, scientific, religious, artistic or literary value could be considered as a monument whenever the national interest of the country imposes its conservation and maintenance without adherence to the time limit contained in the preceding Article no.1
	Article 5	▪ States that the Supreme Council of Antiquities (SCA) is the competent authority responsible for antiquities in Egypt.

	Article 20	▪ States that license of construction in archaeological sites or land is not permitted. It is prohibited to make any installation or landfill or digging channels, construct roads, agricultural land or for public benefits in the archaeological sites or land within its approved border lines. ▪ The Article additionally, states that a buffer zone around the monument or the site is defined as three kilometres in the uninhabited areas or any distance determined by the SCA to achieve environmental protection of the other parts of the monument in the surroundings (article 20-Ch.1). ▪ The provisions of this article (20) apply on land which appears to the SCA - based on conducted studies – that there is a probable existence of monuments in the subsoil. ▪ The provisions of this article are also applied to desert and areas where quarrying work is licensed.
	Article 22	▪ States that license of construction in the immediate vicinity of archaeological sites within populated areas could be delivered by the competent authority, after the approval of SCA. ▪ The competent authority must state in the license the conditions which the SCA emphasizes to guarantee that the building does not have a negative visual impact on the monument and its direct buffer zone protecting the archaeological and historical surroundings. ▪ The SCA has to pronounce its verdict on the license demand within 60 days of the date of submission. Otherwise, the elapsing of this period is regarded as a decision of refusal.
	Article 23	▪ States that the SCA should take the necessary steps to expropriate land that is found in or kept in place and registered according to the rules of this Law. (Article 23- Ch.1). [These rules are defined in the second chapter of the Law 117 – articles 26-30]. ▪ The Ministry of State for Antiquities must be notified in the event that an unrecorded ruin is found by any person (Article 23).
	Article 24	▪ States that everyone finding by chance part or parts of a monument in its place must promptly inform the nearest administrative authority within forty-eight hours. ▪ Although there are no cultural heritage areas in the site vicinity, the ESIA report will refer to relevant regulations for unexpected cases of chance finds.
Air quality and noise		
Law 4/1994 amended by Law 9/2009 and ER 710/2012	Article 42 of Law 4/1994 amended by Law 9/2009 Article 44 of ER 710/2012	▪ Maximum allowable limits for ambient noise intensity and maximum exposure duration
	Article 38 of ER	▪ Open burning of garbage and non-hazardous solid waste is strictly prohibited, and garbage and solid waste shall only be dumped or treated in designated areas away from residential, industrial, agricultural and waterways.
		▪ Dumping areas should be bound by a wall, away from obstruction, traffic and pedestrians and take into account the coverage of volatile soil so as not to cause air pollution. ▪ Transporting waste and dust resulting from excavation, demolition and construction in special containers or using transport vehicles prepared and licensed for this purpose. ▪ (A) The vehicle shall be equipped with a special box or a tight cover that prevents the spread of dust and debris to the air or falling on the road. ▪ (B) The vehicle shall be equipped with special equipment for loading and unloading. ▪ (C) The car should be in good condition according to the rules of safety, durability and lights and equipped with all safety devices.

		▪ Ensure that the places to which this type waste transported so that a distance of not less than 1.5 km from the residential areas and be of a low contour level and settled after filling and filling.
ERs (amended by Decree 1095/2011 amended by Decree 710/2012)	Annex 5	▪ Maximum limits of ambient air pollutants
	Annex 6	▪ Permissible limits of air pollutants in emissions
	Annex 8 and Annex 9	▪ Maximum allowable limits for air emissions, heat stress, ventilation rates within the work environment
Modified ERs (710/2012) of Law 4/1994	Article 37	▪ Maximum allowable limits for exhaust gases from machines, engines and vehicles.
Law 4/1994	Article 36	▪ It is prohibited to use machines, engines or vehicles whose exhaust emissions exceed the limits set by the executive regulations of this Law.
Law 4/1994 and its modified ERs	Article 35 of Law 4/1994 and article 34 of its modified ERs	▪ Maximum allowable limits for ambient air pollutants stated should be met by the contractors and operator throughout the lifetime of the plant.
Infrastructure and utilities		
Petroleum pipelines Law 4/1988	Decree 292/1988	▪ The owner of a property should allow the passing of pipelines transporting liquid or gaseous hydrocarbons beneath the ground surface in accordance with the procedure mentioned in the executive regulations
	Article 2	▪ Specifies that no buildings or trees, other than agricultural land trees, should be constructed or planted at a distance less than 2 m on each side of the pipeline inside urban and 6 m on each side of the pipeline outside the urban areas. ▪ If it is necessary to place the pipelines at a closer distance than what is specified in the law, it is allowed through a decision from the chairman of Egyptian General Petroleum Corporation (EGPC); taking into consideration the necessary safety precautions. ▪ also specifies that if the activities done in accordance to the law will result in damage to the property, the owner has the right to a fair compensation to be decided by a committee formed by a decision from the Minister of Petroleum, and the executive regulations include the guidelines for compensation estimation.
Occupational health and safety		
Law 4/1994	Articles 43 – 45 of Law 4/1994, which address air quality, noise, heat stress, and the provision of protective measures to workers.	▪ The owner of the project should abide by the limits stated in Annex 7 of the Executive regulations ▪ In case the limits are exceeded, special protective equipment should be made available (earmuffs, masks…) (Annex 9) ▪ In case the limits are exceeded, the workers should have rests as specified by the limits (especially for noise and vibration from electric jack hammers or any other ramming equipment) ▪ Conduct regular medical check-ups for workers that are facing noise, vibration or heat stress exceeding the limits
Law 12/2003 on Labour and Workforce Safety	Articles 80-87	▪ Regulates working hours and rest times for workers ▪ The working hours shall include a period of one or more meals and rest not less than one hour in total and the period shall not exceed five consecutive hours. The competent minister may, by a decision, determine the cases or works which are imperative for technical reasons or operating conditions. ▪ Work hours and rest periods should be organized so that the period between the beginning and the end of working hours does not

		exceed ten hours per day. ▪ Work shall be organized at the facility so that each worker shall receive a weekly rest of not less than 24 hours after six working days at most. In all cases, weekly rest shall be paid. ▪ The employer shall put on the main doors used by the workers for entry, as well as in a visible place in the establishment a schedule showing the weekly rest day, working hours and rest periods for each worker and the amendment to this schedule.
	Book 3 - Single worker contract: Article 32	▪ The employer shall be obliged to issue the contract in writing in Arabic in three copies. The employer shall keep one and deliver a copy to the worker. In particular, the contract shall include the following data: ▪ Name of employer and place of work. ▪ The name of the worker, ▪ his qualification, ▪ his profession or craft, ▪ his insurance number, ▪ his place of residence and what is necessary to prove his identity. The nature and type of work being contracted. ▪ If there is no written contract for the worker, the unit to prove his rights, all methods of proof. The employer shall be given a receipt for the papers and certificates he has deposited with him.
Law 12/2003 on Labour and Workforce Safety and Book V on Occupational Safety and Health (OSH) and assurance of the adequacy of the working environment	Minister of Labour Decree 48/1967. Minister of Labour Decree 55/1983. Minister of Industry Decree 91/1985 Minister of Labour Decree 126/2003. Minister of Industry Decree 134/2003	▪ The owner of the project is bound with the provision of protective equipment to workers and fire-fighting/emergency response plans. Moreover, the following laws and decrees should be considered: ▪ The contractors should have appropriate number of first aid kits in relation to the size of the site and the number of workers on site ▪ Work-related accidents, injuries, fatalities and diseases should be notified and bi-annual OHS statistics reporting should be developed. ▪ Types of establishments needing to establish OHS services and committees.
	Article 211 and article 34 of the Decree of the Minister of Labour and Manpower no. 211/2003	▪ The establishment should prepare records/reports/register for chemical safety
Law 137/1981	Article 117	▪ The employer should inform his workers of the hazards associated with non-compliance with safety measures
Decree 458/2007		▪ Egyptian Drinking Water Quality Standards should be met for all water bought and stored on site for the workers' use.
Decree 162, 2019	Articles 5, 9, 11, 19.	▪ Without prejudice to article 17 of the Labour Act (No. 12 of 2003), all parties, including Government entities and their affiliated bodies, public sector companies, the public business sector, the private sector, trade-union and professional associations and youth employment agencies are prohibited from employing workers subject to this regulation other than via the competent department in the Directorate of Manpower and within whose competence the activity falls. ▪ Labour, occupational safety and health inspectors are required in the course of conducting their inspections to monitor the informal

		workers in the establishments under inspection and to notify employers that they are required to proceed to the competent department of the Directorate to register these workers, regularize their status and take the requisite legal measures as per the provisions of the Labour Act and its implementing ministerial decisions. ▪ Without prejudice to the social insurance and pensions system in force, the employer shall at his own expense provide first aid to any worker subject to the provisions of this regulation who suffers injury during work and he shall transport him to the requisite provider treatment. ▪ Labour, occupational safety and health and employment inspectors shall monitor the employment of workers subject to the provisions of this regulation and the enforcement of the rules for employment set out in this regulation.
Socio-economics		
Law 94/2003		▪ The Law on Establishing the National Council for Human Rights (NCHR) aims to ensure respect, set values, raise awareness and grant observance of human rights. ▪ At the forefront of these rights and freedoms are the right to life and security of individuals, freedom of belief and expression, the right to private property, the right to resort to courts of law, and the right to fair investigation and trial when charged with an offence. ▪ This Constitution came into force after a public referendum on 11th September 1971 and was amended on 22nd May 1980 to introduce the Shoura Council and the press.
EEAA EIA guidelines	▪ Paragraph 6.4.3.1 Scope of Public Consultation ▪ Paragraph 6.4.3.2 Methodology of Public Consultation ▪ Paragraph 6.4.3.3 Documentation of the Consultation Results ▪ Paragraph 7 Requirement and Scope of the Public Disclosure	▪ Conduct a public consultation as part of the ESIA study according to the EEAA guidelines methodology. The involvement of the public and concerned entities in the EIA planning and implementation phases is mandatory for Category C projects through the public consultation process with concerned parties. ▪ Preparation of the Public Consultation Plan before starting the consultation activities in the EIA scoping phase, the project proponent prepares a plan indicating the methodology of the public consultation to be adopted in the two public consultation phases (EIA scoping phase and consultation on the draft EIA). The plan should indicate the concerned parties that will be consulted, method of consultation and other points. ▪ An individual chapter in the EIA will be prepared for public consultation ▪ Disclosure of relevant material is an important process and should be undertaken in a timely manner for all Category C projects. This process permits meaningful consultations between the project proponent and project-affected groups and local NGOs is required to take place. Before the public consultation on the draft EIA, the draft technical summary in Arabic should be disclosed to all concerned parties.

5.4 International Agreements

Egypt has signed and ratified a number of international conventions committing the country to the conservation of environmental resources and protection of workers' health & safety and labour rights. The following Table lists the key conventions:

Table 11: Relevant Egyptian International Conventions and Agreements

Name of Multilateral Environmental Agreement	Date
Biodiversity and Natural Resources	
International Plant Protection Convention	1951
Agreement for the Establishment of a Commission for Controlling the Desert Locust in the Near East	1965
Convention on Wetlands of International Importance Especially as Water Fowl Habitat (RAMSAR)	1971
Convention Concerning the Protection of the World Cultural and Natural Heritage	1972
Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	1973
Convention on the Conservation of Migratory Species of Wild Animals	1979
Protocol to Amend the Convention on Wetlands of International Importance Especially as Water Fowl Habitat	1982
Convention on Biological Diversity (CBD)	1992
Agreement for the Establishment of the Near East Plant Protection Organization	1993
United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa	1994
Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean	1995
African Convention on the Conservation of Nature and Natural Resources (revised)	2003
International Tropical Timber Agreement	2006
Hazardous Materials and Chemicals	
Convention Concerning Prevention and Control of Occupational Hazards Caused by Carcinogenic Substances and Agents	1974
Convention on the Prohibition of the Development, Production and Stock-Piling of Bacteriological (Biological) and Toxin Weapons, and on their Destruction	1972
Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal	1976
Convention on the Prohibition of Military or any other Hostile Use of Environmental Modification Techniques	1976
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1989
Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa	1991
Amendment to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1995
Stockholm Convention on Persistent Organic Pollutants (POPs)	2002
Atmosphere, Air Pollution and Climate Change	
Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies	1967
Vienna Convention for the Protection of the Ozone Layer	1985
Montreal Protocol on Substances that Deplete the Ozone Layer	1987
(London) Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	1990
United Nations Framework Convention on Climate Change	1992
(Copenhagen) Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	1992
Kyoto Protocol	1997
Paris Agreement under the United Nations Framework Convention on Climate Change	2015
Health and Worker Safety	
International Labour Organization Core Labour Standards	1936
Convention Concerning the Protection of Workers Against Ionizing Radiation	1960
Convention Concerning the Protection of Workers Against Occupational Hazards in the Working Environment due to Air Pollution, Noise and Vibration	1977
Occupational Safety and Health Convention	1979

5.5 Requirements for Project Financing – IFI's Requirements

The Project will be seeking financing from International Financing Institutions (IFI). Therefore, the E&S requirements of such IFI's must be considered throughout the Project development, which require the Project development to adhere to specific E&S requirements which reflect international best practice.

For the purpose of the ESIA, it will be based on the International Finance Corporation (IFC) E&S requirements, as well as the European Bank for Reconstruction and Development (EBRD) E&S requirements, both of which are discussed below.

IFC E&S Requirements

The IFC E&S requirements are considered the most comprehensive. The IFC of the World Bank provides a range of guidance documents related to the assessment and management of E&S issues in project development. Not only does IFC guidance provide a generally accepted basis for good practice, but it also provides the technical cornerstone for the Equator Principles which set out the E&S requirements of banks for project finance. The IFC requirements have become the *de facto* international E&S performance benchmark for project financing.

Summarized below are the requirements for the International Finance Corporation (IFC).

IFC Policy on E&S Sustainability (2012)

The IFC policy on E&S Sustainability puts into practice IFC's overall commitments to E&S sustainability. The policy seeks to: (i) enhance the predictability, transparency, and accountability of IFC's actions and decision making; (ii) help clients manage their environmental and social risks and impacts and improve their performance; and (iii) enhance positive development outcomes on the ground. In addition, the Policy identifies IFC's commitments, its roles and responsibilities and other as applicable.

One of the key outputs of the Policy is the E&S Categorization of projects, which are summarized as follows:

- Category A: Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented.
- Category B: Business activities with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures.
- Category C: Business activities with minimal or no adverse environmental or social risks and/or impacts.
- The IFC does not provide specific details on what wind farm projects should be classified.

IFC Performance Standards (2012)

The IFC Performance Standards (PS) on Social and Environmental Sustainability set out a framework for managing and improving project performance from planning and assessment, through construction and operations to closure. The Performance Standards requirements are summarized in the table below.

Table 12: IFC Performance Standard Requirements

IFC PS	Key Points
PS1: Assessment and Management of Environmental and Social Risks and Impacts	▪ PS1 underscores the importance of managing social and environmental performance throughout the life of a project by using a dynamic social and environmental management system. Specific objectives of this Performance Standard are: ▪ To identify and assess social and environment impacts, both adverse and beneficial, in the project's area of influence; ▪ To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment; ▪ To ensure that affected communities are appropriately engaged on issues that could potentially affect them; and

IFC PS	Key Points
	▪ To promote improved social and environment performance of companies through the effective use of management systems.
PS2: Labour and Working Conditions	The requirements set out in this PS have been in part guided by a number of international conventions negotiated through the International Labour Organization (ILO) and the United Nations (UN). Specific objectives of this Performance Standard are: ▪ To establish, maintain and improve the worker-management relationship; ▪ To promote the fair treatment, non-discrimination and equal opportunity of workers and compliance with national labour and employment laws; ▪ To protect the workforce by addressing child labour and forced labour; and ▪ To promote safe and healthy working conditions, and to protect and promote the health of workers.
PS 3: Resource Efficiency and Pollution Prevention	This Performance Standard outlines a project approach to pollution prevention and abatement in line with international available technologies and practices. It promotes the private sector's ability to integrate such technologies and practices as far as their use is technically and financially feasible and cost-effective in the context of a project that relies on commercially available skills and resources. Specific objectives of this Performance Standard are: ▪ To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; and ▪ To promote the reduction of emissions that contribute to climate change.
PS 4: Community Health, Safety and Security	This PS recognizes that project activities, equipment, and infrastructure often bring benefits to communities including employment, services, and opportunities for economic development. However, projects can also increase risks arising from accidents, releases of hazardous materials, exposure to diseases, and the use of security personnel. While acknowledging the public authorities' role in promoting the health, safety and security of the public, this PS addresses the project sponsor's responsibility in respect of community health, safety and security.
PS 5: Land Acquisition and Involuntary Resettlement	Involuntary resettlement refers both to physical and economic displacement as a result of project-related land acquisition. Where involuntary resettlement is unavoidable, appropriate measures to mitigate adverse impacts on displaced persons and host communities should be carefully planned and implemented.
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	This Performance Standard reflects the objectives of the Convention on Biological Diversity to conserve biological diversity and promote the use of renewable natural resources in a sustainable manner. This Performance Standard addresses how project sponsors can avoid or mitigate threats to biodiversity arising from their operations as well as sustainably manage renewable natural resources. Specific objectives of this Performance Standard are: ▪ To protect and conserve biodiversity; and ▪ To promote the sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities.
PS 8: Cultural Heritage	Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to protect irreplaceable cultural heritage and to guide project sponsors on protecting cultural heritage in the course of their business operations.

Note: PS 7 (Indigenous Peoples) is not considered to be applicable to this Project. The Indigenous World 2018 Report (IWGIA, 2018) states that Egypt is not classified as a country with indigenous people. In addition, this was confirmed based on previous experiences on E&S assessments with IFIs in Egypt where such standard was not triggered.

IFC EHS Guidelines

In addition, to the Performance Standards, the IFC have sector-specific EHS guideline documents. With regards to the project the following are applicable:

- IFC General EHS Guidelines (2007): identifies detailed EHS management and technical recommendations which are applicable for all development projects;
- IFC EHS Guidelines for Wind Energy (2015): identifies they key E&S impacts that should be investigated and provides detailed management and technical recommendations with regards to Industry-Best Practice. The IFC EHS Guidelines identifies the following key issues:

- Landscape and visual
- Noise
- Biodiversity (to include birds and bats)
- Shadow flicker
- Water quality
- Occupational health and safety
- Blade and ice throws
- Aviation
- Electromagnetic interference
- Public access
- Abnormal load transportation

- IFC EHS Guidelines for Electric Power Transmission and Distribution (2007): this in particular could be applicable for the associated facilities of the Project (i.e. transmission line for connection with the grid). The Guideline identifies they key E&S impacts that should be investigated and provides detailed management and technical recommendations with regards to Industry-Best Practice. The IFC EHS Guidelines identifies the following key issues:

- Biodiversity (to include birds and bats)
- Electric and magnetic fields
- Hazardous materials
- Occupational health and safety
- Community health and safety

EBRD Requirements

EBRD's 2019 Environmental and Social Policy seek to ensure, through its environmental and social appraisal and monitoring processes, that the projects it finances:

- Are socially and environmentally sustainable;
- Respect the rights of affected workers and communities; and
- Are designed and operated in compliance with applicable regulatory requirements and good international practice.

In addition, EBRD's E&S policy identifies large scale wind power projects as 'Category A' which are projects that could result in potentially significant environmental and/or social impacts that require an environmental and social impact assessment.

To translate this objective into successful practical outcomes, EBRD has adopted a comprehensive set of Performance Requirements (PRs) covering key areas of environmental and social impacts and issues.

EBRD is committed to promoting European Union (EU) environmental standards as well as the European Principles for the Environment, to which it is a signatory, and which are also reflected in the PRs. EBRD expects clients to assess and manage the environmental and social issues associated with their projects so that projects meet the PRs.

The EBRD Performance Requirements applicable to this project are summarized in the table below.

Table 13: Overview of Key Points of EBRD Performance Requirements of Relevance to the Project

EBRD PR	Key Points Relevant to the Project
PR 1: Assessment and Management of E&S Risks and Impacts	This PR outlines the process of appraising, managing and monitoring environmental and social issues associated with a project consistent with the European Union environmental impact assessment directive (85/337/EEC as amended).
PR 2: Labour and Working Conditions	This PR assures that human resources policies, procedures and standards will meet the following minimum requirements during the life of the Project with regards to labour and working conditions: Establish and maintain a sound worker-management relationship and promote the fair treatment, non-discrimination and equal opportunity of workers; Promote compliance with any collective agreements to which the client is a party, national labour and employment laws, and the fundamental principles and key regulatory standards embodied in the applicable ILO conventions; and Protect and promote the health of workers, especially by promoting safe and healthy working conditions. In addition, EBRD requires compliance with applicable EU Occupational Health and Safety requirements and, where such requirements do not exist, applicable IFC Occupational Health and Safety guidelines (IFC PS2).
PR 3: Resource Efficiency and Pollution Prevention and Control	Pollution prevention and abatement are key ingredients of a sustainable development agenda and EBRD - financed projects must meet good international practice in this regard. The impacts and issues associated with polluting activities need to be considered in all economic activities, and from effluents and emissions at the facility level, to impacts at a regional and global level where appropriate. This performance requirement assures that all aspects of the Project will meet the following objectives: To avoid or, where avoidance is not possible, to minimize adverse impacts on human health and the environment by avoiding or minimizing pollution directly arising from projects; To assist clients in identifying project-related opportunities for energy and resource efficiency improvements and waste reduction; and To promote the reduction of project-related greenhouse gas emissions.
PR 4: Health. Safety and Security	While bringing many positive benefits to local communities, projects can also increase the potential for community exposure to risks and impacts arising from temporary or permanent changes in population; transport of raw and finished materials; construction, operations and decommissioning; accidents, structural failures, and releases of hazardous materials. This performance requirement addresses the project proponent's responsibility to identify and to avoid or minimise the risks and adverse impacts to community health, safety and security.
PR 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Involuntary resettlement refers both to physical and economic displacement as a result of project-related land acquisition. Where involuntary resettlement is unavoidable, appropriate measures to mitigate adverse impacts on displaced persons and host communities should be carefully planned and implemented.

EBRD PR	Key Points Relevant to the Project
PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	EBRD recognises the need for the protection and conservation of biodiversity in the context of projects in which it invests. In pursuing these aims, EBRD is guided by and supports the implementation of applicable international law and conventions and applicable EU Directives: To protect and conserve biodiversity; To avoid, minimize and mitigate impacts on biodiversity and offset significant residual impacts, where appropriate, with the aim of achieving no net loss or a net gain of biodiversity; To promote the sustainable management and use of natural resources; To provide for fair and equitable sharing of the benefits from project development and arising out of the utilization of genetic resources; To strengthen companies' license to operate, reputation and competitive advantage through best practice management of biodiversity as a business risk and opportunity; and To foster the development of pro-biodiversity business that offers alternative livelihoods in place of unsustainable exploitation of the natural environment.
PR 8: Cultural Heritage	Cultural heritage is important as a source of valuable historical and scientific information, as an asset for economic and social development, and as an integral part of a people's cultural identity, practices, and continuity. EBRD requires the protection of cultural heritage from project activities.
PR 10: Information Disclosure and Stakeholder Engagement	EBRD considers stakeholder engagement as an essential part of good business practice and corporate citizenship. In particular, effective community engagement is central to the successful management of risks and impacts on communities, as well as central to achieving enhanced community benefits. The specific objectives of this PR are: To identify people or communities that are or could be affected by the Project, as well as other interested parties; To ensure that such stakeholders are appropriately engaged on environmental and social issues that could potentially affect them through a process of information disclosure and meaningful consultation; and To maintain a constructive relationship with stake holders on an ongoing basis through meaningful engagement during project implementation.

Note: PR 7 (Indigenous Peoples) is not considered to be applicable to this Project. The Indigenous World 2018 Report (IWGIA, 2018) states that Egypt is not classified as a country with indigenous people. In addition, this was confirmed based on previous experiences on E&S assessments with IFIs in Egypt where such standard was not triggered. In addition, PR 9 (Financial Intermediaries) is also not considered applicable.

6 ANALYSIS OF ALTERNATIVES

6.1 Site Selection Alternatives

The GoE has allocated to the NREA through Prime Ministerial Decree No. (37/4/15/14) of 2015 land for development of renewable energy projects through usufruct rights.

The area was proposed by the National Centre for Land-use Planning and was approved by the Council of Ministers. In line with the decree, the government assigned about 7,600km^2 in the GoS, east and west of the Nile, Benban and Kom Ombo regions, of which about 5,700km^2 are for wind projects (75% share) and about 1,900 km^2 for solar energy projects (25% share), This includes an area of 1,220 km^2 in the GoS with a total capacity of 3,550 MW for wind power projects (IRENA, 2018).

Of the 1,220 km^2 area in the GoS, currently an area of around 300km^2 is being developed for multiple wind farm projects as noted in the figure below. The key factors taken into account for selection of this area include the following:

- The land area is under governmental ownership and therefore does not require any land acquisition measures;
- The area is mostly free from competing uses;
- The area is presumed to be one of the areas in Egypt with the highest wind power potential;
- The area mostly consists of vast desert grounds;
- The geomorphology of the area is favourable for wind power development requiring limited construction and landscape modification measures; and
- The access to the area can be considered to be easy requiring only limited road construction measures.

Based on the above, NREA has granted the Developer full access rights to the specific Project for the development of a 200MW Wind Farm Project. Therefore, taking the above into account, there are no site alternatives that were considered by the Developer in this case.

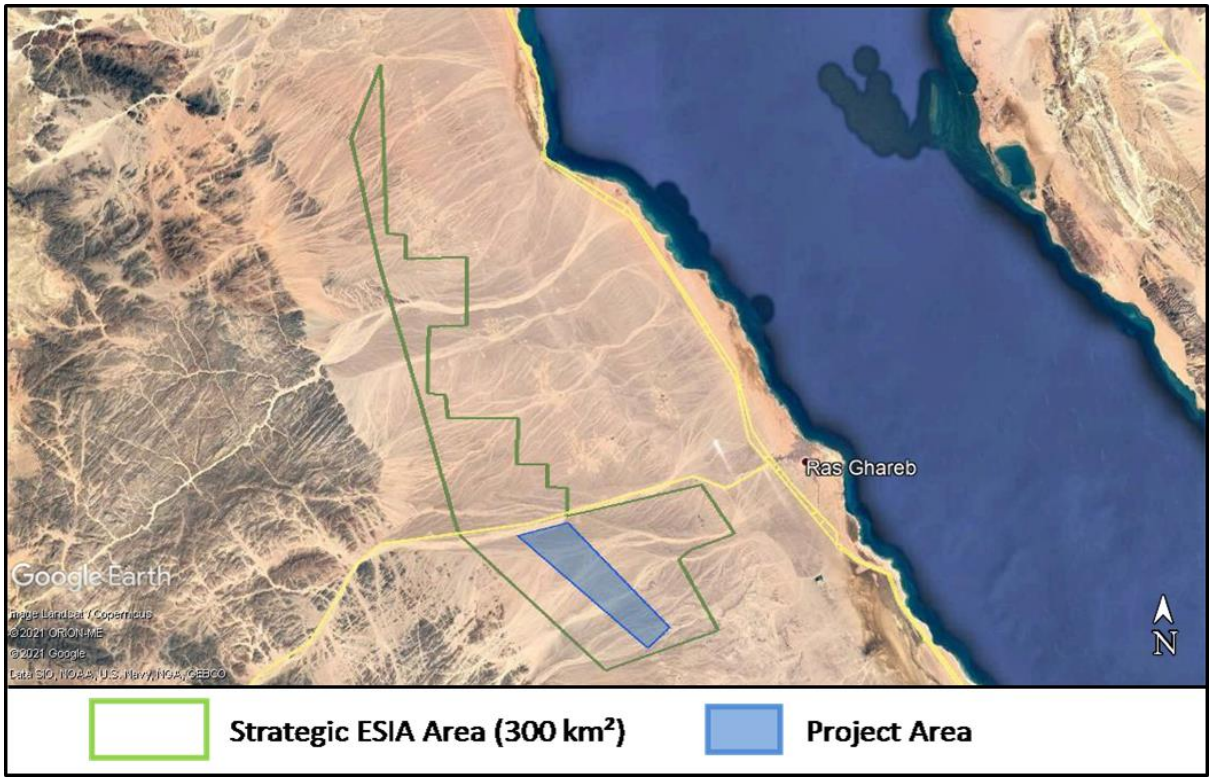


Figure 14: Project Site as Part of the 300km^2 Area Allocated for Wind Farm Developments

6.2 Technology Alternatives

This section discusses several alternatives besides the development of a wind farm project. This mainly includes other renewable energy alternatives suitable for Egypt, as well as other technological alternatives for power generation such conventional thermal power plants.

6.2.1 Renewable Energy Development Projects

As discussed earlier, the GoE has taken bold steps to adopt an energy diversification strategy with increased development of renewable energy and implementation of energy efficiency, including assertive rehabilitation and maintenance programs in the power sector (IRENA, 2018).

To this extent, in 2013, the Arab Republic of Egypt (through the Ministry of Electricity and Renewable Energy) had developed and adopted the ISES 2015 – 2035, which provides an ambitious plan to increase the contribution of renewable energy to 20% of the electricity generated by the year 2022, through hydro, wind, and solar.

Egypt enjoys favourable solar radiation intensity and it is considered one of the most appropriate regions for exploiting solar energy both for electricity generation and thermal heating applications. Similar to the wind power development process, the GoE is developing many solar development projects (to include solar Photovoltaic (PV) and concentrated solar power) through the BOO mechanism and other (such as the Feed-In Tariff mechanism). Such development projects have been identified within key areas that provide the most favourable potential and conditions for solar development – this includes but not limited to Kom Ombo, West Nile, Hurghada, Zaafarana, Benban and other.

With regards to hydropower, the main hydro resource in Egypt is the Nile River, with the highest potential in Aswan where a series of power stations are located. Within this context, several projects have been realised and several other hydroelectric plants are being developed.

Taking the above into account, with regards to the Project site in specific it is best utilised for wind power projects. According to Egypt's Wind Atlas (Wind Atlas for Egypt Measurement and Modelling 1991-2005), the country is endowed with abundant wind energy resources, particularly in the GoS area. This is one of the best locations in the world for harnessing wind energy due to its high stable wind speeds that reach on average between 8 and 10 m/s at a height of 100m, along with the availability of large uninhabited desert areas. Check figure below.

Therefore, as discussed earlier, the GoE has allocated to the NREA through Prime Ministerial Decree No. (37/4/15/14) of 2015 an area of 1,220km^2 in the GoS for wind development projects.

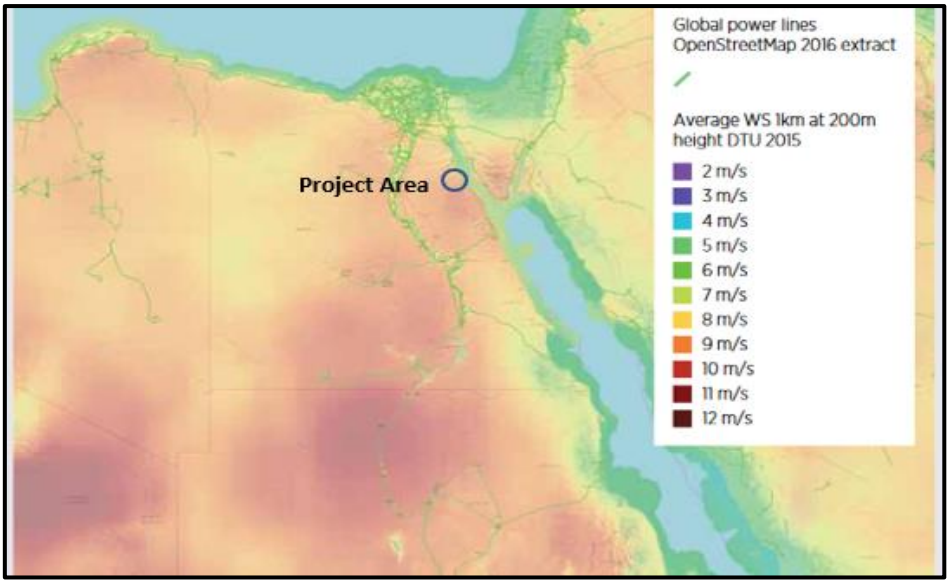


Figure 15: Egypt's Wind Atlas (Source: IRENA, 2018)

6.2.2 Thermal Power Plants

Other energy generation alternatives suitable to be built in Egypt include conventional thermal power plants, similar to others already existent in the country. Despite the advantages that a solution of this kind would entail - such as a potential bigger energy generation capacity or the creation of more jobs during both construction and operation - the disadvantages would be significant; especially those related to environmental impacts. Conventional thermal power plans are well known for their environmental impacts when compared to this Project and could include significantly higher water consumption, generation of air pollutants and greenhouse gas emissions, etc.

More importantly, as noted earlier such developments would not be in line with the Government's ISES 2015 – 2035" which in broad terms advocates for the diversification of energy resources and increasing the share of renewable energy to 20% in 2022.

6.3 Design Alternatives

As discussed earlier, currently an area of around 300km^2 in the GoS is being developed for multiple wind farm projects. NREA has granted the Developer full access rights to the specific Project for the development of a 200MW Wind Farm Project.

A Strategic Environmental and Social Impact Assessment was undertaken for the 300km^2 area (was carried out by the Joint Venture (Lahmeyer International GmbH and Ecoda) on behalf of NREA).

One of the objectives of the Strategic ESIA Area was to investigate the cumulative impacts of the wind farm developments and identify constraints to be taken into account by the various developers.

The Strategic ESIA Area investigated key E&S attributes to include biodiversity, birds, bats, land use, archaeology and cultural heritage, etc. In summary, the Strategic ESIA Area identified some constraints that should be taken into account. In addition, the approval requirements identified by EEAA on the Strategic ESIA Area also identified additional requirements. Those are identified below and have been taken into account (as applicable) by the Developer as part of the layout of the Project components.

It is important to note that at the time of the development of the Strategic study, the Government of Egypt have only approved the development of turbines with a tip height of 200m. However, in July 2022 new governmental approvals have been provided for an increase in tip height up until 220m.

Table 14: E&S Constraints Identified within the Strategic ESIA and its Permit

E&S Attribute	Requirement	Adherence
General	a. Adherence to all specification and conditions included within the 300km^2 ESIA study.	This will be adhered to as applicable
Avifauna Discussed in further details in "Section 7.57.5".	a. Avoid continuous lighting of turbines. Use minimum number of intermittent flashing lights in accordance with civil aviation authority requirements. b. Paint turbine blades to increase blade visibility by using blades with black and white aviation markings. c. Adhere to a buffer area of 1km from any adjacent wind farms that is parallel to the bird migration pattern. d. Minimum distances between wind turbines to be not less than 3 x 12 rotor-diameter to provide corridors for bird migration. e. Restrict turbine height to a maximum total tip height of 120 m (as collision risk increases with height). f. Avoid turbines with lattice towers in order to reduce suitable perching sites. g. Utilize underground electricity cables. If the use of overhead lines cannot be avoided (e.g. 220 kV OHL), such overhead lines should be designed according to the guidelines "Protecting birds from power-lines, Nature and environment No. 140, Council of Europe Publishing"; and h. Analogous measures should be applied at any substation to be built in that area.	a. Adhered to this requirement. b. Adhere to this requirement. c. This requirement will be revised within the new environmental permit that will be issued by EEAA. d. This requirement will be revised within the new environmental permit that will be issued by EEAA. e. As explained earlier, new governmental decision has been issued approving turbine heights of 220m. f. Adhered to this requirement . g. This requirement will be revised within the new environmental permit that will be issued by EEAA. h. Adhered to this requirement
Biodiversity Discussed in further details in "Section 7.4".	a. Installation of turbines and other technical installation should be avoided in areas settled by the Egyptian Dabb Lizard. b. Execution of reconnaissance on Egyptian Dabb Lizard burrow sites prior to detailed design. Installation of turbines and other construction measures are to be avoided at a distance of 250 m from Egyptian Dabb Lizard burrows.	This requirement will be revised within the new environmental permit that will be issued by EEAA.

In addition, one of the objectives of this ESIA is to build on the outcomes of the Strategic ESIA and investigate/identify any further site-specific E&S constraints to be taken into account by the Project developer throughout the planning and design phase of the Project.

However, as presented throughout the ESIA, no further site-specific constraints have been identified in relation to the Project site. Therefore, there are no additional design alternatives to be considered in relation to E&S issues. However, the ESIA identifies additional E&S requirements which must be taken into account as presented throughout the document.

6.4 No-Project Alternative

The 'no Project' alternative assumes that the 200MW Project will not be developed. Should this be the case, then the Project site area would remain the same. The land area would remain with its current characteristics – a vast desert grounds with sparse vegetation.

Should the Project not move forward, then the Project-related negative environmental impacts discussed throughout this ESIA would be averted. However, as noted throughout the ESIA, generally such impacts do not pose any key issues of concern and can be adequately controlled and mitigated through the implementation of the ESMP discussed in "Chapter 9". Nevertheless, should the Project not move forward; the significant and crucial positive economic and environmental benefits would not be realised. Such benefits include the following:

- This development allows for more sustainable development and shows the commitment of the GoE to realizing the energy strategy;
- Contribute to increasing energy security through development of local energy resources and reducing dependency on external energy sources;
- The clean energy produced from renewable energy resources is expected to reduce consumption of alternative fuels for electricity generation, and will thus help in reducing greenhouse gas emissions, as well as air pollutant emissions; and
- Project is expected during the construction and operation phase to generate local employment and commit to other social responsibilities. As such, this is expected, to a certain extent, to subsequently enhance the socio-economic conditions and standards of living of the local communities.

In conclusion, an ESIA must investigate all potential positive and negative impacts from a project development. In the case of this Project, it is important to weigh the significant positive economic and environmental impacts incurred from the Project development, against the negative environment impacts anticipated at the site-specific level – in which generally this ESIA concludes to be minor in nature and can be adequately controlled. The comparison in this chapter clearly concludes that the 'no Project' alternative is not a preferable option.

7 EXISTING PHYSICAL, BIOLOGICAL AND SOCIAL ENVIRONMENT

7.1 Landscape and Visual

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to landscape and visual.

7.1.1 Baseline Assessment Methodology

A site assessment was undertaken to characterize the general landscape and topography characteristics of the Project site. In addition, the site assessment also focused on identifying any key critical visual receptors within the Project site and a 5km radius from the area. Moreover, based on desktop review and consultations with relevant stakeholders (to include Ras Gharib Local Governmental Unit and Red Sea Governorate), any current plans in the area as well as key visual receptors within a 10km radius from the Project site were identified.

Such distance (10km radius) was taken into account, given that based on several European guidelines and regulations, four zones of potential visual impact are identified which can be distinguished as noted in the table below (SESA, 2018). At distances greater than 10km visibility impacts are not relevant and can only be seen as minor elements in the landscape (if seen at all).

Table 15: Classification of Different Zones of Potential Visual Impact

Distance	Perception of tall, man-made structures	Impact
Up to 2 km	perceptible, likely to be a prominent feature in the landscape	high impact
2 to 5 km	regularly perceptible, relatively prominent	moderate impact
5 to 10 km	only perceptible in clear visibility, seen as part of the wider landscape	low impact
> 10 km	only occasionally seen in very clear visibility, only minor element in the landscape (if at all)	no relevant impact

7.1.2 Results

Landscape and Topography

Based on the site assessment, the Project site is located within a plain area with a topography that is gently sloped towards the east. However, the eastern parts of the Project site in particular are more irregular when compared to the remaining areas with some hills. The average ground surface elevation of the Project site ranges from around 200 to 325 m above sea level.

The ground surface of the whole Project area is covered by clastic sediments of gravels, pebbles and sometimes boulder of different rock fragments impeded in fine sand and silt.

The figure below presents the general landscape and topography conditions within the various Project areas.

Visual

Critical visual receptors are identified as those normally seen as valuable by the human perception and include recreational activities, environmental reserves, local community settlements, remarkable historical or cultural sites, and other.

Based on the site visit undertaken for the Project area and the 5km radius buffer, no critical visual receptors were identified. The area in general includes the following

- Petroleum activities mainly within the northern, eastern and western areas. Note: There are also closed drilling wells within the Project site itself and its immediate surrounding areas (refer to “Section 7.9” for additional details);
- Several planned and existing wind farms to the north, south and east;
- Infrastructure elements such as existing Overhead Transmission Lines (OHTL), a substation, highways, a dumpsite, a dam and a stone crusher facility; and
- Several military posts.

In addition, based on the literature review and consultations, no critical visual receptors were identified within the 10km radius. The closest visual receptor that can be identified would be Ras Ghareb city located at around 18km to the east.

Other key critical visual receptors are located at a distance from the Project area. This includes for example: (1) closest key archaeology/cultural heritage site (harbor complex dating to the Old Kingdom located at more than 60 km away), (2) key biodiversity areas (Gabal El Zeit Important Bird Area located more than 12km away); (3) a touristic resort located more than 50 km to the north.

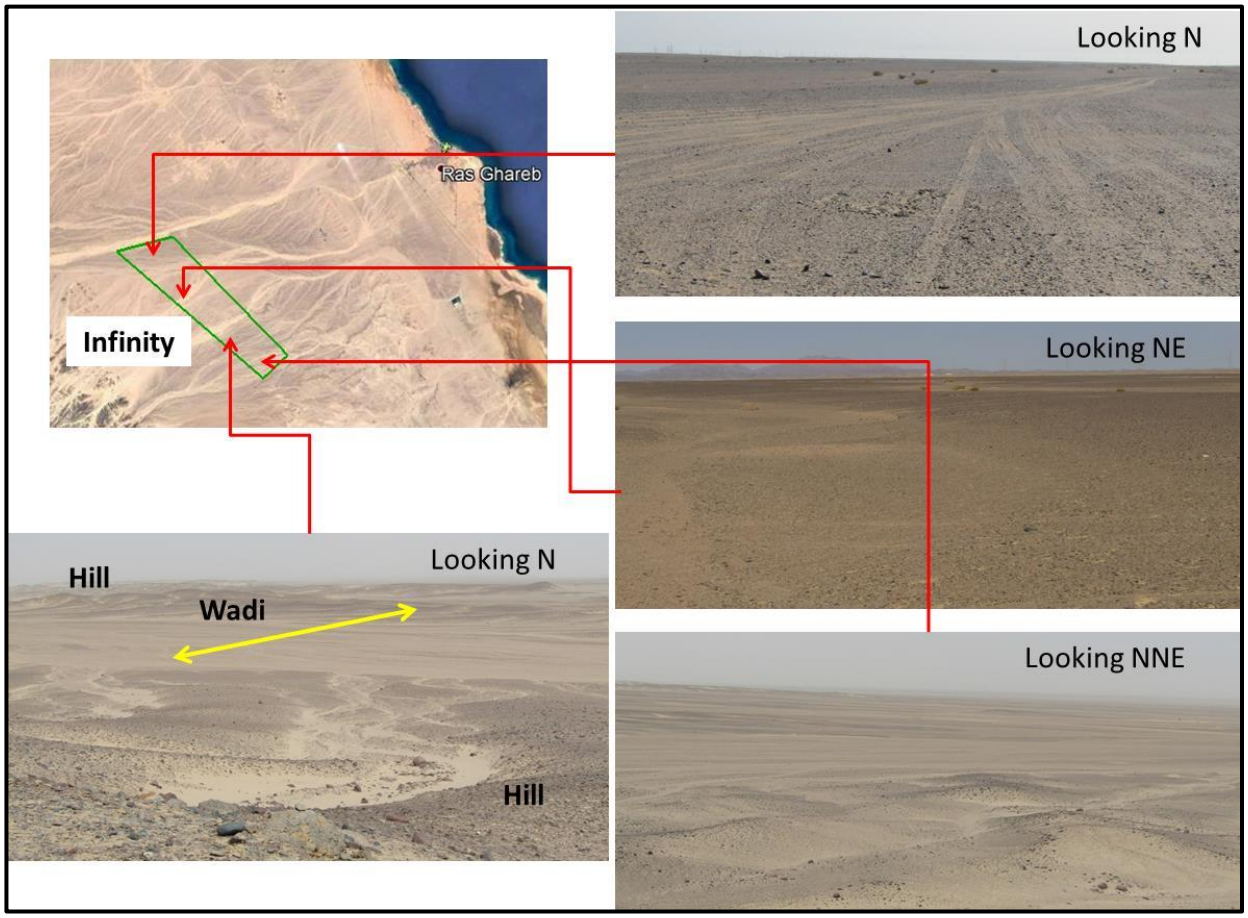


Figure 16: General Landscape and Topography Characteristics of the Project Site

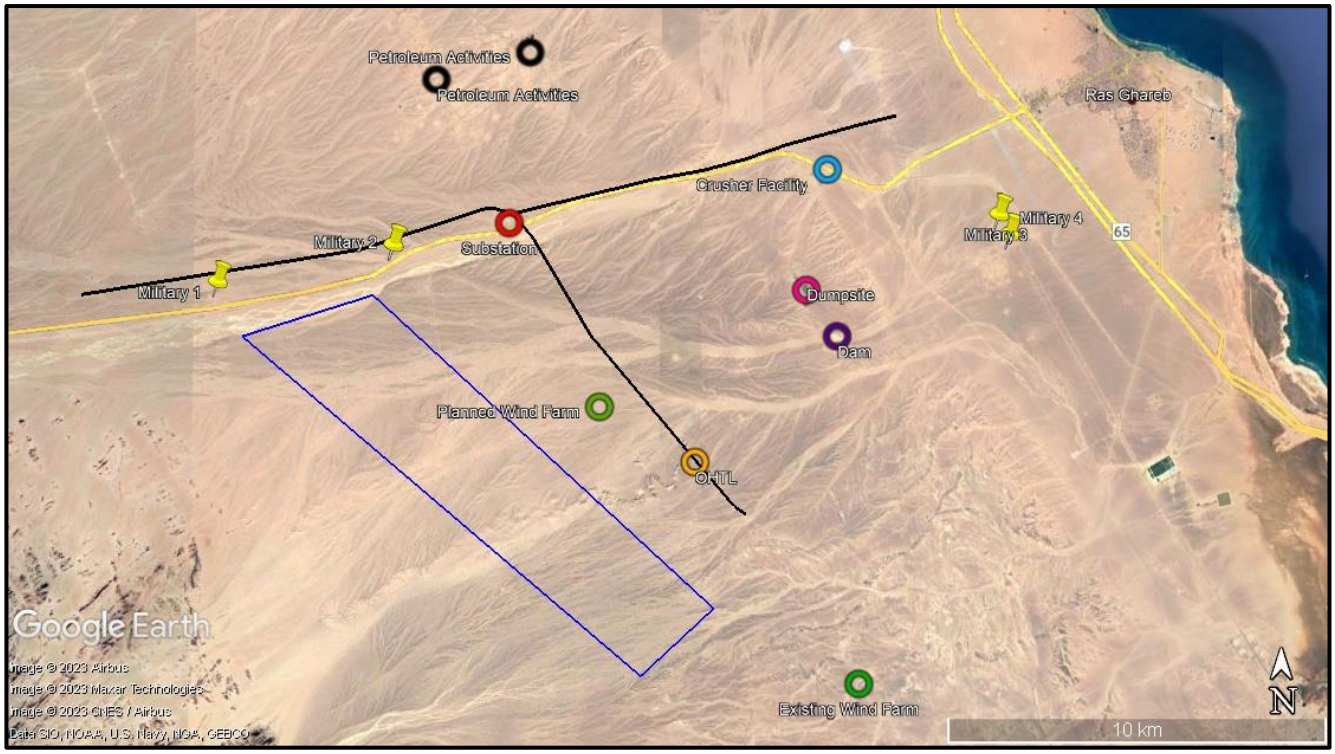


Figure 17: Nearby Visual Receptors to the Project Site

7.2 Land Use

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to land use.

7.2.1 Baseline Assessment Methodology

The baseline assessment of the 'formal' land use was based on collection of secondary data and plans available from the relevant governmental entities – this includes in particular as related to the ESIA: (i) formal land use planning for Ras Gharib; and (ii) area of critical environmental concern planning. In addition, the ESIA Team reviewed the different studies undertaken for the area.

Understanding and characterising the informal, customary, or actual land use of the Project site was mainly based on a detailed land use survey for the Project site and a 2km radius to document and understand any informal land use activities undertaken such as physical activities (houses, structures, etc.) or economical activities (such as grazing, agricultural, petroleum activities, etc.). In addition, consultations were undertaken with relevant stakeholders to further understand any informal, customary, or actual land use practices as identified throughout the text below.

7.2.2 Formal Land Use

Strategic Planning

Consultations were undertaken with the Ras Gharib Local Unit to understand the formal land use plan set for the Project area. According to such consultations, the specified area for the project is not in the City's plan and

based on “Presidential Decree No. 116 of the year 2016”, it has been allocated to NREA for the development of wind farm projects. These plots have been allocated to various developers by NREA.

Land Ownership

The Government of Egypt (GoE) has allocated to the NREA through “Presidential Decree No. 116 of the year 2016”, land for development of renewable energy projects through usufruct rights. The area was proposed by the National Centre for Land-use Planning and was approved by the Council of Ministers. In line with the decree, this includes an area of 1,220 km^2 in the Gulf of Suez (GoS) with a total capacity of 3,550 MW for wind power projects in which the Project site is located as noted in the figure below.

Based on the above, NREA has granted the Developer full access rights to the specific Project for the development of a 200MW Wind Farm Project. Therefore, the land is currently under the ownership of NREA.

Figure 18: GoE Allocated Area to NREA

Areas of Critical Environmental Concern

Planning for areas of critical environmental concern is under the responsibility of the EEAA and this includes Important Bird Areas (IBAs) and natural protectorates. EEAA’s nature protection team published in 2013 the locations for all current and future natural protectorates. The Project location is not located within any existing or planned natural protectorates, where the closest is around 15-20km away to include the planned natural protectorate at Wadi Qena as well as Ras Shukheir.

In addition, Egypt has 34 IBAs and the closest IBA to the Project site is Gabal El Zeit, covering a 100-km strip along the shoreline starting 21 km north of Ras Ghareb reaching its end 50 km north of Hurghada. The Gabal El Zeit IBA is located around 12km to the east of the Project site as noted in the figure below.

Taking the above into account, it is important to note that there is no relevant Egyptian legislation which prevents development projects (including wind farms) within or near IBAs or legislations which identify any specific constraints to be taken into account. In addition, the Strategic ESIA and environmental permit issued do not identify any specific requirements or considerations to be taken into account in relation to Gabal El Zeit IBA.

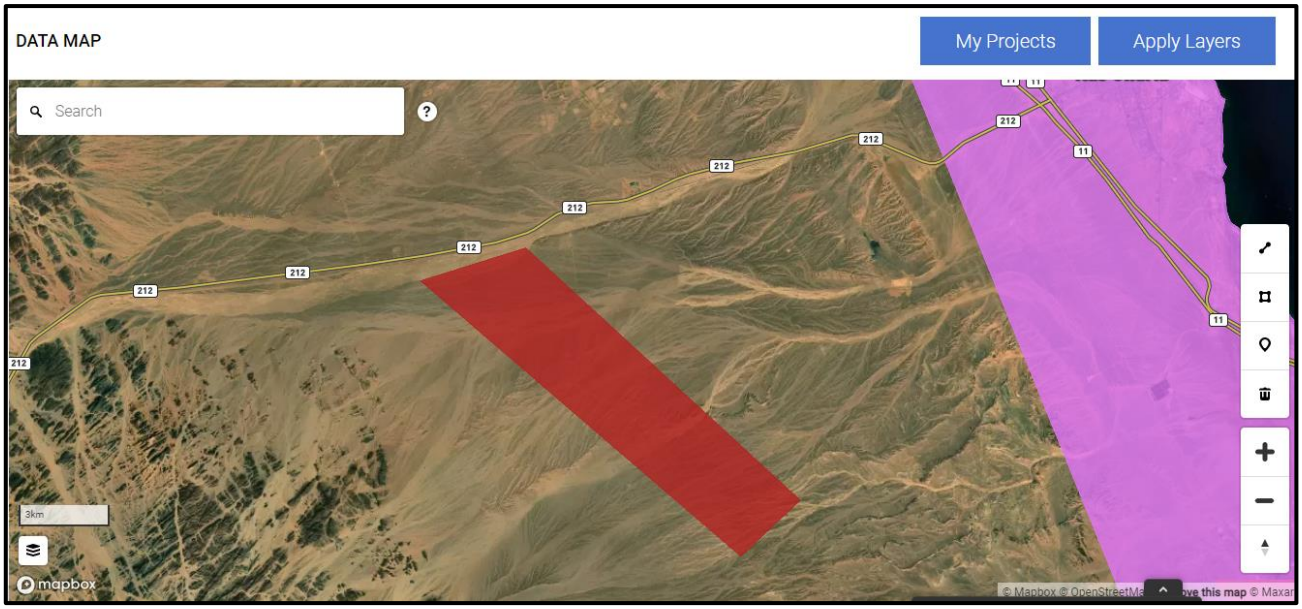


Figure 19: Location of Closest IBA

7.2.3 Informal Land Use

As discussed earlier, a detailed land use survey was undertaken for the Project site to document and understand any informal land use activities undertaken such as physical activities (houses, structures, etc.) or economical activities (such as grazing, agricultural, etc.).

Based on the above, no physical activities or economical activities were recorded within the Project site nor any evidence of such activities (e.g. ploughing marks, abandoned structures, livestock remains, etc.). However, various infrastructure elements were recorded within the Project site and which are discussed in further details under "Section 7.9".

However, a key point to be considered under informal land use is related to Bedouin Groups. The key Bedouin group known in the area is the Tabbna and the Hamadin families. In general, local Bedouin tribes do not abide to the legal process required to own land. Therefore, Bedouins apply a type of customary ownership which is not an official process known as Urfi Contracts and Ghafra System.

Bedouin tribes claim rights of these lands based on their knowledge of the area and the alleged history of their family living there for generations, even though they do not have official documents to support such claims. This practice is followed up by "Urfi" contracts however such documents are not considered by the GoE as official documents and are not considered to be supported legally. Furthermore, aiming at declaring their possession of the lands, separate houses are built and scattered in such lands. The residents construct the houses with no legal license.

In order to avoid conflicts with Bedouins, companies involved in development projects over lands claimed by Bedouins always try to get into certain arrangements with the tribes. In general, developers employ Bedouin groups to provide support in implementing their projects and providing security and protection for an agreed financial compensation. They can also work on various tasks related to the project (such as becoming security guards, provision of raw materials, provision of food supplies and water to the workers, etc.). In terms of engagement and information disclosure, the most important person to engage will be their community leader (i.e. the male head of the family).

Consultations were undertaken with the head and elders of such Bedouin families. Key outcomes are summarised below:

- There are no stable Bedouin communities in or near the Project site (i.e. Bedouin communities that settle either permanently, temporarily or nomadically). The only settled villages in the desert for Bedouin families are in Zaafarana and Wadi Dara Which is at least 50 km away from the Project site; and
- The Project site or the surrounding areas does not have any key land use activities for them such as grazing or farming activities. However, the area in general is subject to their Ghafra System that is divided between two families, the Tabbna and the Hamadin families as discussed earlier.

7.3 Geology, Hydrology and Hydrogeology

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to geology, hydrology, and hydrogeology.

7.3.1 Baseline Assessment Methodology

The assessment was based on review of secondary data to include literature review of previous publications and studies related to geology, hydrology and hydrogeology. In addition, a site assessment was undertaken to confirm and verify the outcomes of the literature review and document conditions on the ground.

7.3.2 Geology

The Project site is a part of Gharib plain which extends Northeast (NE)- Southwest (SW) parallel to the Gulf of Suez and is bounded from the west by the higher mountainous range and from the east by western coast of the Gulf of Suez.

Geologically, the Project site is located in the sedimentary basin called West Bakr that has many productive petroleum wells. As noted in the figure below, Quaternary deposits (Post-Miocene) are the main exposed sediments covering the entire Project site.

These deposits are composed of gravels, sand, clay, aeolian sand sheets and sand accumulations. They are mainly clastic sediments of different textures ranging from silt to gravel size. The composition of the Quaternary deposits is mainly the weathering products of the surrounding exposed rocks. The color of the soil cover (Quaternary deposits) reflects the source of the sediments. However, while the area around the Project site has occurrences of igneous rocks of the Red Sea Mountain range in the far west and southwest, which consists mainly of granitic rocks rich in feldspars reddish in color, the soil cover in the Project area predominantly dark as it consists of fragments of granite and feldspars, the weathered products of granites.

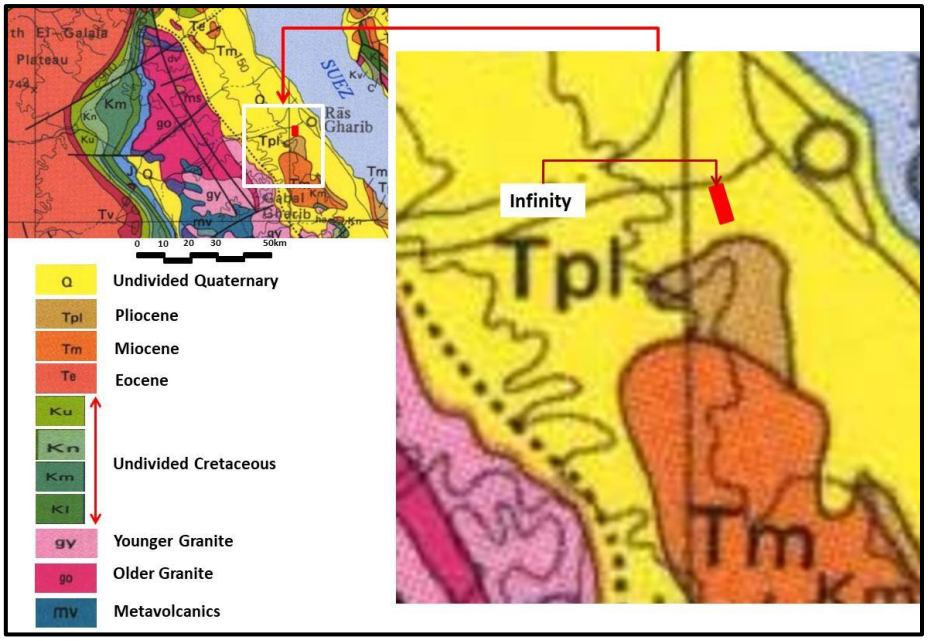
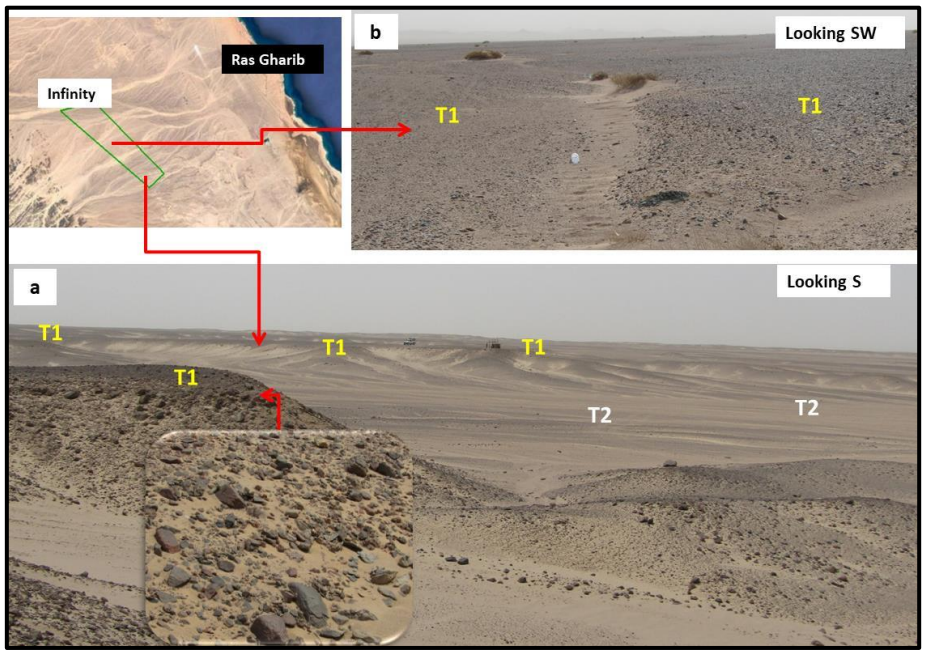


Figure 20: Geological Formations within Project Site and Surrounding Areas

During the field survey, with the help of geological maps and aerial photographs, the different types of soil, characteristics and their location in the Project area were investigated. This includes 3 alluvium terraces as noted in the figures and table below.



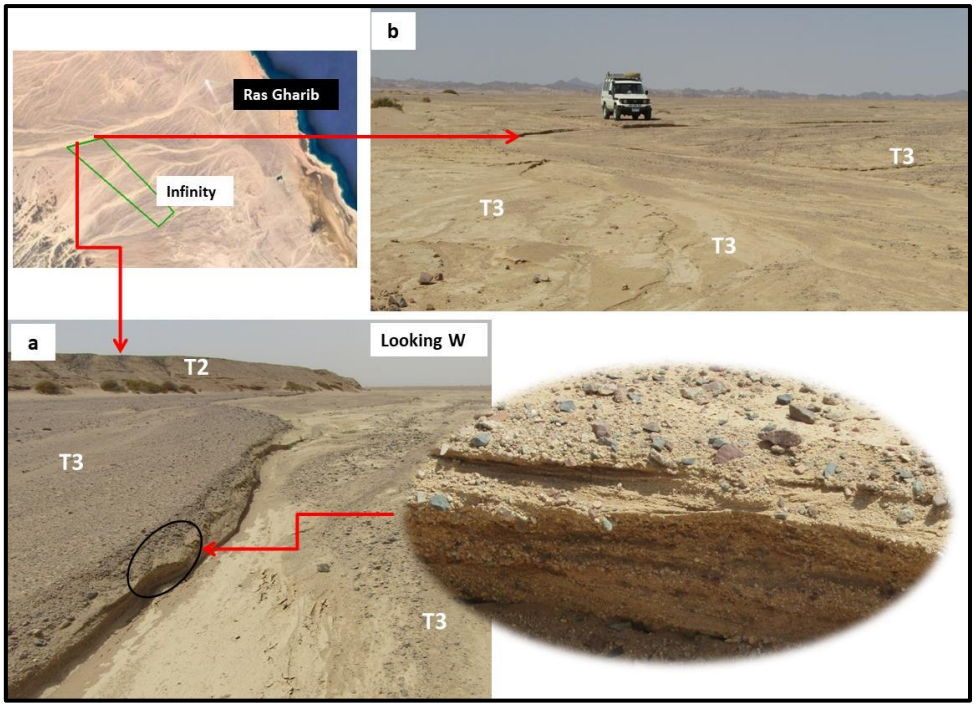


Figure 21: Distribution of Alluvium Terraces

Table 16: Description of Alluvium Terraces within Project Site

Type	Description
T1	These terraces represent the top of the elevated land and the longitudinal shallow hills along the whole area of the Project site. These old terraces have been dissected by numerous shallow and wide tributaries drain eastward to the Gulf of Suez. The maximum elevation of the terraces at the northwest part is about 280 m (a.m.s.l), while it attains about 240 m (a.m.s.l.) at the southwest part. The height of the terrace above the ground level (the level of the following terrace) varies from about 1m to about 2m at the northwest, while it varies from about 1m to about 3m at the southwest. This terrace is composed of very coarse chert nodules, cobbles and boulders of granite, basalt, impeded in fine clay and sand.
T2	These terraces are exposed along the floor of the tributaries cutting through the terrace T1. The height of the terrace T2 above the ground level (the level of the following terrace) varies from about 0.5m to about 1.5 m at the northwest, while it varies from about 0.5m to about 2m at the southwest. This terrace is composed of medium sized chert nodules, fragments igneous rocks impeded in fine clay and sand. The fine clay and sand fraction are bigger than that in the previous terrace (T1).
T3	These terraces are exposed along the floor of the tributaries cutting through the terrace T2. The height of the terrace T3 above the ground level (the level of the following terrace) varies from about <0.5 to about 2m at the northwest, while it varies from about 0.5m to about 1m at the southwest. This terrace is composed of small nodules, fragments of igneous rocks impeded in fine clay and sand. The fine clay and sand fraction is bigger than that in the previous terrace T2.

7.3.3 Hydrology

The Project site is located within two basins of Wadi Abu had and Wadi Aldarb. The physiographic features of the Project area and its surroundings could be distinguished into three units; high, medium, and low relief as noted below.

High Relief Unit: this unit comprises the mountainous area, which is composed essentially of Pre-Cambrian basement rock. This unit rises above 500 m above mean sea level (refer to figure below);

Medium Relief Unit: this unit occupies the eastern foot slopes of the mountainous area. This area is composed of dissected hills and weathered zone. The elevation of this unit ranges from 150 up to 500 m above sea level (asl). This unit is characterized by the presence of shallow and wide drainage lines with dissected hills. This unit is characterized by the presence of some applications to control the flash flood hazards.

Low Relief Unit: the unit occupies the low land area between the hilly unit and the Gulf of Suez. The ground surface elevation of this unit is less than 150 m (asl). This unit comprises many dissected alluvial terraces and dissected peneplain at the exits of drainage basins like Wadi Ahu Had and Wadi Aldarb (discussed in further details below). It represents a good collecting basin for surface water runoff. It has a ground elevation ranging between zero to about 150 m (asl), with a general surface slope towards the east. The following geomorphic features are expected in this plain.

In addition, the following geomorphic features are expected in this plain:

- Dissected alluvial terrace unit: it occupies an extended plain covered by thick alluvial terraces. It faces the hilly area and receives its outwash of the weathering products.
- Coastal plain unit: it occupies a limited zone towards the east between the dissected alluvial plain and the Gulf of Suez shoreline. This coastal plain is narrow to the north and becomes wider towards the south. It receives the finer sediments carried through streams, which cut the dissected alluvial plain and the peneplain.
- Salinas and lakes unit: it occupies a low land area north and south Ras Abu Ghareb city. Sabkhas, salt marshes and ponds of saline water surround it.
- Wadi channel unit: it occupies the main channels of the two (2) dry Wadies dissected the area; which are Wadi Abu Had and Wadi Aldarb as presented in the figure below.

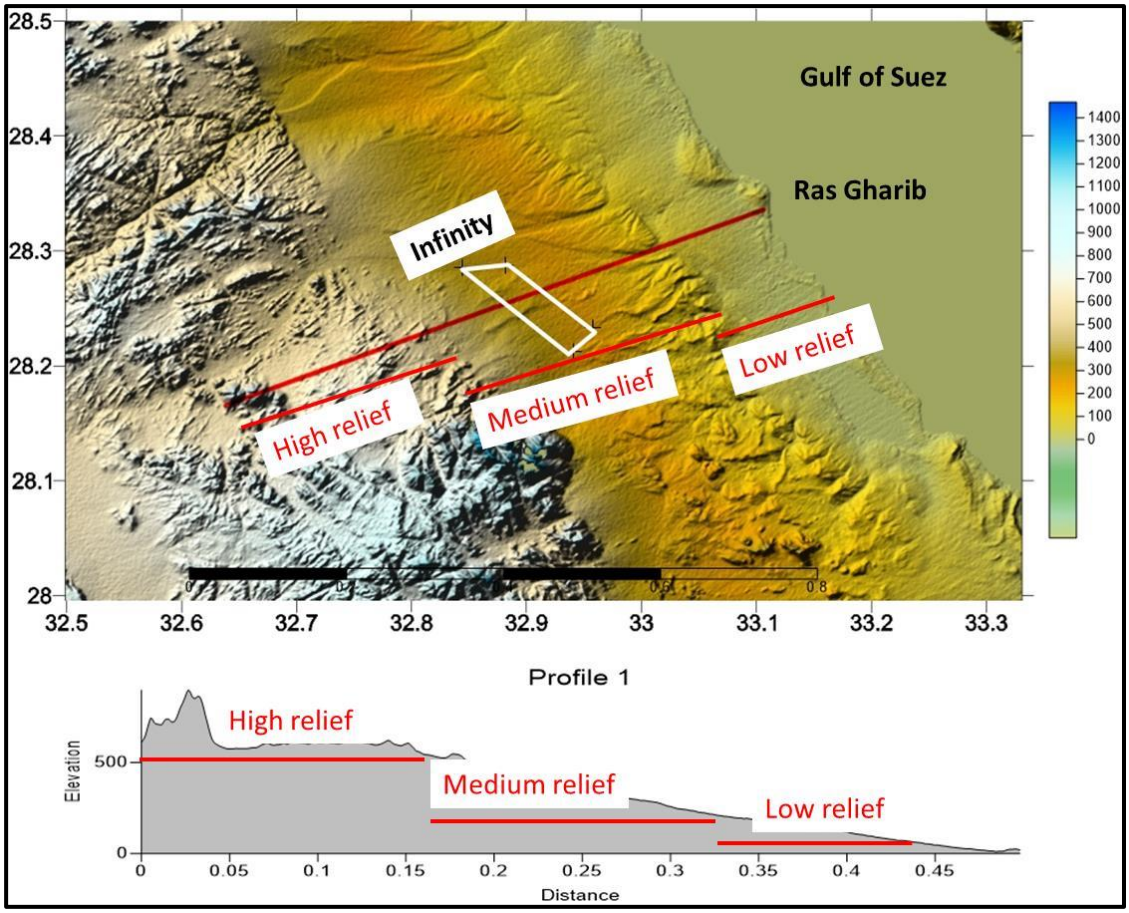


Figure 22: Digital Elevation Map of the Area

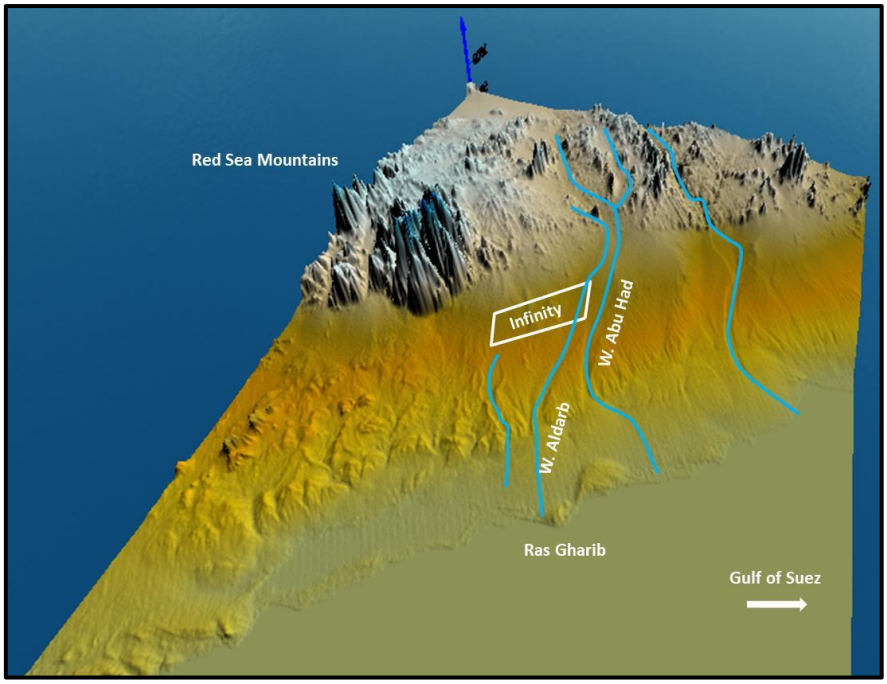


Figure 23: Elevation Model of the Project Area

Based on the site visit undertaken, it is clear that the Project concession is located in a medium relief area characterized by:

- The entire area of the Project is wide and almost horizontal with numerous straight, shallow, and short tributaries. Simple relief and gentile dipping ground surface reflect the weak intensity of runoff to form deep channels.
- The main trunk streams are very shallow and wide covered by fine sand and coarse sized gravels of chert and rock fragment that reflect the week intensity of flow that can't carry boulder sized fragments.
- Variable altitude hills dissected by water tributaries are exposed in many parts of the site especially along the main streams
- Going to the southeast part of the Project site, shallow and very wide drainage lines have been exposed with multi sized grain deposits and low sinuosity reflect the weakness of the surface flow.
- The small tributaries at the Project site are very shallow, straight and have no wide alluvial fans which reflect small volume of water they carry and slow surface water flow
- The great thickness of soil layer with high porosity and permeability as it composed of multi sized chert and rock fragments impeded in sand covered the whole Project area. Therefore, great quantity of rainfall infiltrates the surface reducing the surface flow.
- The main course of Wadi Adu Had runs completely out of the entire project area at the northwest border. Based on the field study, it could be stated that the basin of Wadi Abu Had is located out of the site to the north, which is considered one of the dangerous basins in which flash floods occurs, which driven the officials to establish flood mitigation facilities on this wadi.
- The other key wadi is crossing the Project site (Wadi Aldarb). However, the dangerous part of the Wadi that receives dangerous flooding is out of the Project site to the east and therefore, a flood barrier dam with a wide artificial storage lake was constructed as a flood mitigation facility downstream of the site at around 8km to the east.

7.3.4 Hydrogeology

The figure below presents the hydrogeological conditions of the Project site and surrounding areas, based on the hydrogeological map of Egypt of 1999. As noted, the Project site is located in an area of wadi deposits with moderate to low productive aquifers with insignificant surface recharge and limited sub-surface recharge. This entails that there are no shallow groundwater aquifers with a continuous source of fresh water recharge, and this is due to the lack of rain and large drainage basins to collect rainwater.

There is no utilization of groundwater in the Project site, it could be considered that the fresh groundwater is not an important source of water in the Project area. Moreover, in the wide area surrounding the site, the recent well inventory and available literature show that groundwater wells are concentrated within Wadi Araba, located about 100 km north of Project site. Wadi Araba was considered as a wadi with high groundwater possibility (Aggour, 1990). Rocks belonging to Carboniferous and Lower Cretaceous sandstone represent the main source of water in the Wadi Araba Depression. The water is tapped from springs, shallow wells and occasionally deep wells. The collected information from shallow groundwater wells and springs in Wadi Araba reveals that the water salinity varies between 1025 to parts per million (ppm) and 50,233 ppm.

In the GoS, groundwater is used mainly for touristic and industrial purposes. According to the rates of groundwater withdrawal with respect to water requirements, the Gulf province includes areas into which the groundwater represents 10-40% of the utilized water supplies. The daily discharge ranges from 260 to 3000 m3/day at Wadi Araba and El Sukhna-Zafrana localities respectively (Sewidan and Misak, 1992). The continuous use of such water potentially stresses its quantity and quality.

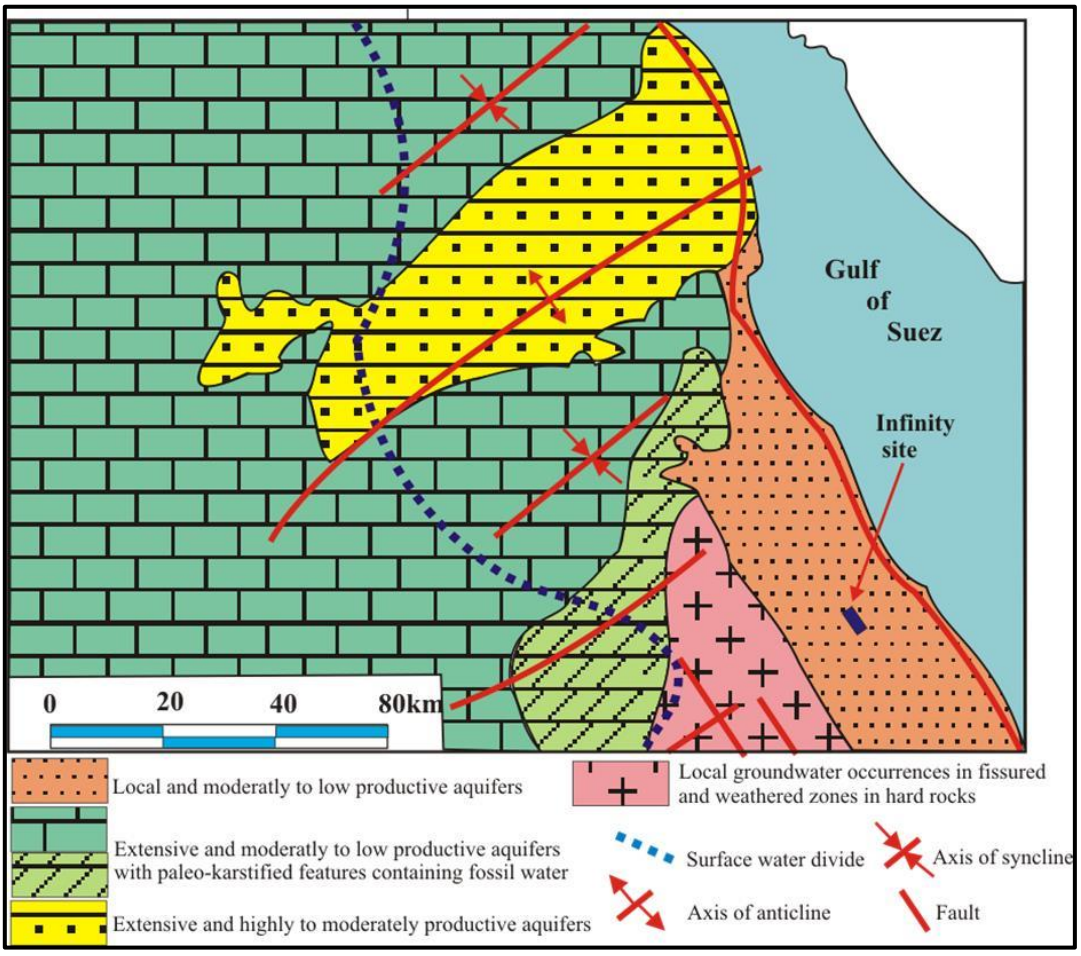


Figure 24: Hydrogeological Map of the Area around the Project Sit

7.4 Biodiversity

This section provides an assessment of baseline conditions in relation to biodiversity. It is important to note that biodiversity assessed in this section excludes birds (avifauna) and bats (Chiroptera), which are discussed separately in subsequent chapters.

7.4.1 Baseline Assessment Methodology

(i) Desktop Review

The baseline assessment of the Project site was first based on review of existing literature which includes published sources of previous studies, data, surveys, and records available in published scientific papers, books, and journals on flora and fauna of the region, other available data from other studies that have been conducted in the area and/or adjacent areas, as well as any available grey literature or vernacular knowledge based on local community observations in order to establish a preliminary baseline data on terrestrial fauna and flora of proposed Project area. The key documents reviewed are provided in the table below.

The main objective was to assess the site's relative significance for terrestrial fauna and flora, taking into consideration known and potential species, their status, local distribution and proposed project activities. Conservation status of recorded species was taken into consideration during the assessment and reporting. Species conservation status was identified according to International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN, 2020), which provides the global conservation status of evaluated species. Local status of the potential and recorded species was added, when their status in national Red Lists were available.

In addition to desktop review, surveys were undertaken for the Project site during spring 2021, autumn 2021 and spring 2023. Additional details for each survey is discussed below.

Aly, M. A., Harhash, M. M., Awad, R. M., & El-Kelawy, H. R. (2015). Effect of foliar application with calcium, potassium and zinc treatments on yield and fruit quality of Washington navel orange trees. Middle East J. Agric. Res, 4(3), 564-568.
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Braun-Blanquet, J., and J. Braun-Blanquet. "Pflanzengesellschaft und Biozönose." Pflanzensoziologie: Grundzüge der Vegetationskunde (1964): 1-6
El Alqamy, Husam, and Sherif Baha El Din. "Contemporary status and distribution of gazelle species (Gazella dorcas and Gazella leptoceros) in Egypt." Zoology in the Middle East 39.1 (2006): 5-16.
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Schubert, Gerald, Donald Lawson Turcotte, and Peter Olson. Mantle convection in the Earth and planets. Cambridge University Press, 2001.
Sheriff Baha El-Din (2006): A Guide to Reptiles & Amphibians of Egypt. The American University in Cairo Press. 320 pp

(ii) Mammal and Reptile Surveys

- Line Transects: a GIS-based survey design was prepared taking into account the hydrology of the landscape to create a cross-shaped line transects at quadrant corners with a distance covering 200 m per transect across the landscape. Additionally, a dedicated system of transects were applied using the sampling center-point as starting points and walking a 500 m in the four cardinal directions (E, W, N & S). Every line transect was scanned 25m by visual observation and 50m through binocular observation at either side of the transect walk. It should be noted that roughly 94,400 m of transects were surveyed to form roughly 9.44 km2 over the site. *Particular attention was given during the survey to a threatened species known to inhabit the area, Egyptian Dabb Lizard Uromastyx aegyptia which is classified as globally "Vulnerable" by IUCN Red List of Threatened Species.*

  This design ensured a minimal bias of the surveyors towards certain areas and served as an excellent quality control of the data acquisition process. The survey teams (2-surveyor teams morning/night each team consisting of 3 experienced ecologists) along with their drivers, navigated to the designated station using 4*4 vehicles and GPS. When the team arrived at the beginning of the line, they got on foot for careful data collection and meticulous examination of the surroundings along the survey line. Any observations, especially the Uromastyx were recorded.

  During the navigation time between sampling location the team conducted a drive transect, in which each surveyor covered one side of the path, and any wildlife observations were recorded within the data sheets.

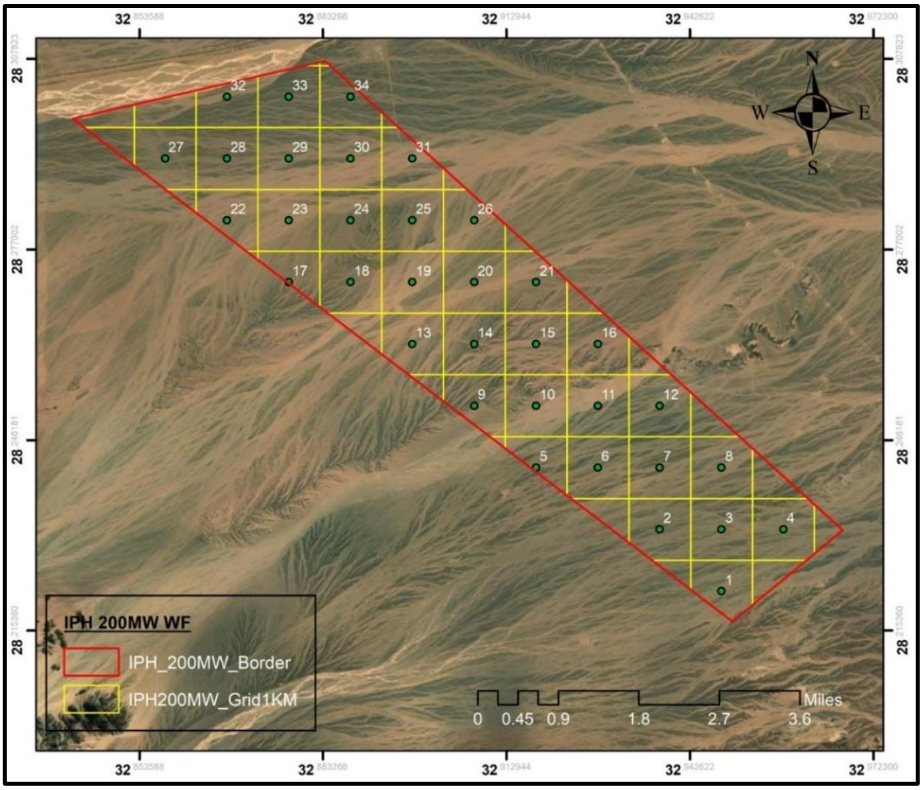

Figure 25: Sampling Sites within the Project Area

- Track stations: two (2) track stations were installed (site 1/ N: 28.302912, E: 23.872760 and Site 2/ N: 28.276487, E: 32.890468) each with an area of 3 m^2. The traps were visited twice per day (morning and evening) for checking of tracks and recordings. In the evening, clearing activities were conducted for the next night. Traps were fixed according to indirect observation (track, faeces, etc.) of animals. Camera traps (Bushnell –HD camera trap) were fixed at one site for one night- 3rd of May 2023- for nocturnal animal

detection (site 1) using canned salmon with a strong fishy odor. Camera traps were fixed at one site for one night for nocturnal animal detection (site 1). The sites were selected according to the activity of animals at this site. Track stations are established to maximize the detectability of nocturnal large mammal species that are hard to detect using active survey methods like line transects or live-trapping. Track stations are mainly put in place to augment the active survey during the night time where these species are more active and provide less invasive way of sampling such shy and illusive species.

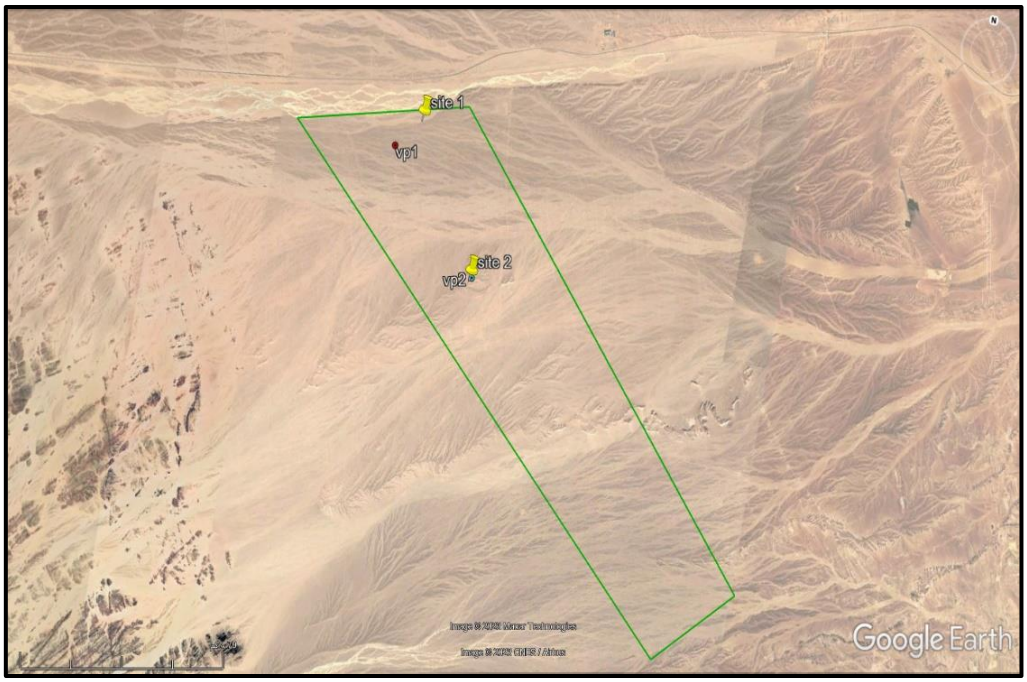

Figure 26: Track Stations

- Pitfall Trapping: three (3) stations of sand-bedded pitfall traps (a total of 50 traps) were deployed in Wadi beds from 10th of April for six (6) nights. Stations of sand-bedded pitfall traps (a total of 50 traps) were deployed in Wadi beds. The locality of the stations was determined after site visits were undertaken for the Project area. Each station was visited twice a day (morning and evening) for data collection and release of trapped animals.

- Active Searching: active searching was undertaken to provide direct input to the target data set inventorying the herepto fauna. Active searching targets the moving ground dwelling reptile species such as lizards agamas and snakes. During active search spiny-tailed lizard and its burrows are also recorded. Between each consecutive transect line (as per method earlier), an active searching plot will be conducted.

- Night searching: night searches were conducted for nocturnal reptiles using strong torches and headlights as well as car lights in the main habitat types such as wadis, and slopes. Based on the outcome of the line transect surveys; night search locations were determined.

- Invertebrate Fauna survey: For invertebrate survey, the stated methods of active search and pit-fall traps were the main methods of sampling. In addition, using handheld-nets were used for sampling to confirm identification. Direct observations and photographic documentations evidence were used to confirm presence and confirmation of identification of the species.

(iii) Habitat and Flora Surveys

In general, the spring season is considered the best period to assess the habitat and vegetation conditions onsite. The objective was to confirm the identity of the species, species densities coverage, and abundance estimation as well as determining the habitat that may be utilized by them within the proposed Project area.

Linear Transects /Quadrat Method

This method was used to study flora within the site for studying community structure and covers the most distribution data. A stratified sampling technique was utilized. A total of nine (9) transects were surveyed within the Project location with transects selected to cover and represent all microhabitats (check figure below). Within each transect, 100 x 100 m (10000 m²) quadrants were placed along its length on alternating sides of the transect (figure below). A total of thirty-four (34) quadrats were distributed onsite.

According to "Braun – Blanquet (1964)" in each of the transects / quadrates the following vegetation parameters were recorded namely: species, abundance, and density cover. These parameters were used to assess the general conditions of vegetation cover and to determine the community structure quantitatively.

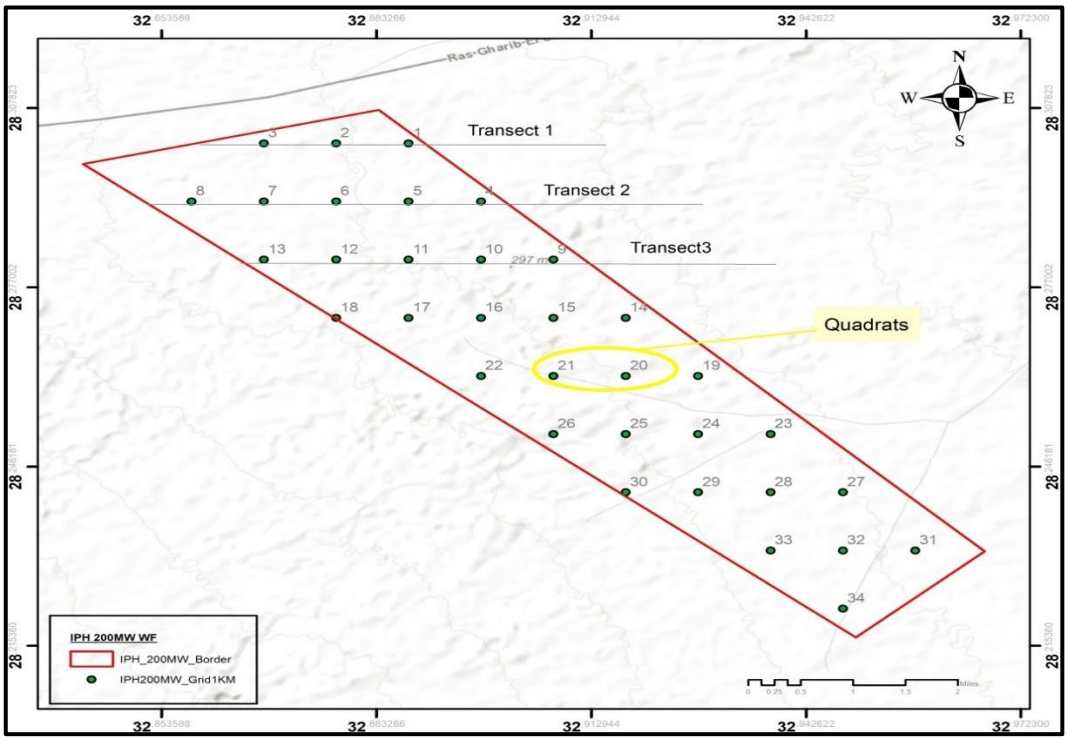

Figure 27: Transects within the Project Site

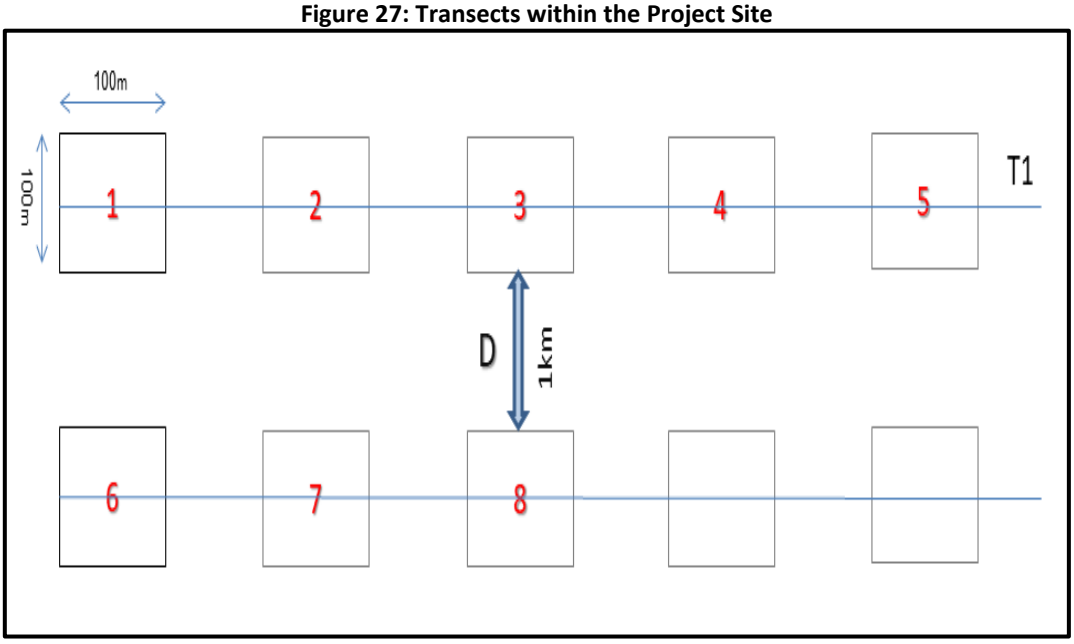

Figure 28: Sampling Methodology, Linear Transects / Quadrant Method

7.4.2 Results

In accordance with the methodology discussed above, the results below discuss the findings and outcomes for flora and fauna based on the literature review and field survey.

Reptiles

Reptiles are the most diverse vertebrate group in the desert habitats like the Project area, and consist entirely of typical desert species. This herpetofauna is composed of lizards and snakes that are adapted to rocky and sandy desert habitats. Additionally, according to Baha El Din (2006), there are 33 species that are documented, or at least expected, to be present in the Project area and its vicinity, see table below. On the other hand, the 33 species listed belong to seven families. Out of all those species, twelve are assessed on the global level of the IUCN Red List of Threatened Species. Eleven of these species are evaluated as Least Concern while one species is evaluated as threatened (Vulnerable); *Uromastyx aegyptia*.

Table 17: Reptilian Species Known to Occur within Study Area

Family	Scientific name	Common name	IUCN Red List of Threatened Species 2021
Gekkonidae	*Cyrtopodion scabrum*	Keeled Rock Gecko Rough Bent-toed Gecko	Least Concern
	Hemidactylus flaviviridis	Yellow-bellied Gecko	Not Evaluated
	Hemidactylus turcicus	Turkish Gecko	Least Concern
	Ptyodactylus guttatus	Spotted Fan-toed Gecko	Not Evaluated
	Ptyodactylus hasselquistii	Egyptian Fan-toed Gecko	Not Evaluated
	Ptyodactylus siphonorhina	Saharan Fan-toed Gecko	Not Evaluated
	Stenodactylus petrii	Sand Gecko	Not Evaluated
	Stenodactylus stenodactylus	Elegant Gecko	Not Evaluated
	Tropiocolotes steudneri	Steudner's Pigmy Gecko	Not Evaluated
Agamidae	*Agama spinosa*	Spiny Agama	Least Concern
	Pseudotrapelus sinaitus	Sinai Agama	Least Concern
	Trapelus pallidus	Pallid Agama	Not Evaluated
	Uromastyx aegyptia	Egyptian Dabb Lizard	Vulnerable
Lacertidae	*Acanthodactylus boskianus*	Bosc's Lizard	Not Evaluated
	Acanthodactylus scutellatus	Nidua Lizard	Not Evaluated
	Mesalina guttulata	Small-spotted Lizard	Not Evaluated
	Mesalina olivieri	Olivier's Lizard	Least Concern
	Mesalina rubropunctata	Red-spotted Lizard	Not Evaluated
Varanidae	*Varanus griseus*	Desert Monitor	Not Evaluated
Scnincidae	*Chalcides ocellatus*	Ocellated Skink	Least Concern
	Scincus scincus	Sandfish	Not Evaluated
	Sphenops sepsoides	Audouin's Sand-skink	Least Concern
Colubridae	*Lytorhynchus diadema*	Diademed Sand Snake	Least Concern
	Malpolon moilensis	Moila Snake	Not Evaluated
	Platyceps rogersi	Spotted Racer	Least Concern
	Platyceps saharicus	Saharan Cliff Racer	Not Evaluated
	Psammophis aegyptius	Saharan Sand Snake	Not Evaluated
	Psammophis schokari	Schokari Sand Snake	Not Evaluated
	Spalerosophis diadema	Diadem Snake	Not Evaluated
Viperidae	*Cerastes cerastes*	Horned Viper	Least Concern
	Cerastes vipera	Sand Viper	Least Concern
	Echis coloratus	Burton's Carpet Viper	Not Evaluated

Based on the site survey, the reptile taxa included 6 species varying into four (4) lizards, namely: *Uromastyx aegyptia*, *Mesalina rubropunctata*, *Acanthodactylus boskianus,* and *Trapelus pallidus*, one (1) viper *Cerastes cerastes* and one (1) snake Psammophis aegyptius. None of these reptile species is endangered or vulnerable on the Redlist scale except for the Egyptian Dabb Lizard (*Uromastix aegyptia*) which is categorized globally as Vulnerable (VU).

Acanthodactylus boskianus

Mesalina rubropunctata

Psammophis aegyptius

Spalerosophis sp

Trapelus pallidus

Figure 29: Reptiles Species Recorded in the Project Site

The field work resulted in recording high density of active Dabb (Egyptian Dabb Lizard) burrows. A total of 123 Dabb burrows were recorded where 95 of those were active. The active burrows were mainly concentrated in the northern parts of the study site as shown in the figure below. These results show a density of 3.5 burrow /km².

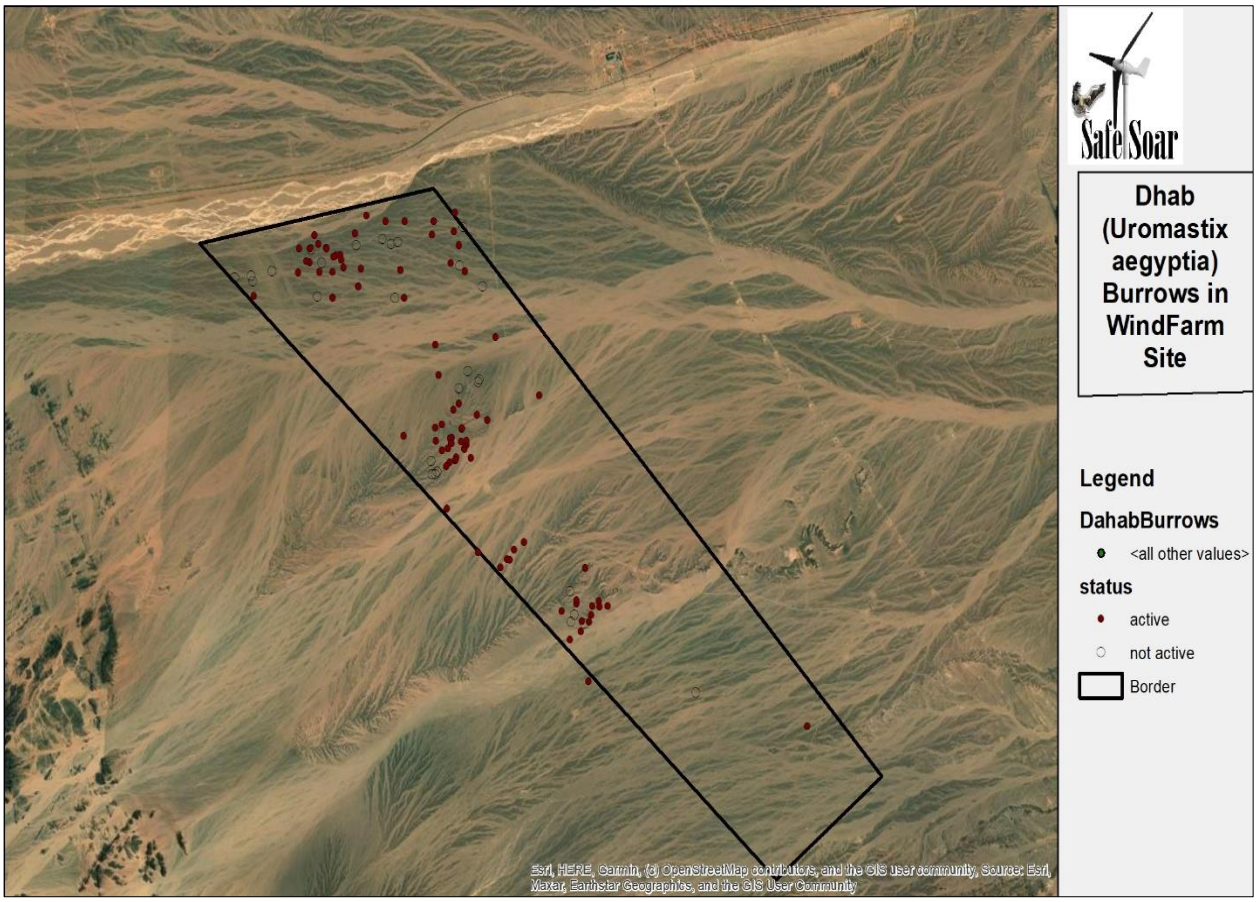

Figure 30: Recorded Burrows in the Project Site

Figure 31: Egyptian Dabb LizardRecorded During Site Survey

Mammals

Mammals' distribution is associated with the distribution and abundance of vegetation cover and therefore most species are found in vegetated wadis, rocky hillsides or mountain slopes.

Literature review has shown that 19 species occur in the Project site and its vicinity (Basuony et al., 2010; Hoath, 2009; Osborn and Helmy, 1980), see table below. It should be mentioned that some of the species are listed as their distribution range maps in literature have shown that they are present in the general area of the Project site although no specific studies have confirmed that. Additionally, some of the listed species are known to be present in the highlands to the west of the Project site and therefore are potentially considered to be present in the vicinity of the Project site, even in small numbers.

Out of the 19 species listed, sixteen are listed as Least Concern according to IUCN's Red List of Threatened Species while two are evaluated as Threatened (both Vulnerable); *Capra nubiana* and *Gazella dorcas,* while the remaining species is evaluated as Near Threatened; *Hyaena hyaena*.

The *Capra nubiana* and *Gazella dorcas* have the area of the Project site as part of their distribution range. Regarding the *Capra nubiana*, the species typical habitats include mountainous areas and is expected to be present, if at all, to the west of the Project site in the mountains. In addition, regarding the Striped Hyaena (Near Threatened), the species is known to have a very wide home range reaching up to 60 km. Although it could still be present in the Project site, its numbers are believed to be extremely low and would be generally confined to areas with very low human presence.

Table 18: Mammal species (excluding bats) Recorded in Project Site and its Vicinity

Family	Scientific name	Common name	IUCN Red List of Threatened Species 2021
Erinaceidae	*Hemiechinus auritus*	Long-eared Hedgehog	Least Concern
Leporidae	*Lepus capensis*	Cape Hare	Least Concern
Muridae	*Acomys cahirinus*	Cairo Spiny Mouse	Least Concern
	Acomys russatus	Golden Spiny Mouse	Least Concern
	Dipodillus dasyurus	Wagner's Gerbil	Least Concern
	Gerbillus gerbillus	Lesser Egyptian Gerbil	Least Concern
	Gerbillus henleyi	Pygmy Gerbil	Least Concern
	Gerbillus pyramidum	Greater Egyptian Gerbil	Least Concern
	Gerbillus floweri	Flower's Gerbil	Least Concern
	Jaculus jaculus	Lesser Egyptian Jerboa	Least Concern
	Meriones crassus	Sundevall's Jird	Least Concern
	Sekeetamys calurus	Bushy-tailed Jird	Least Concern
Felidae	*Felis silvestris*	Wild Cat	Least Concern
	Vulpes rueppellii	Ruppell's Fox	Least Concern
	Canis lupaster / *Canis aureus*	African Wolf / Golden Jackal	Least Concern
	Hyaena hyaena	Striped Hyena	Near Threatened
Procaviidae	*Procavia capensis*	Rock Hyrax	Least Concern
Bovidae	*Capra nubiana*	Nubian Ibex	Vulnerable
	Gazella dorcas	Dorcas Gazelle	Vulnerable

Based on the site surveys, five (5) mammal species were recorded in the site, namely; Arabian Red Fox (*Vulpes vulpes*), Dorcas gazelle (*Gazella Dorcas*) and other 3 species of smaller rodents. Those are Lesser Egyptian Jerboa (*Jaculus jaculus*), Mackilligin's Dipodil (*Dipodilus macklilligni*) and Lesser Egyptian Gerbil (*Gerbillus gerbillus*). All the rodent species are typical species of the ecosystem and are usual encounters. Rodent specie recorded are all Least Concern on the Redlist scale. Similarly, the Red Fox is also quite common species in the Red sea coast ecosystem and is categorized as Leas Concern.

The most significant species is the Dorcas gazelle. Egypt's fauna has only 2 species of gazelle surviving (H. El alqamy and S. Baha eldin, 2006) the Dorcas Gazelle and the Selender-horn Gazelle in the western Deserts of Egypt. A fresh track was recorded in the site. Gazelle species is very high on the National conservation agenda.

Figure 32: Traps

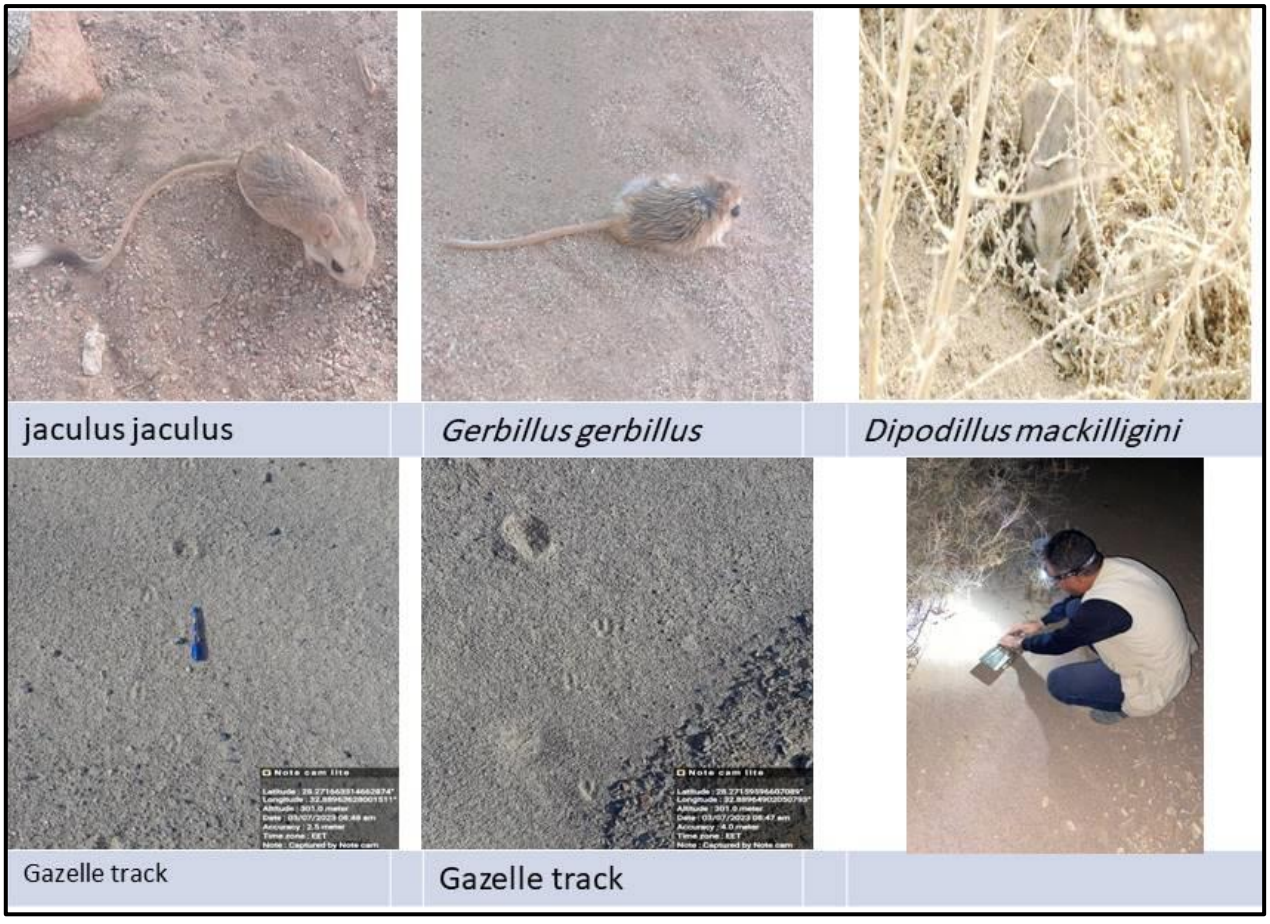

Figure 33: Mammals (some Rodents and Gazelle Track) Recorded in the Project Site

Figure 34: Red Fox Recorded in the Project Site

Other invertebrates were recorded as identified in the table below. Many insect species that are the staple of the diet of many vertebrates, such as lizards and species of predators are common in the study area. The invertebrates belonged to 16 families and 37 genera with the most abundant being ants and beetles. The diversity index for invertebrates was 0.78, indicating a moderate level of diversity.

Table 19: Invertebrate Species recorded within Study Area

Family	Scientific name	Common name	IUCN Red List of Threatened Species 2021
Nymphalidae	*Vanessa cardui*	The Painted Lady	Least Concern
Buthidae	*Leiurus quinquestriatus*	Death Stalker Scorpion	Not Evaluated
Coccinellidae	*Coccinella undecimpunctata*	Eleven-spotted Ladybird	Not Evaluated
Acrididae	*Anacridium aegyptium*	Egyptian Locust	Least Concern
Salticidae	*Salticidae spp.*	Jumping Spiders	Not Evaluated
Formicidae	*Cataglyphis spp.*	Desert Ants	Not Evaluated
Tenebiorinidae	*Tenebiorinidae spp.*	Desert Beetles	Not Evaluated
Syrphidae	*Syrphidae spp.*	Hoverflies	Not Evaluated
Eremiaphilidae	*Eremiaphila spp.*	Desert Mantis	Not Evaluated
Sarcophagidae	*Wohlfahrtia magnifica*	Spotted flesh fly	Not Evaluated
Braconidae	*Braconid Wasp*	Parasitoid wasps	Not Evaluated

Figure 35: Other Invertebrates Recorded in the Project Site

Flora

According to Olson et al (2001), the Project area is located in the Desert and Xeric Shrublands Biome and more specifically in the Ecoregion of Red Sea Coastal Desert. Applying the classification elaborated by Harhash et al. (2015) to the habitats found in the Project area, the whole Project area must be attributed to the main habitat system "Desert". The vast majority of the Project area can be classified as "Hamada Desert" (Sub-System: "Plain Land") that is crossed by wadis which belong to the Sub-System "Low Land".

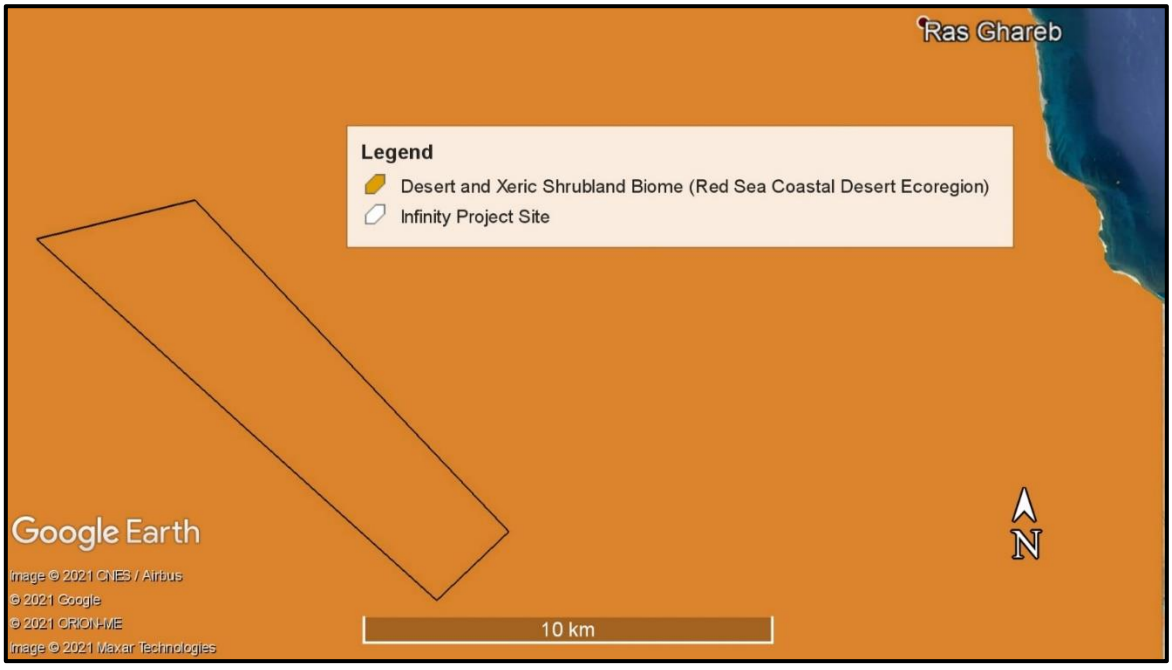

Figure 36: Location of Project in Reference to Ecoregions of the World (TEOW)

A total of twenty-seven (27) plant species were identified in the Project site. The plant species identified included 14 families and 23 genera. The most abundant plant species were *Heliotropium strigosum* and *Salsola imbricata*. The Simpson diversity index for plant species was 0.87, indicating a good level of diversity.

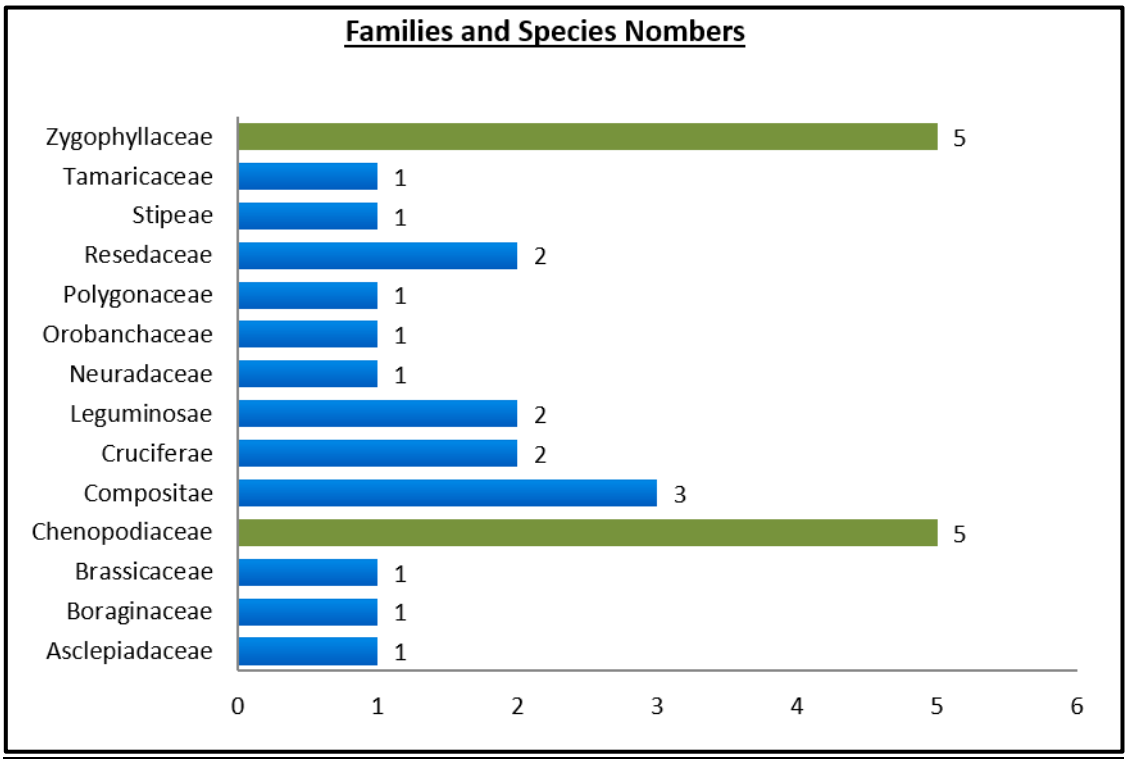

Figure 37: Plant Dominant Families recorded in the study area.

Floral diversity was summarized using 2 community methods, namely: species richness and Shanon-Wiener (H) biodiversity index to quantify the biodiversity in the site. Individual species richness and biodiversity index were calculated for each of the sampling sites and the collective indices were used to represent a spatial model of the flora diversity and species richness over the whole site using Kernel density.

The biodiversity surface is shown in the map below as well as the species richness. The most noticeable observation is the pattern illustrated in the two (2) maps where there is a central area in the site void of diversity or of very low readings while most of the diversity is concentrated on the northern and southern parts of the site.

Flora species recorded showed no significant species concerning endemism or species under a specific threat. The community is very much a normal Red Sea coast community with no specific interests.

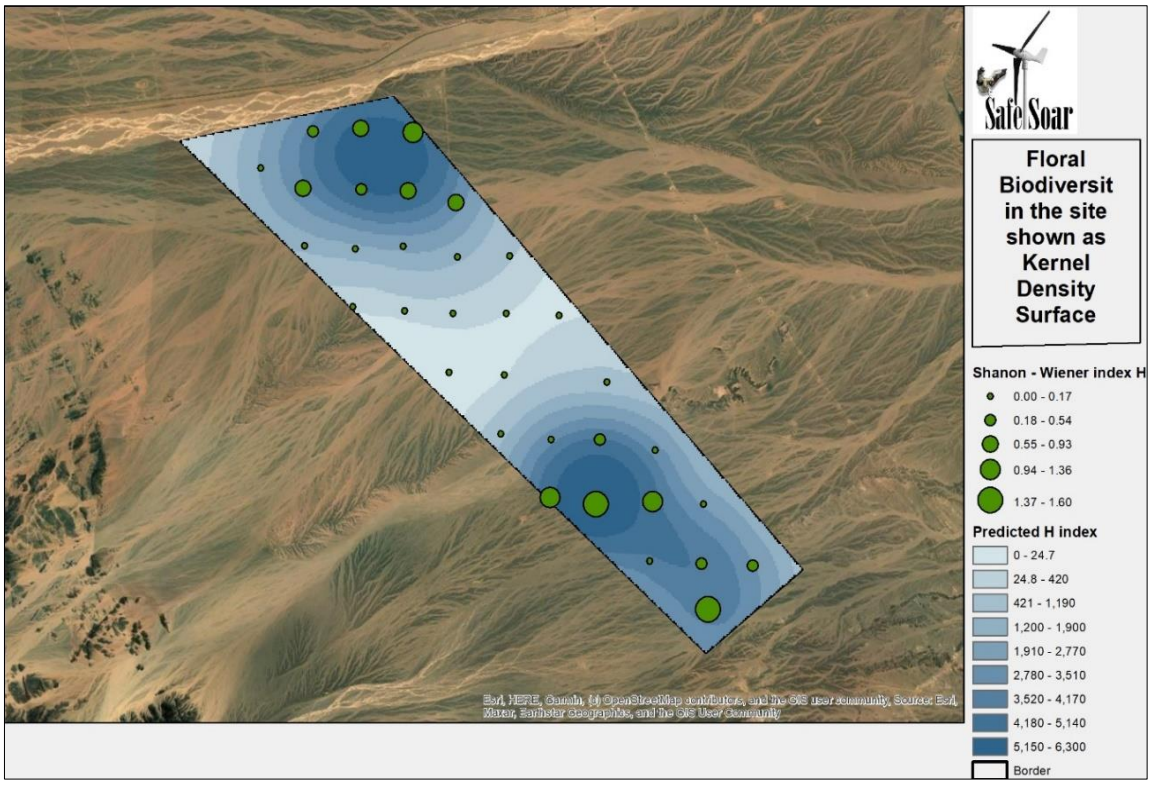

Figure 38: Flora Diversity is Represented by H Shanon Wiener Index as a Kernel Density Surface

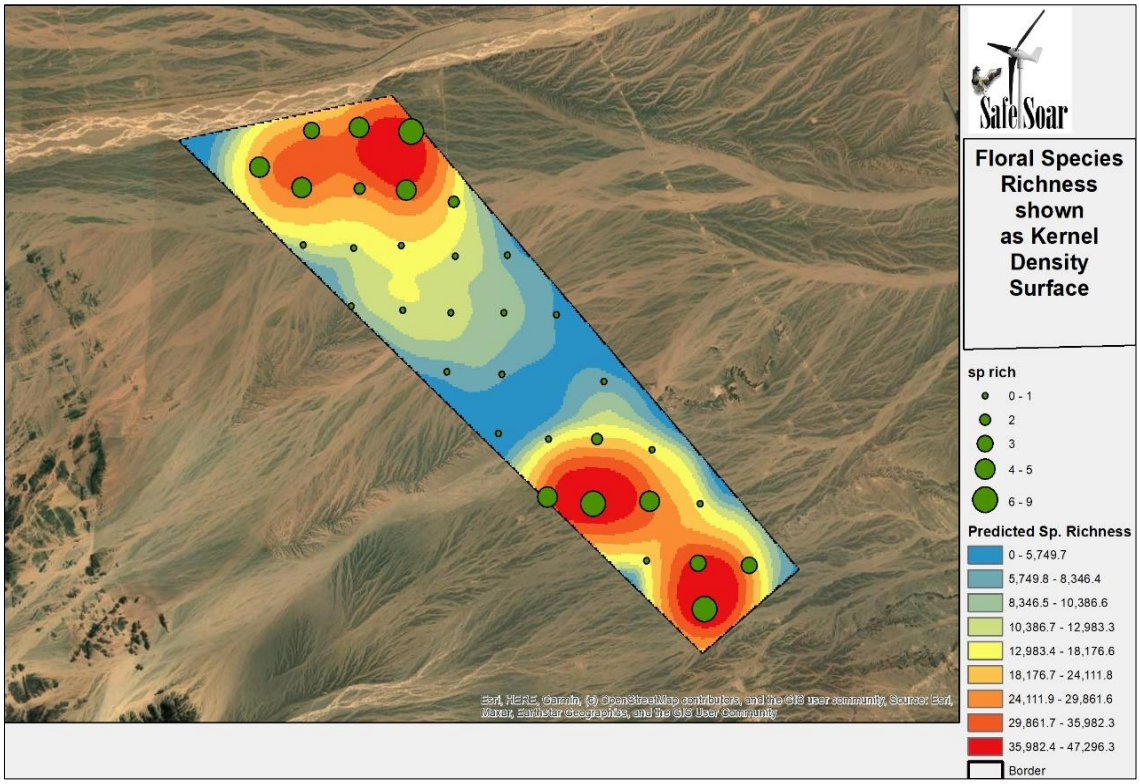

Figure 39: Flora Diversity Represented as Species Richness as a Kernel Density Surface

	
Salsola imbricata Forssk. خريط	*Heliotropium strigosum Boiss.*
	
Tamarix nilotica (Ehrenb.) Bunge.	*Acacia tortilis subsp. raddiana (Savi) Brenan*
	
Fagonia bruguieri DC.	*Calligonum polygonoides L.*

Pulicaria incisa (Lam.) DC.

Ochradenus baccatus Delile.

Figure 40: Dominant Species in Project Site

The table below presents the full list of flora species recorded onsite.

Table 20: Flora Species Recorded Onsite

No.	Latin Name	Family Name	Annual	Perennial	IUCN/Red List
1	***Acacia tortilis subsp. raddiana (Savi) Brenan.***	Leguminosae		√	Not Evaluated
2	***Anabasis articulata (Forssk.) Moq. In A. DC.***	Chenopodiaceae		√	Not Evaluated
3	***Artemisia judaica L.***	Compositae		√	Not Evaluated
4	***Astragalus vogelii (Web) Bornm.,.***	Leguminosae	√		Not Evaluated
5	***Atriplex halimus L.***	Chenopodiaceae		√	Not Evaluated
6	***Calligonum polygonoides L.***	Polygonaceae		√	Not Evaluated
7	***Cornulaca monacantha Delile,***	Chenopodiaceae		√	Not Evaluated
8	***Diplotaxis harra***	Cruciferae	√		Least Concern
9	***Fagonia arabica L.***	Zygophyllaceae		√	Not Evaluated
10	***Fagonia mollis Zohary.***	Zygophyllaceae		√	Not Evaluated
11	***Fagonia bruguieri DC.***	Zygophyllaceae		√	Not Evaluated
12	***Haloxylon salicornicum (Moq***	Chenopodiaceae		√	Not Evaluated
13	***Heliotropium strigosum Boiss.***	Boraginaceae		√	Not Evaluated
14	***Morettia philaeana***	Brassicaceae	√		Not Evaluated
15	***Neurada procumbens L.***	Neuradaceae	√		Not Evaluated
16	***Ochradenus baccatus Delile.***	Resedaceae		√	Not Evaluated
17	***Orobanche cernua Reut.***	Orobanchaceae	√		Not Evaluated
18	***Pergularia tomentosa L.***	Asclepiadaceae		√	Not Evaluated
19	***Pulicaria incisa (Lam.) DC.***	Compositae	√		Not Evaluated
20	***Pulicaria undulata (L.) C. A. Mey.***	Compositae	√		Not Evaluated
21	***Reseda muricata C. Presl.***	Resedaceae		√	Not Evaluated
22	***Salsola imbricata Forssk.***	Chenopodiaceae		√	Not Evaluated
23	***Stipa SP.***	Stipeae	√		Not Evaluated
24	***Tamarix nilotica (Ehrenb.) Bunge.***	Tamaricaceae		√	Not Evaluated
25	***Zilla spinosa (L.) Prrantl in Engl. & Prantl.***	Cruciferae		√	Not Evaluated
26	***Zygophyllum coccineum L.***	Zygophyllaceae		√	Not Evaluated

No.	Latin Name	Family Name	Annual	Perennial	IUCN/Red List
27	***Zygophyllum simplex L.***	Zygophyllaceae	√		Not Evaluated

Summary

In summary, based on the literature review and field survey undertaken to date, it can be concluded that the Project site has low vegetation cover with a low number of species (as expected in a desert) with absence of restricted range species and with only few species of conservation concern. The diversity is that typical of the Egyptian Red Sea coast with no exceptional features. In addition, no key or sensitive habitats were recorded within the Project site, and all floral and faunal species recorded where in general considered common and typical to such habitats and generally of least concern. However, special consideration should be given to the globally threatened Egyptian Dabb Lizard *Uromastyx aegyptia* and the Dorcas Gazelles (*Dorcas Gazelle*) since the Project site provides a typical habitat for the species.

Finally, the Project site is considered a Natural Habitat in accordance with EBRD PR 6 requirements. The total area of Natural Habitat that will be affected is around 0.33km^2 as per the Project footprint calculated in "Section 2.4" earlier.

7.5 Birds

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to birds.

7.5.1 Baseline Assessment Methodology

General Introduction

According to the methodology outlined in the "*Environmental Impact Assessment (EIA) Guidelines and Monitoring Protocols for Wind Energy Development Projects along the Rift Valley / Res Sea Flyway (RVRSF) with a particular reference to wind energy in support of the conservation of Migratory Soaring Birds (MSBs*)" (2013), the "*Strategic Environmental and Social Impact Assessment for an Area of 300 km² of potential wind farms at the Gulf of Suez (2013*)", and the methodology applied in the "*Strategic and Cumulative Environmental and Social Assessment Active Turbine Management Program for Wind Power Projects in the Gulf of Suez* (2019)", the assessment used specific pre-assigned Observation Points (OPs) [also known as Vantage Points (VPs)] for the spring 2021 and 2023 and autumn 2021 monitoring periods.

The objective of the survey was to provide an assessment of the presence and activities of the migratory and resident birds within the Project site and provide a detailed analysis indicating species' duration of activity and the elevations at which they are present. Meeting these objectives will provide an in-depth understanding of the predicted impacts of the Project on bird species.

Four (4) Vantage points (VPs) were designated to cover the Project area. In determining the location of the VPs, the methodology provided an analysis to ensure the most comprehensive coverage and rotational system, in which (2) of (4) VPs were used for monitoring activities daily. in the figure below, the locations and orientation of the VPs are indicated at the site where they were attended on alternating days. In other words, two VPs located adjacent to one another were not operated in the same day in order to avoid duplication and double-counted sightings. For example, Group A's VP1 and VP3 (red coloured) and Group B's VP2 and VP4 (white coloured) would be active on alternating days.

Other measures undertaken to avoid double-counting included: (i) continuous communication between team members onsite at VPs to report key flocks passing through the site to avoid double counting; (ii) daily revision

of daily sheets of observers by Team Leader to check for any potential double counting data, which if identified were removed for the data set accordingly – this included records that have same or similar number of birds, trajectories and timings.

The field assessment team was composed of (2) observers with prior field experience in avifaunal assessments for wind farms. Each VP was covered by a single observer during observation periods covering the predicted peaks of migration, based on previous assessments as outlined in the required guidelines. As part of the capacity building program integrated into the assignment, (2) junior observers joined the qualified observers for a maximum of 30-35 days.

Monitoring from VPs were carried out daily following a rotational system to ensure that the (4) VPs were covered regularly, while also covering the various periods of daylight from dawn to sunset.

Observation periods from each VP were conducted for a maximum of 4 hours in order to ensure that the quality of monitoring was not subject to human error and observers were allocated a minimum of a 1-hour break between each observation period. In total, a maximum of (2) VPs were covered daily, where each observation period covered a minimum of 8 hours per day; 4 hours in the morning followed by a minimum of 1-hour break and 4 hours in the afternoon.

Note: Although a 1-hour break is provided between each two-observation periods, the approach ensured that this does not affect the quality of recordings by alternating break periods among observes (i.e. one observer takes a break, for example, from 1pm-2pm while the second observer remains on shift and vise-verse). The approach enabled the continuous observation of avian sighting throughout daylight hours.

The start and end of observation periods varied depending on the following conditions:

- The season and, therefore, the duration of daylight hours
- Weather conditions, including visibility
- The records of the previous observation sessions, as this could reflect on the expected bird activity

Generally, observations started a minimum of 1- hour after sunrise and ended 1- hour before sunset. Observers were equipped with binoculars and cameras.

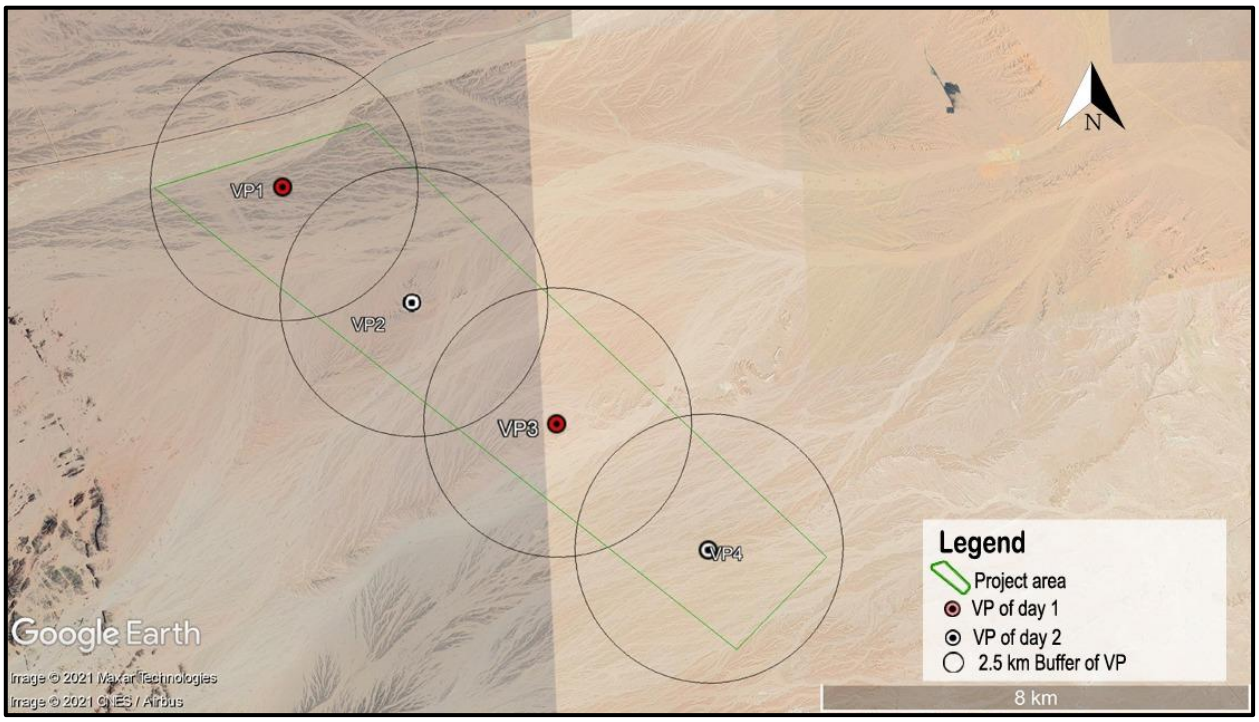

Figure 41*:* Location of OP at IPH's plot

The field team was instructed to commence the monitoring program at the IPH plot on 28 March, 2021, in accordance with the methodology identified above. The spring monitoring season in Egypt begins 20 February. The ESIA Consultant was involved in another ESIA for a neighbouring Wind Farm project (refer to Section X for additional details), and was already present on the IPH plot conducting the spring 2021 season bird monitoring, in which selected VP for that project (VP1, VP4 and VP7) overlap with the Project site as noted in the figure below. Therefore, as requested by RCREEE, the data for 20 February – 27 March 2021 period were obtained from the VPs in the figure below, covering about 85-90% of IPH's plot.

During spring 2023, the monitoring period was spread over the entire migratory period employed in the wider region of the Eastern Desert in Egypt (mid or late February to mid-May).

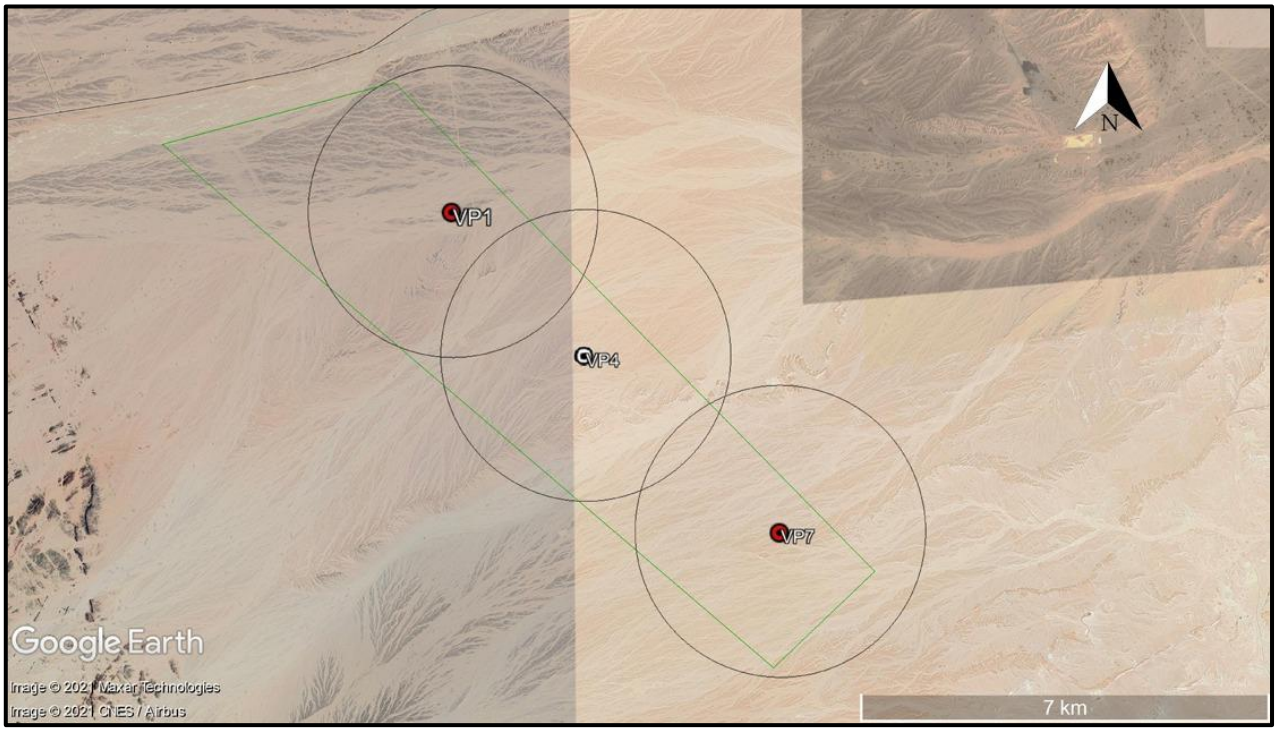

Figure 42: Location of VP for the duration of 20th February – 27th March 2021

Viewshed Mapping

The VP locations presented below were used for the spring and autumn 2021 season. Prior to commencement of the spring 2023 season, a viewshed analysis was undertaken. The figure below illustrates the viewshed analysis of the Project site from each VP. It was prepared based on visual observations undertaken by bird observers when standing at each VP, where any blind spots noted were mapped out. As noted, only minor blind spot areas are noted from VP2, VP 3 and VP 4. Areas in yellow are blind spots from VP2 and areas in white are those for VP3 and areas in green are those for VP 4.

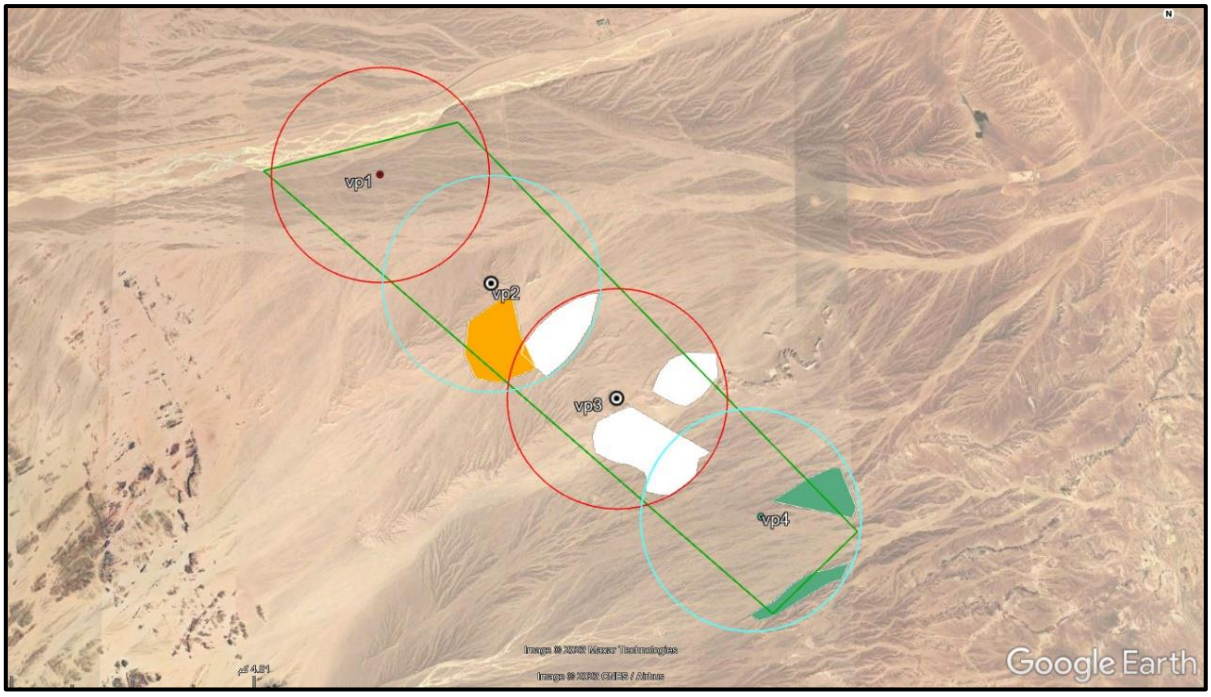

Figure 43: Initial Viewshed Mapping

Based on the above, the locations of VP2, VP 3 and VP 4 were slightly adjusted as per the table below for the spring 2023 season. Based on that an updated viewshed analysis was undertaken where minimal blind spots remain for VP 3.

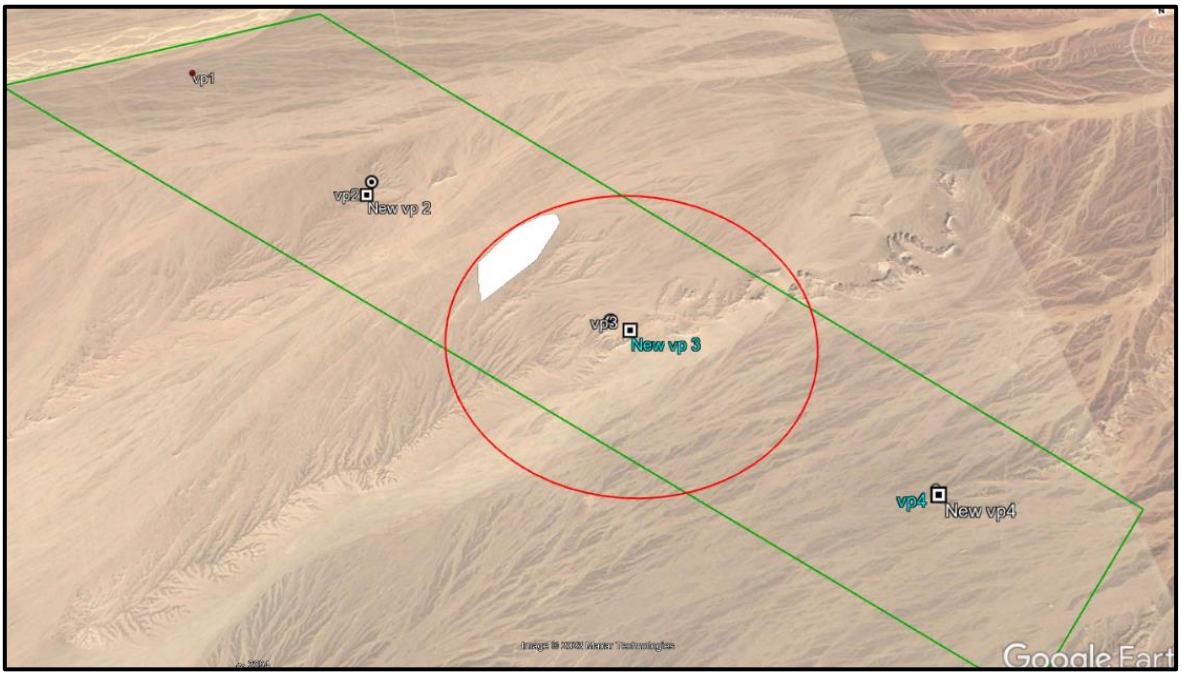

Figure 44: Updated Viewshed Mapping

Table 21: VP Coordinates

VP	Coordinates				Distance (m)
	Old		New		
	N	E	N	E	
2	32.890520	28.275390	32.891095	28.277268	200 to the west
3	32.919400	28.25468	32.917432	28.256026	260 to the

					south
4	32.947260	28.234510	32.947260	28.235140	110 to the south

Data Collection

Data was recorded on spreadsheets (figure below) that were completed on a daily basis. During data collection, observers accounted for days of zero bird counts (days with no records of migrating birds) to better understand birds' response to changes in weather conditions, limiting factors of crossing the Gulf of Suez, as well as determine favourable and unfavourable weather conditions of migration generally or specifically for a certain species.

Information on bird flight activity was collected from the VPs. The recording of observations followed the methods described by Band et al. (2007) and SNH (2017), which are summarized below, in addition to some site-specific adaptations to the migratory context in Egypt (also indicated below). This has been taken into account given that SNH includes method developed for Scotland, where migration patterns are different when compared to Egypt.

If a target species is detected, it was followed until it ceased flying or was lost from view. For each observation of a target species, the following data were collected:

- The time the target species was detected
- The flight duration of the target species to the nearest 15-second interval
- Estimate of the bird's flight elevation from the point of first detection and thereafter at 15-second intervals. Flight elevation was classified based on turbine specifications and at least divided into two classes: at collision risk and above collision risk.

At the time of the spring 2021 season, neither the Project layout nor the specifications of turbines were available. Therefore, the collision risk height was set at 120m was assigned - the general turbine tip height planned for the wind developments in the region. However, by the autumn 2021 season, higher turbine tip heights were allowed up until 200m. Therefore, for autumn 2021 and spring 2023 data was collected for such height band accordingly.

As guidance to observers to define their area of survey before starting the observation, determining the cardinal directions (North, South, East, and West) and pre-defining several landmarks of reference in the field, if feasible, were outlined. Observers constantly scanned with and without binoculars within a circumference of 360 degrees around each VP until a target species is detected.

Weather conditions (wind intensity and direction, visibility, cloud cover and precipitation) were recorded at start of monitoring activities, then at every subsequent hour and at the end time of monitoring activities. Ideally, observations should have been made in a range of wind conditions. This is particularly important in the case of soaring birds when wind direction and strength is likely to affect migration behaviour and flight routes.

BASIC DATA METRICS

- Date (year/month/day)
- Vantage point (or Observation Point)
- Observer name (initials)
- Time at the start of the observation period
- Time at the end of the observation period
- Observation time in hours and minutes format (00: 00)

- Species with their English names. For unidentified birds it will be referred to the nearest identifiable systematic Genus, e. g. two close species *Circus macrorus/pygargus*, or to Genus level, e.g., *Aquila sp*., if not possible to the closest group e. g. Unidentified Raptor (UR).
- Number – number of birds of the same species (mixed species flocks should have one line and one key number for each species)
- Sex and Age - Sex: M/F; Age: Juvenile (J), Immature (I), Adult (A).
- Flying Height considering the following classes: 0-120, and above 120 m for the spring 2021 and below 200 or above 200 m for the autumn 2021 and spring 2023. As explained earlier, during spring 2021 only turbines with a tip height of 120m were allowed in the region while later in autumn 2021 turbines up to 200m were allowed.
- Origin – cardinal/inter cardinal direction of the point where the bird was first detected in relation to the observer.
- Direction – cardinal/inter cardinal main direction of the bird(s)'s trajectory
- Relevant behaviour of flying – Soaring, Gliding, Active flying
- Observation numbers
- Observation Distance
- Recorded Inside or Outside the project site
- Any other noteworthy remarks were noted.

Weather Data

- This sheet will only be filled by one of the senior observers assigned by the Team Leader.
- The following weather variables will be recorded hourly.
- Cloud cover (%)
- Visibility (km)- following predefined categories: 1 = 2.5 km, 2 = 5 km 3 = 7.5 km, 4 = 10 km
- Temperature (ºC)
- Wind direction (cardinal/inter cardinal points)
- Wind speed (Beaufort)
- Precipitation: Yes/No. Heavy (H)/Moderate (M)/Light (L)

Data sheets A-D indicating weather conditions, avifaunal detection (B and C) and VP locations comprised the field observers' datasheets

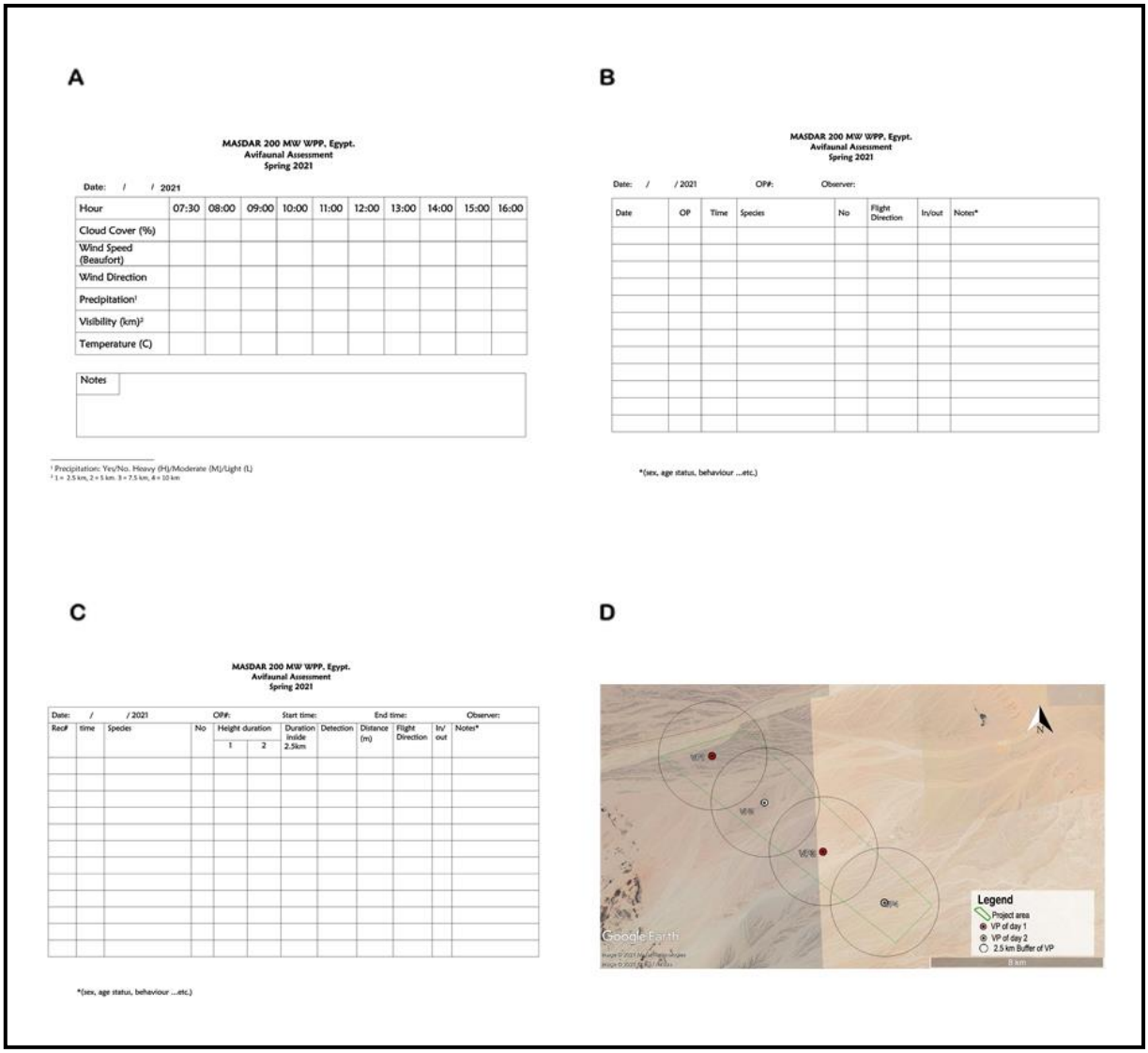

Figure 45: Data sheet example

The field team was in contact during the reporting period via mobile phones and a "WhatsApp Group". This would ensure immediate communication to follow up on the migrating flocks and individuals over the Project area, avoiding double counts of same flocks/individuals, while also ensuring full and accurate perception about the record spatial and temporal aspects.

Maintaining consistent and rapid communication was crucial to avoid double counting of observed species.

7.5.2 Spring Season

As shown in the table below, monitoring times per VP during spring 2021 differed, because there was fewer number of observation days (e.g. VPs 2 and 3 were not monitored in February and VP7 was not monitored in April and May due to the reasons explained earlier). The alternating monitoring time per VP resulted in the raw number of birds recorded incomparable comparable between VP groups. For example, if compared, a longer monitoring time might result in more birds recorded, increasing the chance of recording more birds.

Therefore, a standardized value for such comparisons was calculated as noted throughout this section. This variable, which measures such variations, is the *passing rate (#birds/hour of observation*), see Bibby et al. 1992, Caughley 1977.

Table 22: Level of Effort from Project Site VP during spring 2021

Season	VP	Feb	Mar	Apr	May	Totals
Spring 2021 54 days *	VP1	44:26	121:52	105:58	68:50	**341:06**
	VP2	00:00	18:30	108:25	69:55	**196:50**
	VP3	00:00	14:59	112:16	75:35	**202:50**
	VP4	34:16	121:24	114:09	76:00	**345:49**
	VP7	40:51	93:01	00:00	00:00	**133:52**
Totals		**119:33**	**369:46**	**440:48**	**290:20**	**1220:27**

- Data for February and March were taken from a neighbouring project, see text for explanations.

The relief of the landscape at the project site is quite homogeneous. There is bare ground with almost no vegetation cover, except a few shrubs. This suggests there are few and rare features that would affect the birds' behaviour making them to prefer certain areas within the footprint (e.g. use of slope soaring flight because the presence of mountains or deep cliffs).

As previously mentioned, the VPs of a neighbouring project overlap with those at Infinity 200MW to a range of 85-90%. The project footprint presents and almost linear shape in the region with the VPs located in a straight line. Using the passing rates for the analyses reduced potential biases between monitoring times per VPs but also lower VPs (three against four), at least for the first month.

For the spring analyses four (4) VPs in total were considered regardless the day and month. The data and monitoring hours for VP1 of neighbouring site have been included under VP 1 of the IPH site. In addition, the data and monitoring hours for VP 4 and VP7 of the neighbouring site have been include under VP 4 of the IPH. The justification is because of the relatively small footprint of IPH site and proximity between the VPs.

Spring 2023

The Table 23table below shows the time spent in the observation point monitoring during the spring 2023.

Table 23: Level of effort from OPs during spring 2023

	VP1	VP2	VP3	VP4	Total
February	41:28	32:09	39:58	32:34	**146:15**
March	127:30	135:15	128:10	134:30	**525:25**
April	120:20	122:10	120:35	122:10	**485:15**
May	91:05	91:05	91:05	91:05	**364:20**
Total	**380:23**	**380:39**	**379:48**	**380:19**	**1521:09**

The time invested in bird monitoring increased from 1,220 hours, and 27 min in 2021 to 1,521 hours 09 min in 2023, a 24.7% increase. As seen in

Table 22 and Table 23, also the time per month increased.

This is the main reason to use the bird passing rates and not the raw bird counts when analysing for comparisons between 2021 and 2023, when doing a "same site different time validation".

(i) Bird Numbers

In 2021, a total of 62,451 individuals (2,488 records) of twenty-three species (23) were recorded as noted in the table below. Around 58% of the birds were raptors (twenty species), while the remaining 42% belong to three

species of non-raptors: Black and White Storks and White Pelicans. In 2023, the total number accounted for 87,076 individuals (2,798 records) of another twenty-three species but not the same as in 2021, see table below.

It must be highlighted that two species for which the counts may result in clear underestimations, the Lesser Kestrel and the Common crane. Both are also night migrants, when no bird counts are obviously undertaken. In addition, several of the species in the table below – except the kestrels, falcons and the Osprey – are considered as migratory soaring birds, despite some of them being facultative soaring birds (Panuccio et al. 2021) as they use either flapping or gliding for their displacements.

Globally, the most abundant species were, in decreasing order, the White stork *Ciconia ciconia* (35.34-41.74%), the Steppe Buzzard *Buteo rufinus* (19.40-38.72%), Honey Buzzard *Pernis apivorus* (7.21-26.96%), the Black kite *Milvus migrans* (5.75-6.27%), and the Steppe eagle *Aquila nipalensis* (3.07-4.35%). There are other species which may contribute a huge number in one year but is almost non-existing in the following one, like the Levant Sparrowhawk *Accipiter brevipes* (from 0.01% to 1.84%), or the Great White Pelican (up to 6% in 2023).

All the remaining species were below the threshold of the 1% of the birds recorded. A fraction were unidentified birds classified e.g. as "eagle", "harrier", "raptor" species. These numbers were almost insignificant in 2021 (thirty-five birds accounting for a 0.06%) or "unidentified raptors" (249 birds and 0.4% of the birds recorded). However, in 2023 the proportion of unidentified birds reached a 1.83%. All these counts have been excluded from further analyses, as they cannot be assigned to the species level.

Table 24: Species Recorded during Vantage Point Monitoring in spring 2021 and 2023 (number of records and individuals)

			2021		2023	
SPECIES	**IUCN Red List (2019)**	**National Status**	**# observations**	**Individuals**	**# observations**	**Individuals**
Black Kite	LC	*Pm*	515	3589	571	5356
Black Stork	LC	*Pm*	24	355	23	332
Booted Eagle	LC	*Pm*	57	83	105	126
Common Kestrel	LC	*Pm/R*	9	9	37	40
Eastern Imperial Eagle	VU	*Pm*	22	29	13	13
Egyptian Vulture	EN	*Pm*	28	42	43	48
Eurasian Sparrowhawk	LC	*Pm*	9	11	24	26
European Honey Buzzard	LC	*Pm*	94	4481	253	22876
Great White Pelican	LC	*Pm*	2	83	15	5069
Greater Spotted Eagle	VU	*Pm*	14	14	20	21
Lanner Falcon	LC	*Pm*	1	1	0	0
Lesser Kestrel	LC	*Pm*	1	1	0	0
Lesser Spotted Eagle	LC	*Pm*	75	131	79	131
Long-legged Buzzard	LC	*Pm/Wv*	5	1146	29	31
Levant Sparrowhawk	LC	*Pm*	42	90	2	5
Osprey	LC	*Pm*	7	8	4	4
Pallid Harrier	NT	*Pm/Wv*	6	7	2	2
Eleanora's Falcon	LC	*Pm*	0	0	0	0
Short-toed Snake Eagle	LC	*Pm/Sm*	101	143	130	182
Sooty Falcon	VU	*Pm/Sb*	1	1	2	2
Steppe Buzzard	LC	*Pm*	879	24077	725	16582
Steppe Eagle	EN	*Pm/Wv*	518	1907	674	3718

			2021		2023	
SPECIES	**IUCN Red List (2019)**	**National Status**	**# observations**	**Individuals**	**# observations**	**Individuals**
Western Marsh Harrier	LC	*Pm*	10	12	12	120
White Stork	LC	*Pm*	46	25947	70	30212
Common Crane	LC	*Pm*	0	0	5	680
Crested Honey Buzzard	LC	*Pm*	0	0	2	3
Subtotal			**2,466**	**62,167**	**2,849**	**85,480**
Unidentified Harrier	-	-	-	-	2	2
Unidentified Buzzard	-	-	-	-	11	334
Unidentified Falcon	-	-	-	-	10	13
Unidentified Eagle	-	-	6	35	65	699
Unidentified raptor	-	-	16	249	40	531
Total			**2,488**	**62,451**	**2,978**	**87,076**

Pm: Passage migrant, Wv: winter visitor, Sb: summer breeder.

(ii) Conservation Status

According to IUCN Red List of Threatened Species (IUCN, 2021), there are two (2) endangered (EN) species: the Egyptian vulture and the Steppe eagle; three (3) are listed as vulnerable (VU) the Sooty Falcon, and the Eastern Imperial and Greater Spotted eagles; and one (1) species as Near Threatened – the Pallid Harrier *Circus macrorus*. The remaining species are evaluated as 'Least Concern'.

A Critical Habitat Assessment (CHA) and a Cumulative Effects Analysis (CEA) were performed separately to evaluate the contribution of the bird counts to the global populations of each species. Also, the CEA compares the project area to other nearby sites, determining whether this site has any "unusual" characteristics relative to others.

(iii) Spatial Passage per VP

Each species has a different passing rate, which will vary depending on the month and season. For example, the avifaunal species within the assessment do not migrate during the entire season from Feb to May. This has been fully studied in the scientific literature, e.g. (Shirihai et al. 2000).

For the comparison among VPs, the median passing rate (birds per hour of observation) was utilized. The comparison indicated significant differences in the passing rates for all species when pooled together among the observation points in 2021: Analysis of Variance (ANOVA) F (4, 2483) =2.96 and p =0.01) but not in 2023 F (3, 2974) =0.77 and p =0.50). There were on-year differences between some VPs indicating some consideration for an on-year flight pattern change.

The lack of a preference is an expected result because of two main reasons: 1) the uniform landscape of the project site which does not have special characteristics forcing or influencing the birds to behave differently and 2) the, similarly, absence of geographic features which could influence the bird´s flight. Reasons for the differences in 2021 could be related with the congregatory behavior of the different species: there are species migrating solitary or small groups, opposite to others like the White stork or the Honey Buzzard. The mean flock sizes for every species each year appear in the table below.

Table 25: Mean flock size per species, number of observations in 2021 and 2023, and min and max flock sizes recorded. Those highlighted are considered solitary or migrating in small groups.

SPECIES	Spring 2021		Spring 2023		Minimum and Maximum Flock Sizes	
	Mean Flock Size	# observations	Mean Flock Size	# observations	Min	Max 21-23
Black Kite	6.96	515	9.3	571	1	250-230
Black Stork	14.79	24	14.43	23	1	95-76
Common Crane	-	-	136	5	50	270
Booted Eagle	1.45	57	1.2	107	1	12-7
Common Kestrel	1.00	9	1.10	37	1	1-3
Eastern Imperial Eagle	1.31	22	1.00	13	1	2-1
Egyptian Vulture	1.50	28	1.11	43	1	7-3
Eurasian Sparrowhawk	1.22	9	1.08	2	1	2
European Honey Buzzard	47.67	94	90.40	251	1	700-2500
Great White Pelican	41.50	2	337.9	15	7	1200
Greater Spotted Eagle	1.00	14	1.05	20	1	1-2
Lanner Falcon	1.00	1	-	-	1	1
Lesser Kestrel	1.00	1	-	-	1	1
Lesser Spotted Eagle	1.74	75	1.65	79	1	12-15
Levant Sparrowhawk	229.20	5			1	650
Long-legged Buzzard	2.14	42	1.06	29	1	9-2
Montagu´s Harrier	-	-	1	6	1	1
Osprey	1.14	7	1	4	1	2-1
Pallid Harrier	1.16	6	1	2	1	2-1
Short-toed Snake Eagle	1.41	101	1.4	130	1	6-6
Sooty Falcon	1.00	1	1	2	1	1-1
Steppe Buzzard	27.39	879	22.87	725	1	520-280
Steppe Eagle	3.68	518	5.51	674	1	53-110
Western Marsh Harrier	1.20	10	1	12	1	3-1
White Stork	564.06	46	431.6	70	1	4500-7000

The table above indicates the results of observations for the various species sighted including: the White stork and Levant Sparrowhawk have the largest mean flock sizes (>200 individuals per flock) in 2021. Others like the Eurasian Honey and Steppe buzzards have smaller mean flock size in 2021 but quite large in 2023. On the contrary, fourteen (14) out of twenty-five (25) species, are considered and solitary birds (as highlighted in the table).

The above data help interpret the passing differences per VP, as the resulting indications in passing differences were determined to be due to flock behaviour are surely influenced by the flocking behaviour in the absence of notable landscape and geographical features.

Table 26: Median passing rates per species, Quartiles 25 and 75, number of observations in 2021. Highlighted those which showed significant differences among Vantage Points

SPECIES	# of Observations	Birds/hr Q25	Birds/hr Median	Birds/hr Q75	VP Highest passing rate
Black Kite	515	0.150	0.371	0.881	1 and 7

SPECIES	# of Observations	Birds/hr Q25	Birds/hr Median	Birds/hr Q75	VP Highest passing rate
Black Stork	24	0.244	0.711	1.937	n.s.
Booted Eagle	57	0.124	0.142	0.222	n.s.
Common Kestrel	9	0.123	0.126	0.130	n.s.
Eastern Imperial Eagle	22	0.111	0.134	0.220	n.s.
Egyptian Vulture	28	0.135	0.152	0.235	n.s.
Eurasian Sparrowhawk	9	0.124	0.135	0.136	n.s.
European Honey Buzzard	94	0.400	1.980	7.500	1
Great White Pelican	2	0.129	4.473	8.817	-
Greater Spotted Eagle	14	0.126	0.134	0.152	n.s.
Lanner Falcon	1	0.121	0.121	0.121	-
Lesser Kestrel	1	0.121	0.121	0.121	-
Lesser Spotted Eagle	75	0.126	0.152	0.270	n.s.
Levant Sparrowhawk	5	9.545	10.227	46.667	n.s.
Long-legged Buzzard	42	0.112	0.153	0.450	n.s.
Osprey	7	0.120	0.130	0.135	n.s.
Pallid Harrier	6	0.112	0.140	0.154	n.s.
Short-toed Snake Eagle	101	0.121	0.136	0.251	n.s.
Sooty Falcon	1	0.136	0.136	0.136	-
Steppe Buzzard	879	0.242	0.769	2.857	n.s.
Steppe Eagle	518	0.129	0.247	0.475	1 and 7
Western Marsh Harrier	10	0.124	0.151	0.154	n.s.
White Stork	46	0.242	8.653	61.500	3

The section's concluding remarks are as follows:

- In 2021, only four species had significant differences in the passing rates among one or several VPs. As indicated in the table earlier, these species included the White stork, Steppe eagle, European Honey Buzzard, and the Black Kite. The White Stork had its highest passing rate at VP3, the Black Kite and the Steppe eagle both at VPs 1 and 7, and the European Honey buzzard – at VP1. For the Sooty and Lanner falcon, Great W. Pelican, and Lesser kestrel, there were not sufficient data to evaluate.
- In 2023, there were again four species showing significant differences: The Black Kite, Steppe Buzzard, Short-toed eagle, and Egyptian vulture. Only the Black kite showed a significantly different passing rate in both 2021 and 2023. However, in 2023 the highest rate for the kite was at VP3 ($p < 0.05$). For the Steppe buzzard it was VP1 ($p < 0.001$), for the Short-toed eagle also VP3 ($p < 0.05$), and VP4 and VP3 ($p < 0.05$).
- The hypothesis before performing the spring 2023 monitoring sessions and based on the experience of the Consultant in analysing similar data for other wind farm projects in the region for multiple spring seasons, was for those species that tend to pass in greater numbers through specific VPs one year, they are not likely to repeat their routes in the same way the following season – demonstrating variability at the scale of the project site.

(iv) High Risk Flight Paths

The monitoring teams in 2021 and 2023 were different. As noted in the table earlier, it is evident that there are differences in the resulting number of unidentified birds. In this case, there is the effect of human error

(including varying perceptions in estimation of flight altitude and avifauna identification) as there were different teams available between the two years. Additionally, on-year differences in weather events will have had their impact on the results between the seasons of these two years.

The exploratory analysis for 2023 indicated that the number of birds at risk was significant but negative related to the increasing observation time ($p = 0.001$) based on Pearson r-coefficient. The earlier the time of observation in the day, the higher the number of birds at risk. This relationship suggests that any analysis on the passing rates or bird numbers should include as much variables as possible that could influence the behaviours including a) the time of day, b) weather conditions (indicating wind speed and direction), c) temperature, d) location (VP), and e) observers.

For example, at the site, wind direction was influential in indicating the number of birds at risk – indicated as ("yes") or ("no"). Western, southwestern and southern wind directions indicated that species were less likely or had not traversed the project footprint.

Table 27: Distribution of bird numbers according to wind direction in spring 2023

Wind Direction	Total	Yes	No
NW	39787	10087	29700
N	33400	3479	29921
NE	3847	1660	2187
E	5084	1047	4037
SE	3959	983	2976
SW	195	156	39
S	91	16	75
W	711	601	110

This analysis provides an added perspective for understanding as well as predicting avifaunal patterns at the project site.

(v) Risk Flights

Another approach has been to compare only the passing rates per observation point at risk flight of the most significant species quantitative and qualitatively: the Black Kite, Honey and Steppe buzzards, White Stork, Short-toed and steppe eagles, and Egyptian vulture. For a proper comparison only the risk flight at 120 m was used, as it is the only height which was sampled both in 2021 and 2023.

Only three species showed significant differences among VPs at 'risk height' in 2021: the Black kite, the Steppe eagle, and the White Stork). In both the springs of 2021 and 2023, the Black Kite was observed at 'risk height'.

The Black kite had significantly higher passing risk rates through VPs 1 & 3, compared to spring of 2023 when its passing risk rates were indicated at VPs 1 & 2. For the Steppe eagle in 2021, it was VP1; for the White Stork - VP3. The results confirm the different highest risk flight rate, but the lack of differences in the second year suggest that passing rates may have been influenced by weather conditions within a specific season. A long-term analysis would provide clarification.

Table 28: Mean passing rate (birds/hr) among VPs in 2021 and 2023. Percentiles 5, 25, 75 and 95 also showed. Those species highlighted showed significant differences among VPs for the specific year.

Species	Year	VP	N	Q25	Median	Q75	Percentile 5	Percentile 95
Black Kite	2021	1	38	0.15	0.67	2.28	0.11	9.47
		2	15	0.15	0.25	0.62	0.12	1.69
		3	22	0.11	0.13	0.25	0.11	0.40

Species	Year	VP	N	Q25	Median	Q75	Percentile 5	Percentile 95
		4	49	0.13	0.27	0.62	0.11	2.56
		7[1]	6	0.65	0.69	0.74	0.13	0.86
	2023	1	32	0.36	1.08	2.67	0.13	6.00
		2	45	0.44	0.94	1.88	0.13	4.57
		3	51	0.25	0.67	3.23	0.11	10.00
		4	46	0.29	0.57	1.62	0.11	3.00
		7	0					
Booted Eagle	2021	1	3	0.12	0.12	0.32	0.12	0.32
		2	2	0.12	0.12	0.12	0.12	0.12
		3	1	0.13	0.13	0.13	0.13	0.13
		4	1	0.11	0.11	0.11	0.11	0.11
		7	2	0.12	0.20	0.28	0.12	0.28
	2023	1	2	0.11	0.13	0.14	0.11	0.14
		2	0					
		3	1	0.13	0.13	0.13	0.13	0.13
		4	0					
		7	0					
Egyptian Vulture	2021	1	2	0.25	0.28	0.30	0.25	0.30
		2	1	0.15	0.15	0.15	0.15	0.15
		3	0					
		4	3	0.12	0.22	0.24	0.12	0.24
		7	0					
	2023	1	0					
		2	1	0.10	0.10	0.10	0.10	0.10
		3	3	0.13	0.13	0.17	0.13	0.17
		4	1	0.17	0.17	0.17	0.17	0.17
		7	0					
European Honey Buzzard	2021	1	1	0.16	0.16	0.16	0.16	0.16
		2	0					
		3	0					
		4	5	0.14	0.27	0.27	0.12	1.21
		7	0					
	2023	1	5	1.22	2.78	3.67	0.11	4.44
		2	3	0.20	2.81	15.00	0.20	15.00
		3	11	0.38	1.44	3.00	0.11	9.11
		4	10	0.33	1.38	33.33	0.11	133.33
		7	0					
Short-toed Eagle	2021	1	7	0.12	0.15	0.30	0.12	0.37
		2	6	0.12	0.15	0.15	0.12	0.31
		3	0					
		4	8	0.12	0.13	0.24	0.12	0.26
		7	3	0.12	0.14	0.14	0.12	0.14

[1] In 2023, observation activities at VP 7 were not conducted – indicating 0s.

Species	Year	VP	N	Q25	Median	Q75	Percentile 5	Percentile 95
	2023	1	1	0.24	0.24	0.24	0.24	0.24
		2	3	0.13	0.14	0.21	0.13	0.21
		3	1	0.13	0.13	0.13	0.13	0.13
		4	2	0.10	0.11	0.13	0.10	0.13
		7	0					
Steppe Buzzard	2021	1	43	0.13	1.00	3.49	0.11	14.94
		2	36	0.12	0.30	0.96	0.12	11.54
		3	36	0.13	0.18	0.50	0.11	32.50
		4	71	0.13	0.31	1.62	0.11	14.52
		7	23	0.14	0.39	0.65	0.13	6.76
	2023	1	11	0.19	0.88	2.33	0.13	10.56
		2	39	0.22	1.00	6.00	0.11	17.00
		3	37	0.19	0.38	1.29	0.11	13.75
		4	41	0.29	0.67	1.33	0.11	5.25
		7	0					
Steppe Eagle	2021	1	25	0.12	0.37	1.00	0.11	2.37
		2	7	0.12	0.25	0.33	0.12	0.65
		3	1	0.13	0.13	0.13	0.13	0.13
		4	32	0.12	0.24	0.36	0.12	1.09
		7	24	0.14	0.25	0.43	0.13	0.99
	2023	1	10	0.24	0.24	0.47	0.11	12.94
		2	20	0.19	0.25	0.62	0.10	1.36
		3	16	0.22	0.71	1.43	0.11	5.18
		4	19	0.14	0.25	1.14	0.10	6.50
		7	0					
White Stork	2021	1	1	18.23	18.23	18.23	18.23	18.23
		2	1	0.15	0.15	0.15	0.15	0.15
		3	4	220.18	302.75	412.84	165.14	495.41
		4	6	1.23	5.00	40.45	0.55	53.93
		7	0					
	2023	1	6	9.44	14.44	50.00	4.00	78.57
		2	7	12.50	46.15	230.77	9.14	461.54
		3	7	5.00	12.50	24.44	2.00	44.44
		4	2	6.61	35.45	64.29	6.61	64.29
		7	0					

(vi) Temporal Patterns: Monthly and Daily Passes

From the data in the tables earlier, and the project adjacent to the IPH plot, the Consultant was able to represent temporal patterns to understand the migration through the project site as organized within two subsections i) per #week and month and ii) time of the day, from 7:00am to 18:00pm.

The figure below shows the percentage of overall migratory birds passing per week and month during the spring seasons 2021 to 2023. Between early March to mid-May, there is a stead passage of avifauna species suggesting that birds consistently cross traverse the project site.

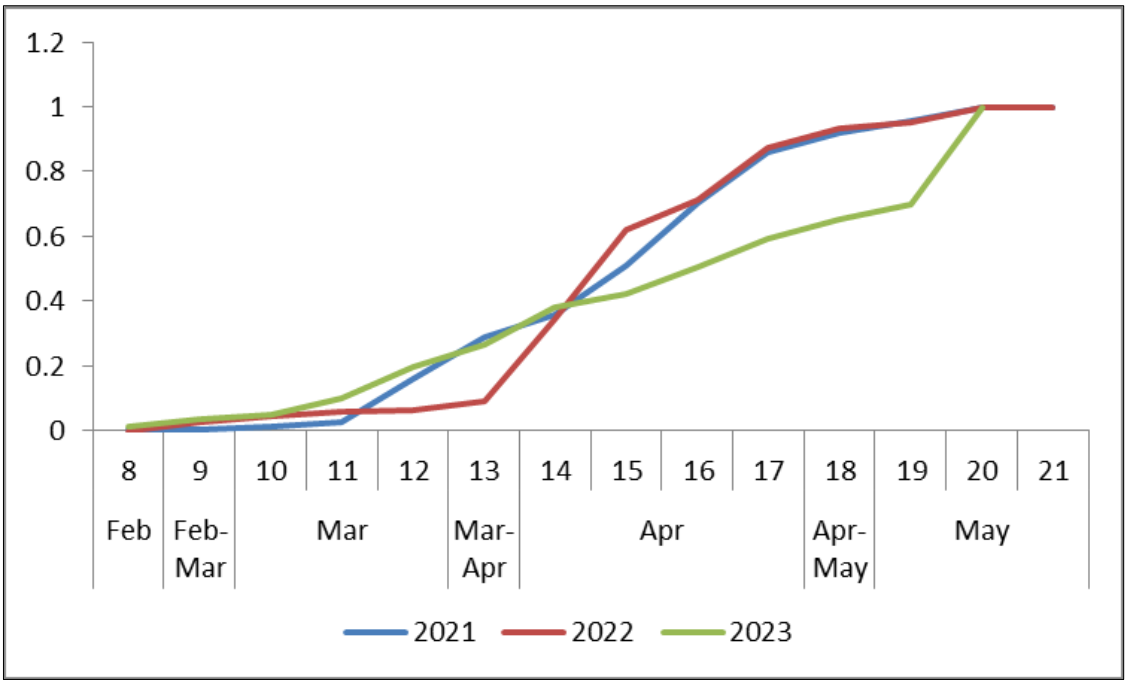

Figure 46: Weekly and monthly cumulative percentage of birds crossing in the springs from 2021 to 2023. Data from 2022 reported by the adjacent project - NIAT 500MW

The figure above shows that during the spring 2023, the percentage of avifauna traversing the project site steadily increased around late February and slowed around mid-March in 2021 and, to a greater extent, 2022 in on-year comparison (first week of April). In 2021 and 2022, the peak migrations occurred earlier (end of April – nearly 80%) in these years compared to 2023 – by early May.

The most comprehensive monitoring of bird migration in the Middle East comes from the work by Shirihai et al. (2000) "*Raptor Migration in the Middle East. A summary of 30 years of field research*". As the title says, it includes more than thirty years of established monitoring. The authors explain that counts at the Gulf of Suez of migratory birds in both autumn and spring were observed and recorded already in the 80´s and 90`s with specific references there such as Biljsma (1982, 1983), Wimpfheimer et al. (1983), Meininger & Atta (1994), or other counts in the Southern Red Sea Area (Sorensen 1982, Grieve 1996). The authors also provide details on and how migration occurs both in spring and winter along the entire Middle East, from Djibouti to Jordan and Lebanon, from Egypt to Yemen, providing also data from latitudes further north like Bosphorus. The assessment below compared the results with the Shirihai et al. (2000) study in order to understand and compare the raptor migratory patterns recorded within the Project site since it is more focused in the Middle East. For the non-raptor species, other scientific sources have been considered.

It must be kept in mind that despite wind energy is a new field; the migratory counts existed many decades before the first turbines started spinning. The VP counts do not differ from those counts being done exclusively to study the migration.

The White Stork

The White Stork's passage through the site indicated two peaks in spring 2021: in early April and early May as illustrated in the figure below. Ninety percent (90%) of the total birds crossed within a two-week timeframe. Reasons for this are unknown, as it is a species which migrates earlier in the season. In 2023, the populations of White Stork migrating are more dispersed and less concentrated compared to 2021, peaking by early May. There was one outlier in this case of comparison to 2021 – a flock of 7,000 individual birds, comprising about 23% of the White Storks recorded in total.

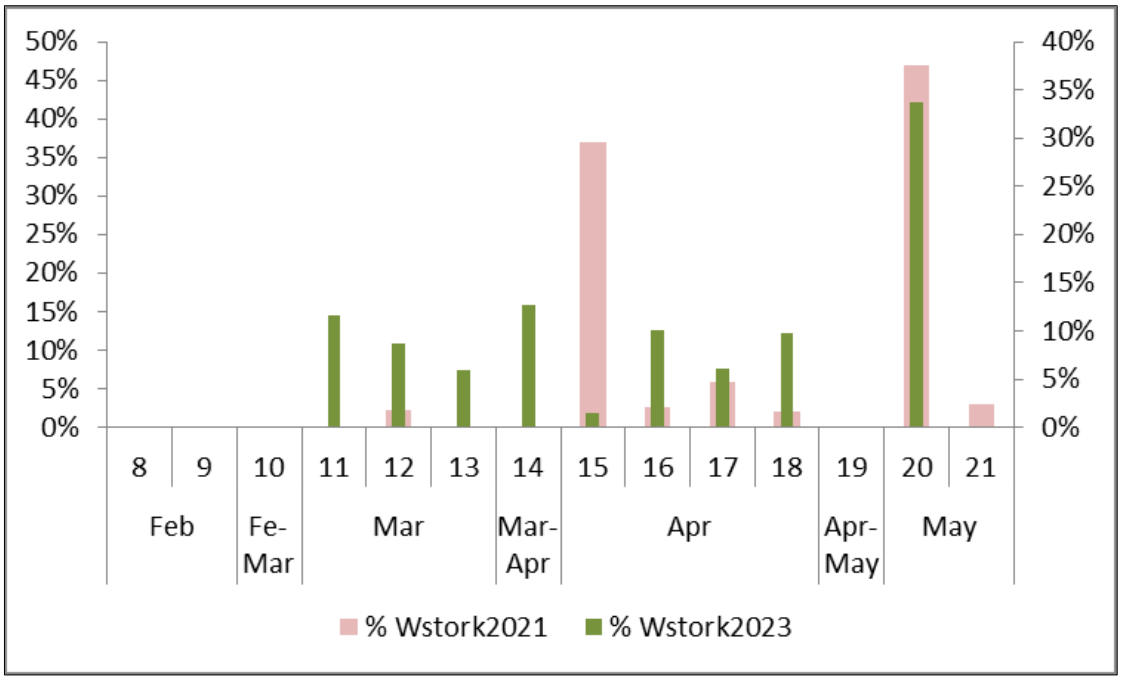

Figure 47: Percentage of White Storks migrating in spring 2021 and 2023 with details of weeks and months

As noted below, when analysing the median passing rate Figure 48, in 2021 the highest passing rate occurs after some time after dawn (8:00am-9:00am), and again by the end of the day between the hours of 15:00 to 16:00. However, the number of records shows two peaks, one at the same time of the highest passing rates from 8 to 9am and again from 13 to 14:00pm. High passing rates but a low number recorded is an indication that most of such observations involve a large number of individuals (i.e. larger flocks).

The bimodal pattern of the passing rate and records suggest the species arrived late to the site and overnight elsewhere. At the same time, those higher passing rates recorded at approximately two hours after dawn would indicate the presence of storks that are overnighting in the area of influence of the project.

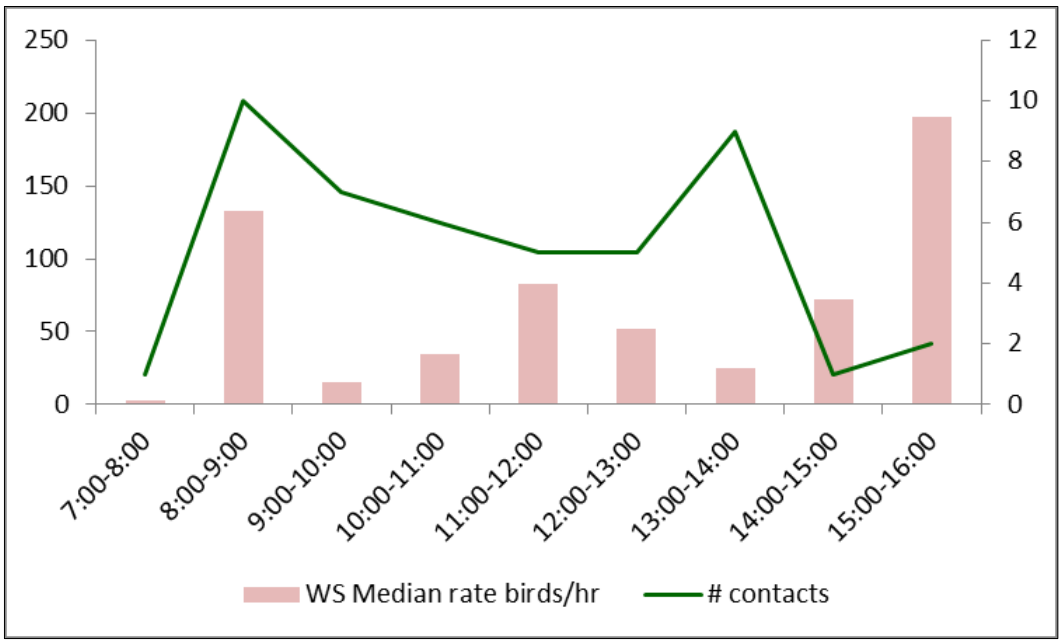

Figure 48: Median passing rates (birds/hour) for the White Stork and number of contacts per daily hour interval in 2021

In 2023, the pattern is similar after dawn, increasing the number of contacts in the early morning and in the afternoon as well. The migratory flux in 2023 over the area in the absence of indications of late-evening passage could indicate the possibility of roosting (lower number of contacts but also a low passing rate).

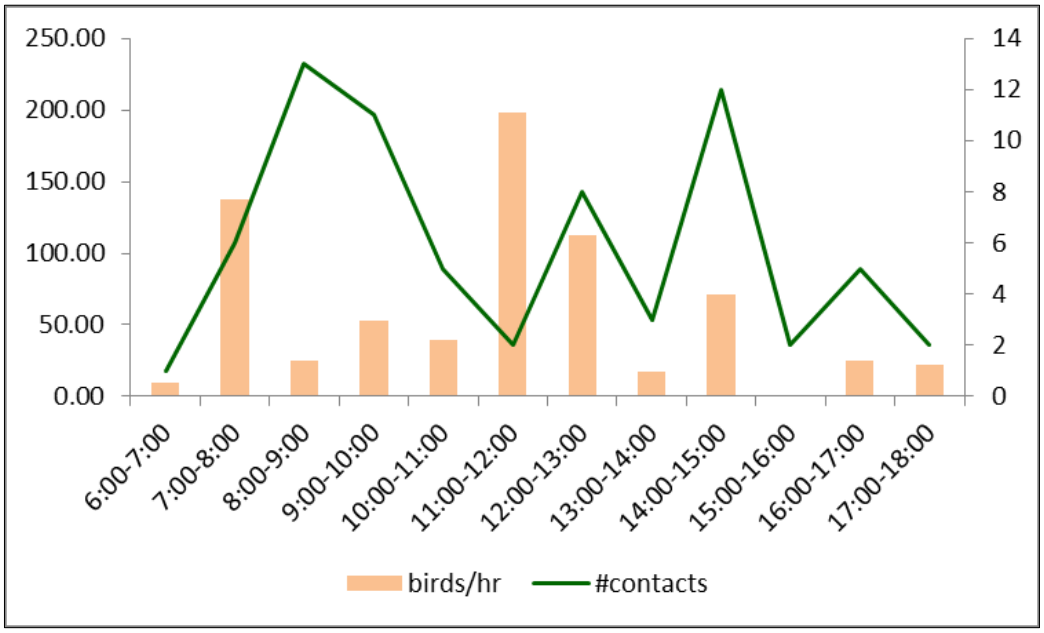

Figure 49: Median passing rates (birds/hour) for the White Stork and number of contacts per daily hour interval in 2023

The Steppe Buzzard

The figure below represents the migration pattern for the Steppe Buzzard, extending from late February to May for the years 2021 and 2023. Large numbers traversed in mid-March and March-end early April (2023) with peaks by the mid of the month and maintaining similar proportions till late-April. Migration at the site extended over a twelve-week period, but individual numbers indicate some delay. Shirihai et al. (2000) mentions that 90% of the total numbers pass between 22 March and 15 April. The results of the study's observations generally match this pattern, being consistent in both seasons.

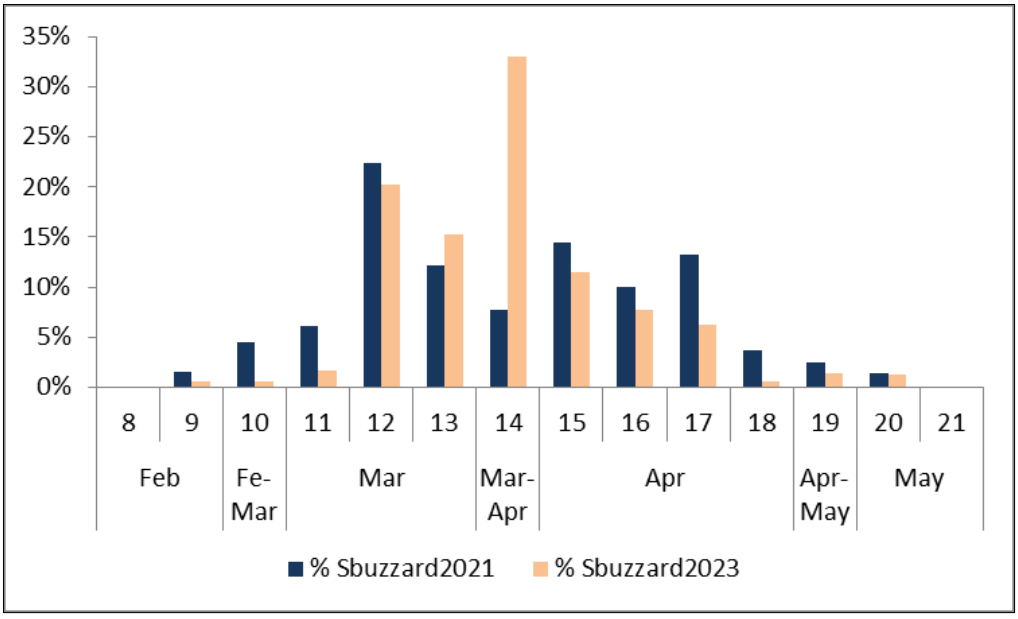

Figure 50: Percentage of Steppe Buzzard migrating in spring 2021 and 2023 with details of weeks and months

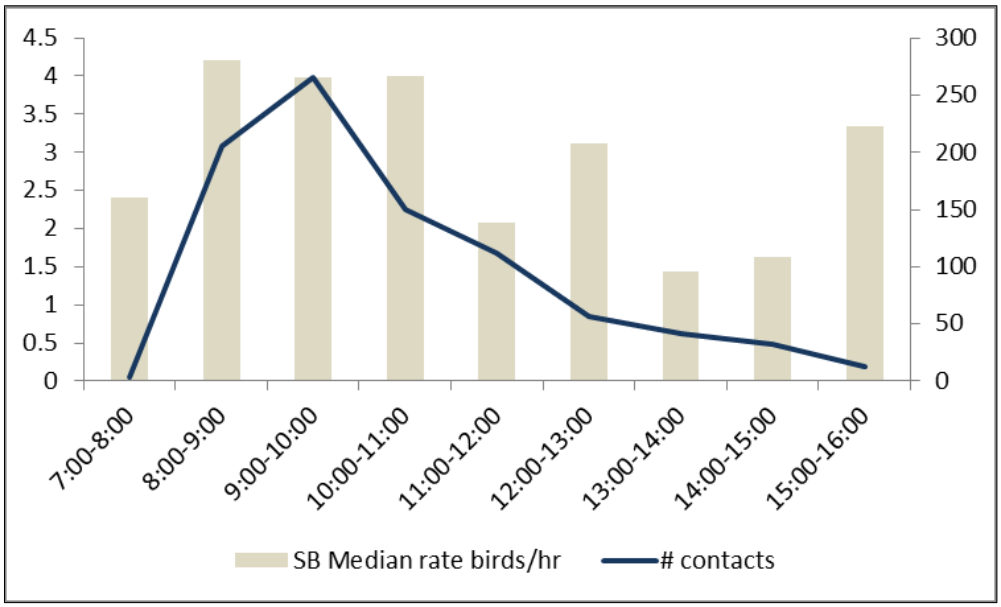

Figure 51: Median passing rates (birds/hour) for the Steppe Buzzard and number of contacts per daily hour interval in 2021

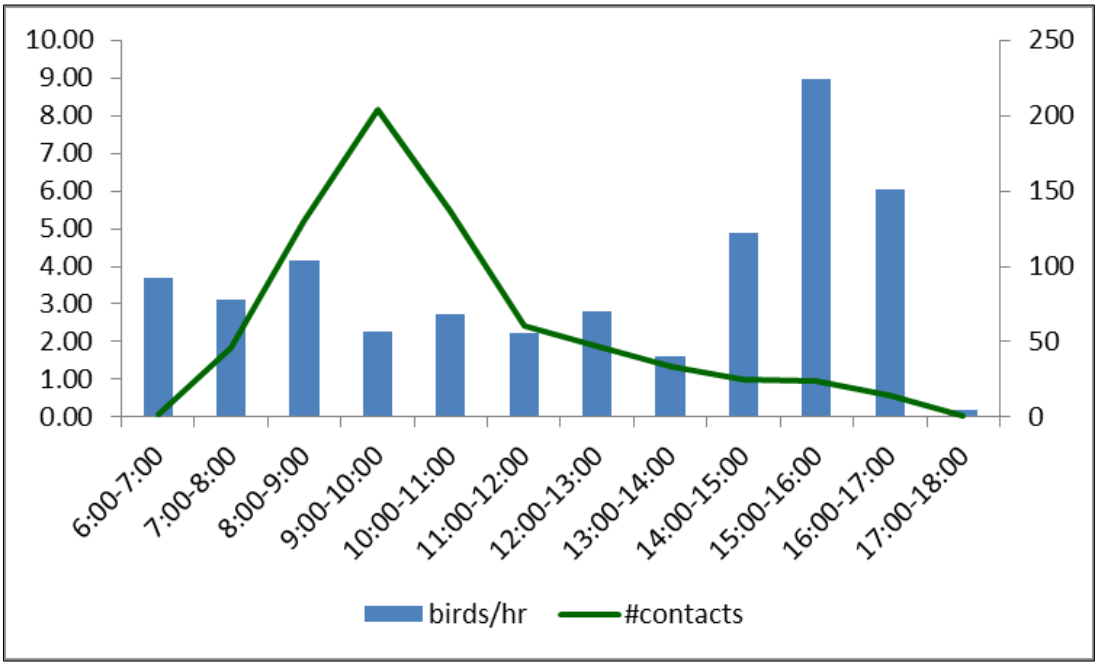

Figure 52: Median passing rates (birds/hour) for the Steppe Buzzard and number of contacts per daily hour interval in 2023

The passing rates and contacts per hour interval show opposite trends. While the higher number of contacts show the same trend (a peak in the early morning around 10:00am), the passing rate is highest in the early morning and late evening in 2021, but only in the late evening in 2023. In other words, more contacts and birds crossed in 2021; while lower birds but the same contacts appeared in 2023.

The European Honey Buzzard

The European Honey Buzzard is presented in the figure belowFigure 53. According to the well-known migratory patterns in the region, the European Honey Buzzard peaks in May, despite an indication of early migration in the last week of April. Shirihai et al. (2000) refers to the European Honey Buzzard with a migration period which extends from mid-March to mid-June and recorded the peak between late April and late May. The observed pattern agrees with that study.

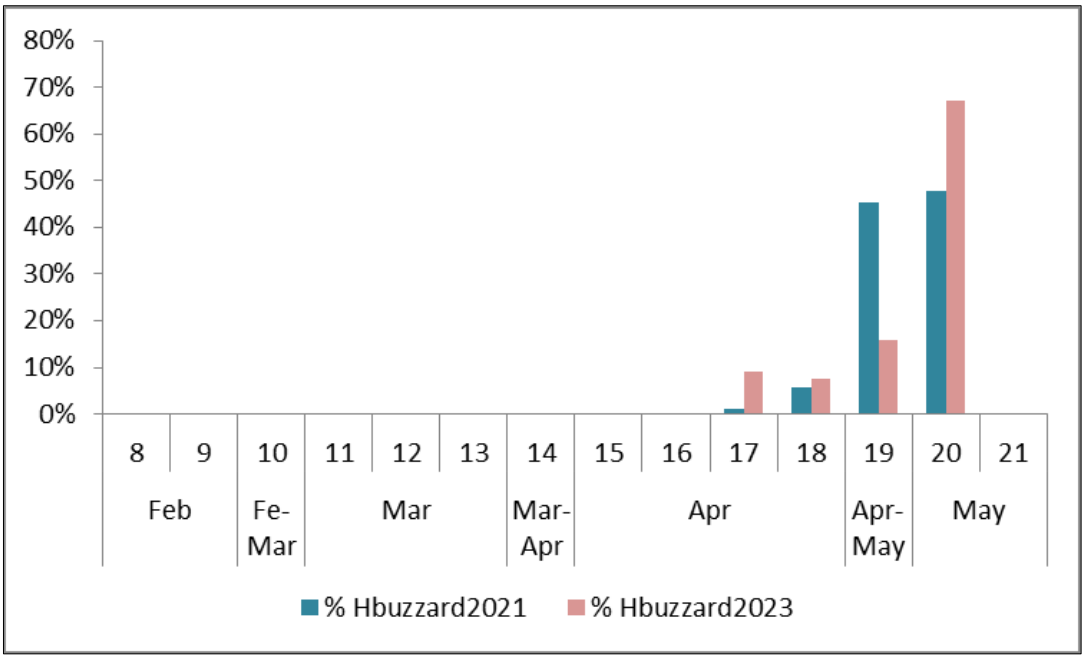

Figure 53: Percentage of the Honey Buzzard migrating in spring 2021 and 2023 with details of weeks and months

The Honey Buzzard shows a clear pattern both for the passing rate and the number of contacts, both run together throughout the day, with peaks around two hours after dawn, then decreasing till the end of the day in 2021. In 2023, the contacts follow the same trend as in 2021, with the exception that more birds passed in the afternoon. These results are expected due to the lack of landscape features which might make the place attractive for birds. There is not a marked pattern of migration required over the site and the factors affecting the migration on a large scale along the Flyway remain unknown. The Honey Buzzards roost elsewhere overnight.

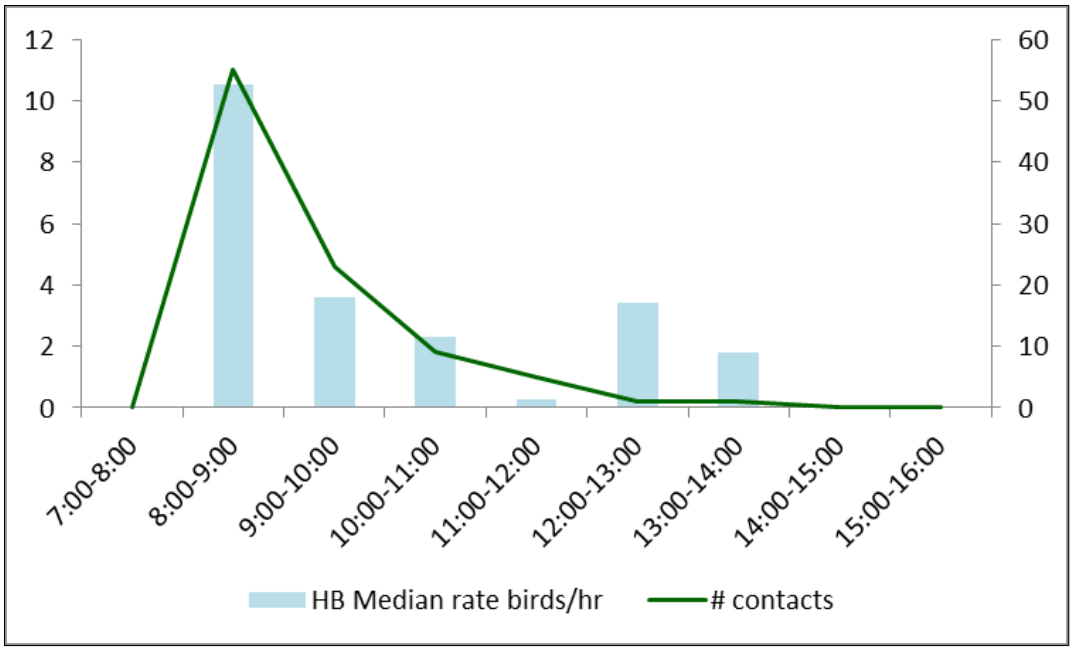

Figure 54: Median passing rates (birds/hour) for the Honey Buzzard and number of contacts per daily hour interval in 2021

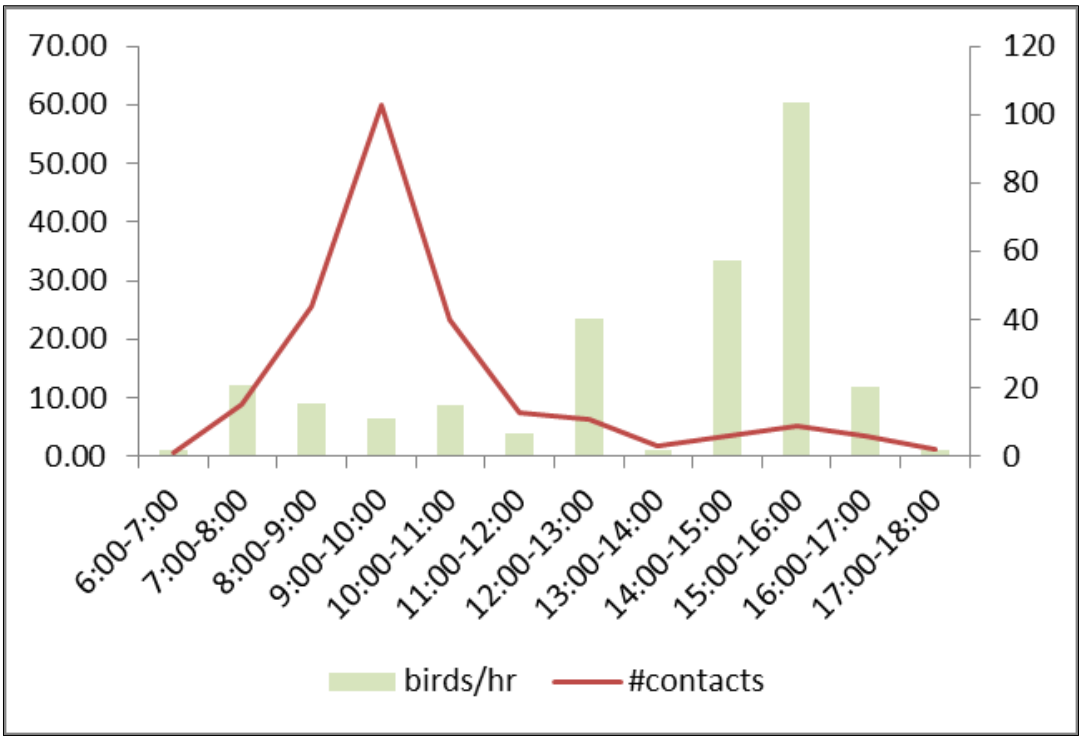

Figure 55: Median passing rates (birds/hour) for the Honey Buzzard and number of contacts per daily hour interval in 2023

The Black Kite

The figure below presents the migration pattern for the Black Kite. This species appeared from March to May (a total of 11 weeks) with the highest numbers occurring between mid-March and end of April. This pattern is similar to what is referenced by Shirihai et al. (2000). Some slight differences appear with other projects in the region –a week later in 2021- but this could be due to normal issues in the migration (delays because of unknown reasons, detours, etc.) given the scale of this process.

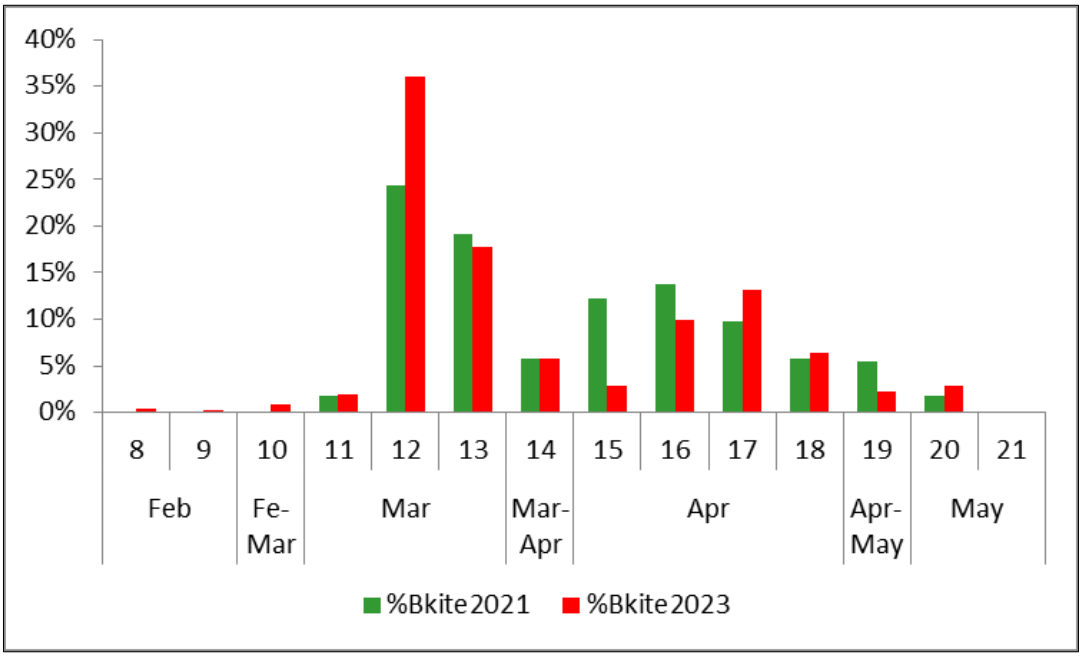

Figure 56: Percentage of the Black Kite migrating in spring 2021and 2023 with details of weeks and months

The daily pattern for the Black Kite resembles that of the Honey Buzzard, with a major peak in both passing rates and number of records in the morning, as soon the conditions are good for migration, and then a decrease till the end of the day. This is the expected migration in an area with no attraction for raptors because of its lack of resources for them to provide.

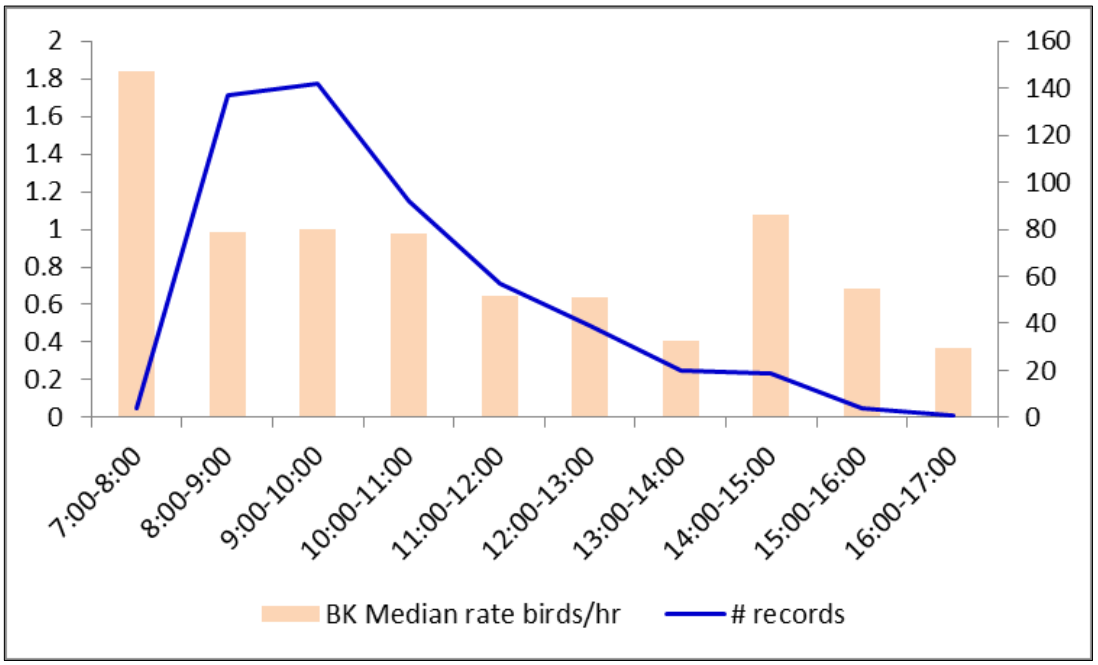

Figure 57: Median passing rates (birds/hour) for the Black Kite and number of contacts per daily hour interval in 2021

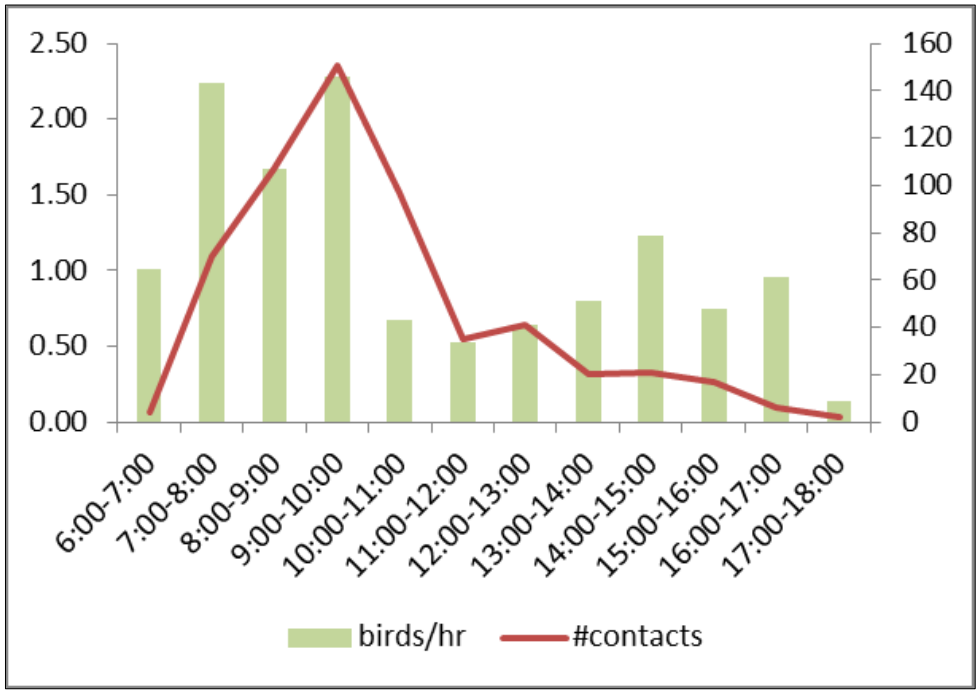

Figure 58: Median passing rates (birds/hour) for the Black Kite and number of contacts per daily hour interval in 2023.

The Steppe Eagle

The Steppe Eagle during the reporting period migrated between mid-February and April (a total of 11 weeks), showing its peak between late February-March. The Steppe Eagle according to Shirihai et al. (2000) has two main periods of migration, late Feb to mid-March with a peak in the second week of March, and another during

third week of March-early April, with a few recorded before February or after May 10th. At the Project site, the peak occurs in March as stated by Shirihai et al. (2000).

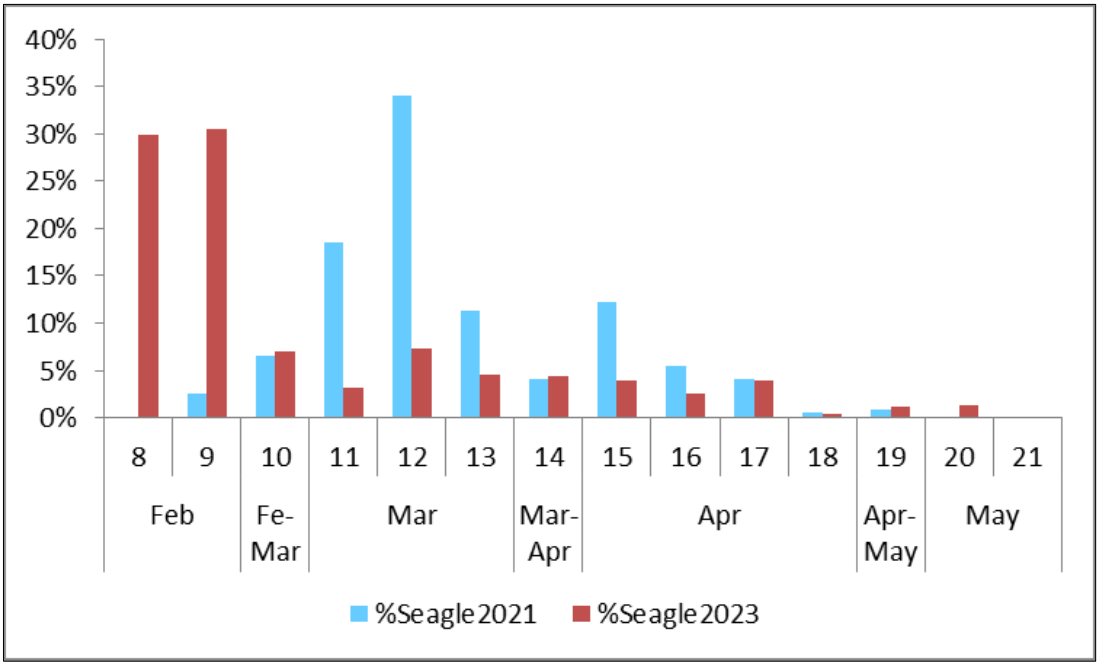

Figure 59: Percentage of the Steppe Eagle migrating in spring 2021 and 2023 with details of weeks and months

The hourly passage rate for the Steppe Eagle is similar to that for the Steppe Buzzard, with a nearly similar passing rate throughout the day. Also, the patterns of the number of records keep the same trend of the previous raptor species; the records reach the peak by 9:00-10:00am, then decreasing till the end of the day.

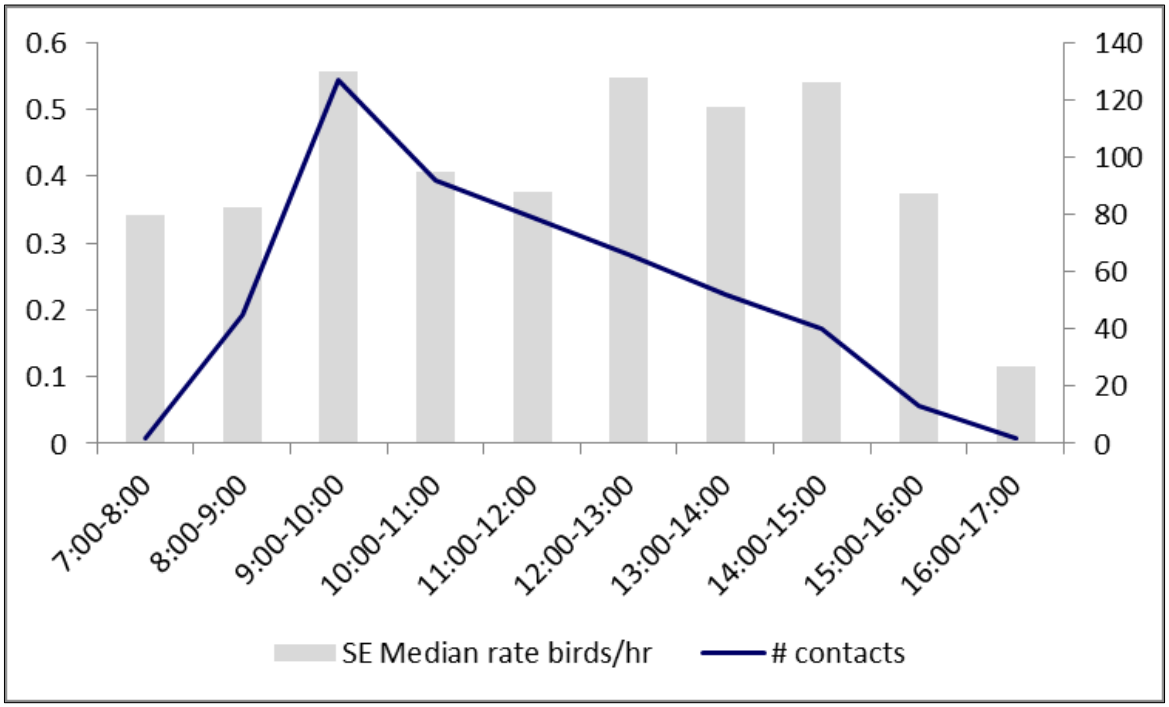

Figure 60: Median passing rates (birds/hour) for the Steppe eagle and number of contacts per daily hour interval in 2021

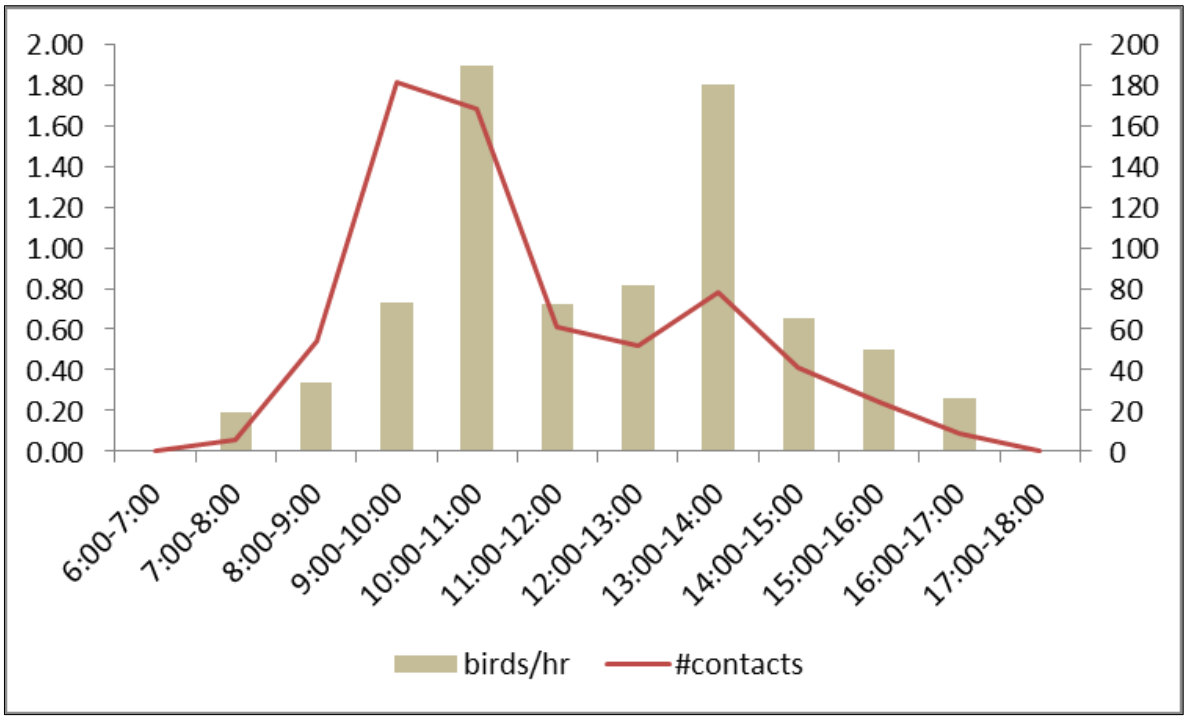

Figure 61: Median passing rates (birds/hour) for the Steppe eagle and number of contacts per daily hour interval in 2023

The overall remarks of this section are:

- Related with the migration period of each of the species, the White Stork, Steppe Buzzard, European Honey Buzzard, Black Kite, and the Steppe Eagle follow the known pattern through the Middle East, as described by Shirihai et al. (2000), despite some delays recorded. An exhaustive recording of the ages of the birds passing was not conducted which may assist to better understand which fractions of the populations are migrating.
- Secondly, and except for the White Stork, the most abundant species show the same pattern of migration throughout the day. There was a marked passage between 8:00-10:00am for all of them. The highest bird/hour numbers are those of the White Stork, followed at a great distance by the Honey Buzzard. This is also the case of other species for which the analysis has been done but graphs not included here like the Levant Sparrowhawk, Booted Eagle, or the Black Stork.
- There is a consistency in three important points in 2021 and 2022: 1) species composition - the species present were the same as in other projects within the region; 2) the passing times per month were similar between the two years and related to joining projects in its vicinity; and 3) there was consistency in the daily passing time as well. The only difference was the number of birds migrating, but this is also an expected outcome, because the area does not form any bottleneck but a small piece of a wide Flyway. The passing times (monthly, weekly or daily) are helpful to inform mitigation. The data show where the major efforts have to be devoted in terms of human resources, e.g. field observers.

(vii) Landing and Resting

Avifauna typically rest overnight along the route with the exception of species such as the Lesser Kestrel and the Common Crane. Overnight may pose a risk of being predated and the desert is not a secure place. This is a different behavior of what is considered “roosting”, when birds return to a same site several times during a period like dispersal after fledgling, or when food resources are abundant. Overnighting may also occur because of a sandstorm which may disrupt birds during migration or a late flight in the evening. Before resuming flight,

birds stop and rest, depending of the constraints of the circumstances, it may imply staying for a while or an entire period (e.g., night hours).

Related to wind energy developments it is important to know when birds do stay either on site or its vicinity, as it has implications for mitigation like the shutdown of turbines in critical dawn or sunset periods. Then, flight conditions for obligate soaring birds are limited and may expose such species to higher risks compared to facultative soaring or flapping flight user species.

A total of 6,293 individuals from six species were recorded landing at some point (figure below): the White Stork, White Pelican, Steppe eagle, Steppe Buzzard, Black stork, and Black Kite. Sixty percent (60%) of the birds were white storks and 35% pelicans, being the remaining 5% the other species.

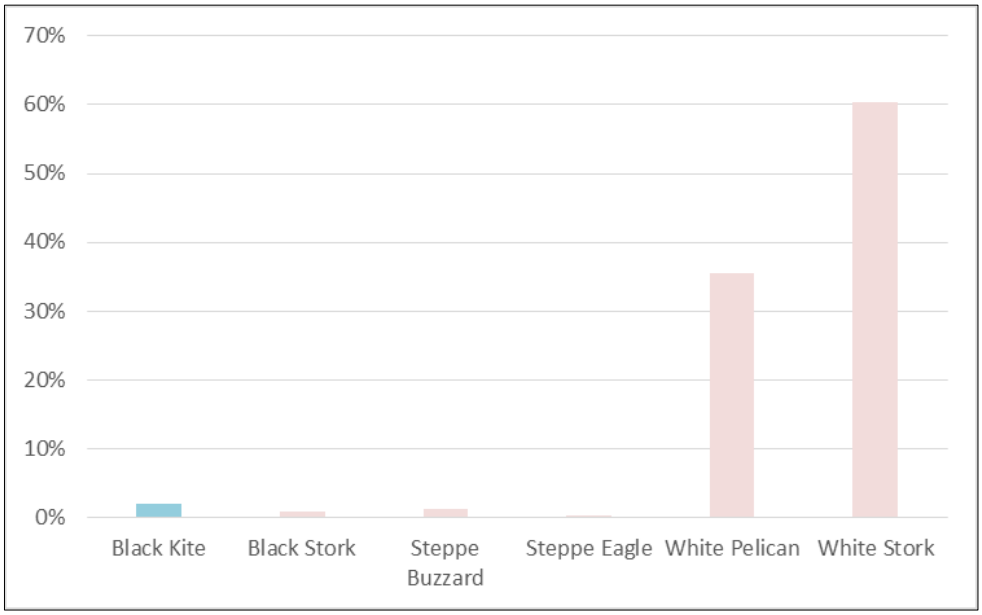

Figure 62: Proportion of birds per species (total = 6,293 individuals) recorded landed within the project area or its vicinity

The figure below shows the distribution of the 6,293 individuals throughout the time interval in a day. Eighty two percent (82%) of the birds were recorded in the early morning while 18% were found in the evening. This indicated to the Consultant team that a significant portion of birds were engaged in overnight flights, in alignment with previous knowledge of the species observed and their night-time flight patterns.

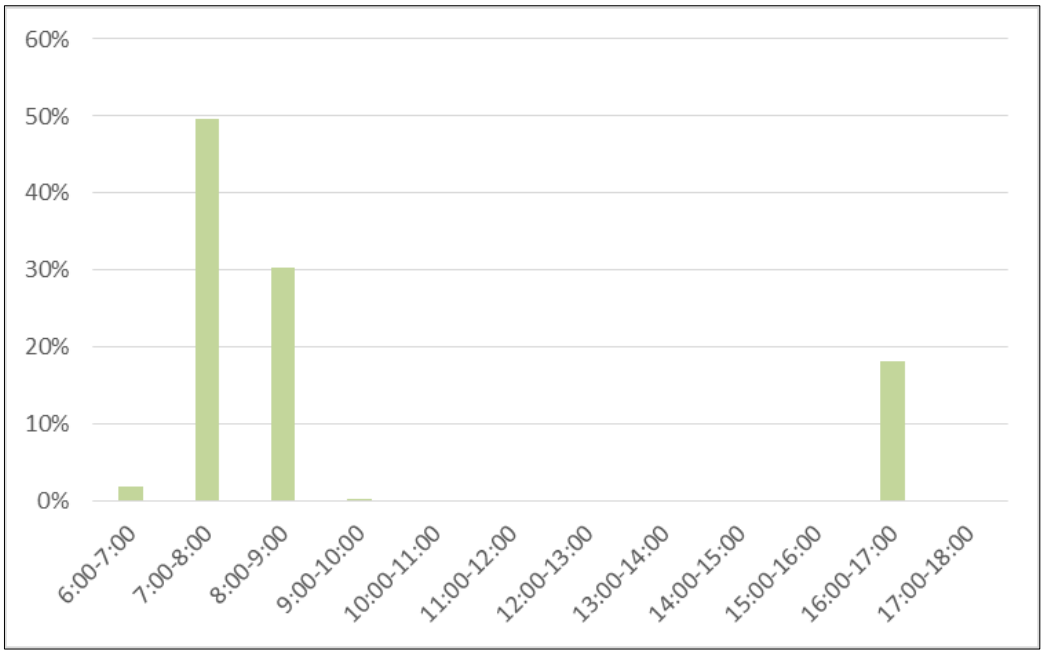

Figure 63: Proportion of birds recorded at each daily time interval

Precise landing sites within the Project footprint were observed but are not indicated in this report. The recurrence of bird landings was anticipated due to the project site's location within the Red Sea Region and along the migration corridor extending from Southern Africa, through the Middle East, and to Northern Continents. Mitigation strategies to mind the migration corridor should be incorporated into the project site's development and operation.

(viii) The landfill

Eight kilometers (8 km) east of the Project site is the Ras Gharib Landfill. In general, dump sites and landfills pose distinct challenges for bird conservation (see Birdlife Intl 2015 for a detailed study). Landfill and dumpsite management and operations are important factors in addition to the site's proximity to the wind farm, as it may attract birds and, subsequently, bring them in proximity with the turbines.

Based on the data that have been made available and collected from the nearby wind farm project (see section X below), no significant risk was indicated. Additionally, the landfill is scheduled to be decommissioned at a to-be-determined date and is to be relocated to another site by local authorities.

Figure 64: Location of the landfill in relation to the Infinity project plot

(ix) Flight Direction

Ninety-six percent (96%) of the total birds recorded were migrating NW, N, and NE. As for the remainder, the weather conditions such as strong winds, sandstorms or whatever variable which may have influenced their flight route. The flight directions of the five most abundant species have been represented in the figures that follow.

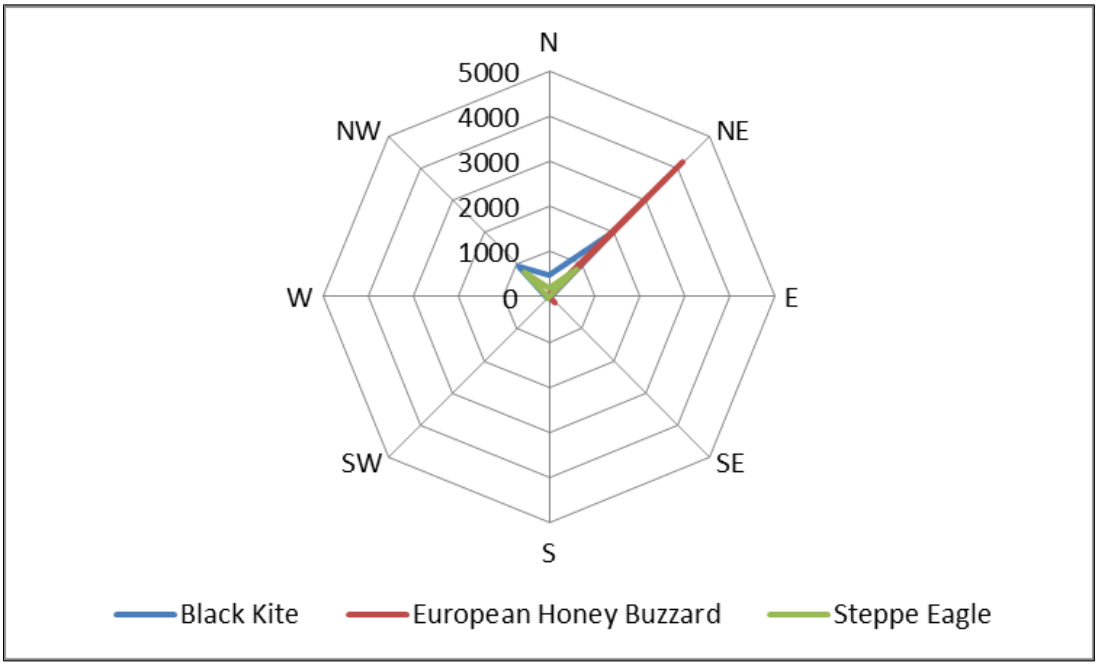

Figure 65: Main flight directions of the Black Kite, E. Honey Buzzard, and the Steppe eagle

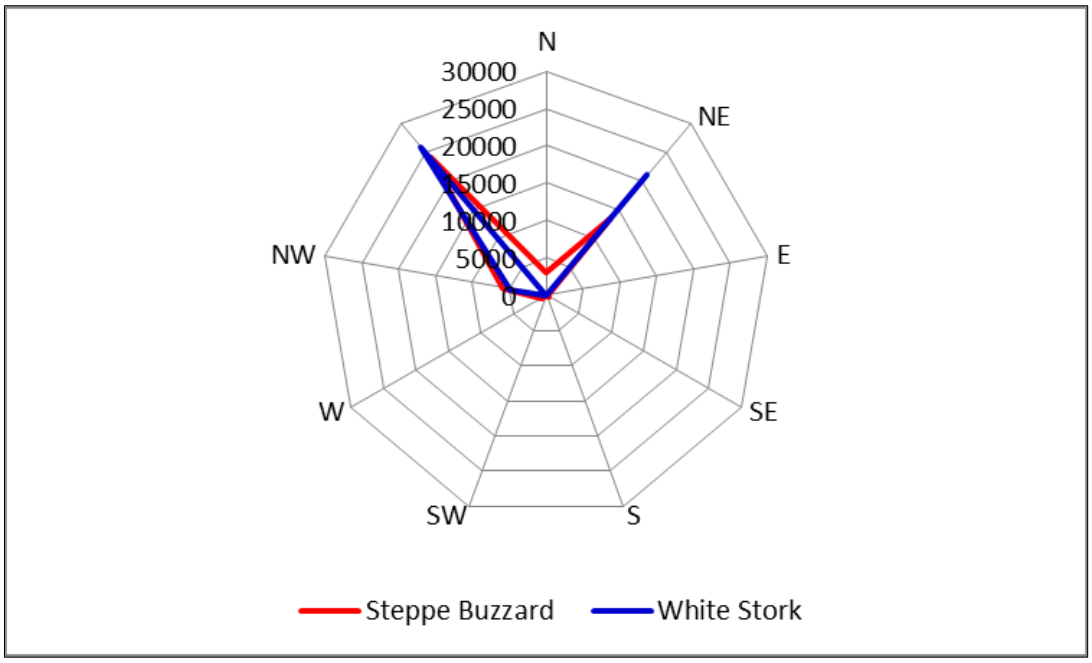

Figure 66 Main flight directions for the Steppe Buzzard and the White Stork

(x) Cumulative Analysis with the Neighbouring Project

First, it must be kept in mind that comparisons are only appropriate when performing the so-called "*same time (season and year) different place validation (project 1 versus project 2)*". This implies that comparisons are only possible for the same season across two projects within the same year, e.g. spring 2021. In other words, comparing spring 2021 for the first project versus spring 2022 for the second one is not possible.

As shown in the figure below the IPH 200MW project has right to the eat another wind farm project which is under planning and includes 173 turbines with a total capacity of 500MW.

As explained earlier, the bird monitoring data for IPH during spring 2021 form Feb to March 28th were taken from this project.

The bird monitoring has taken place at the same time as that for IPH but having the following differences:

- There were eight (8) Vantage Points
- Bird data has been compared only for April and the remaining time of May 2021. In April, IPH employed 440 hr and 48 minutes compared to 819 hr and 59 min at the neighbour project. In May, IPH performed 290 hr and 20 min, and the neighbour project 543 hr and 3 min. Overall, the neighbouring project devoted 1.86 more time to monitoring than IPH.
- The allocated land for this project is 73km^2 compared to 37.5km^2 for IPH.

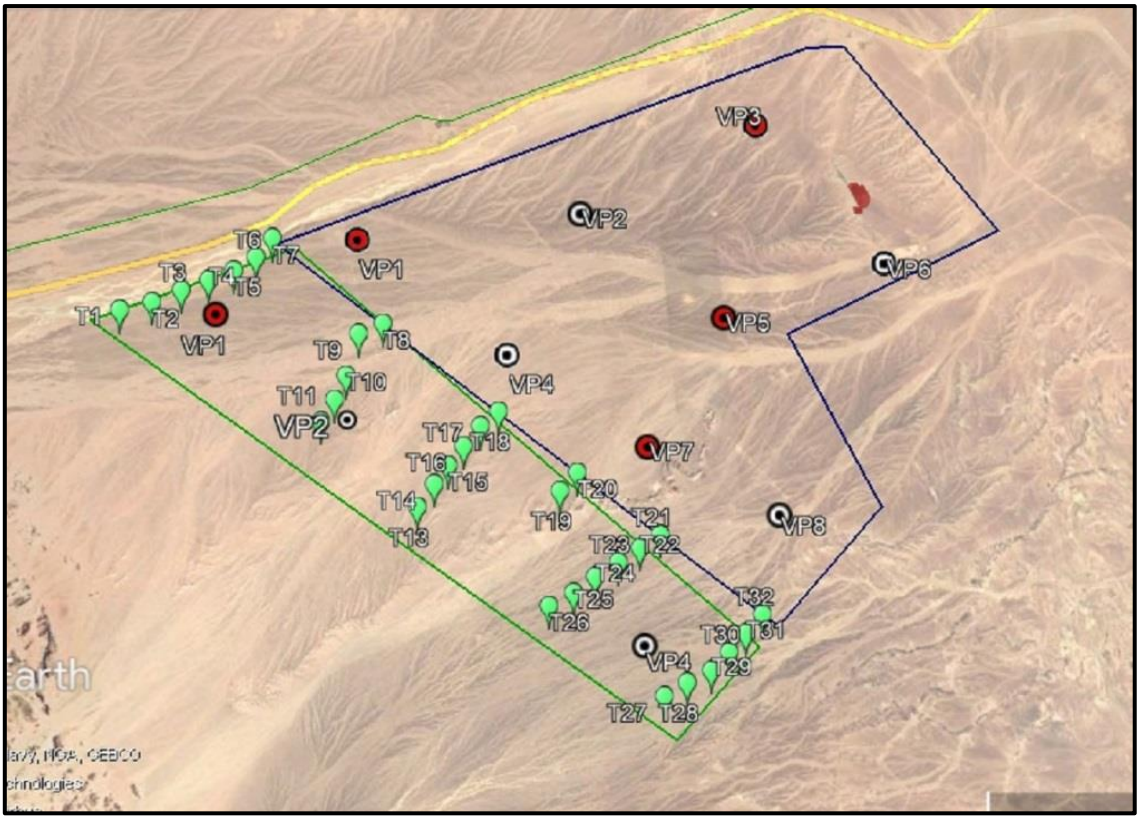

Figure 67: Location of Infinity (200MW), green outline and turbine layout, and its neighbouring project (500MW), blue outline and respective VPs.

Due to the above, comparison without data standardization cannot be undertaken either quantitatively (raw numbers) or qualitatively (species composition). Due to same reasons explained earlier, the more time is spent on monitoring, the higher the chance to counts more birds and record more species. The site and species composition were compared for each project and the passing rates at the two sites as explained in further details below.

Species composition and numbers at the two projects

The table below shows the species recorded during the spring 2021 monitoring season sorted per both, number of observations and individuals. A third column expresses the passing rates (number of birds/total hours of observation) for each project.

Table 29: Species specific composition (#records and individuals) plus the passing rates for the two projects in spring (April-May) 2021

	500MW Infinity Project			500MW project		
SPECIES	**n obs**	**Individuals**	**Birds/hr.**	**n obs**	**Individuals**	**Birds/hr.**
Black Kite	376	1872	0.6723	818	4804	0.8253
Black Stork	19	292	2.2096	46	1368	4.6026
Booted Eagle	44	66	0.1951	93	119	0.1886
Common Kestrel	4	4	0.1326	26	26	0.1422
Common Crane						

Eastern Imperial Eagle	22	29	0.1636	33	49	0.2358
Eleanora`s Falcon						
Egyptian Vulture	23	34	0.1982	41	43	0.1530
Eurasian Hobby						
Eurasian Sparrowhawk	8	10	0.1567	17	20	0.1739
European Honey Buzzard	94	4481	7.3363	190	5353	4.6162
Great White Pelican	1	82	8.8172	7	615	10.6861
Greater Spotted Eagle	8	8	0.1521	11	11	0.1434
Lanner Falcon	1	1	0.1212	1	1	0.1714
Lesser Kestrel						
Lesser Spotted Eagle	54	101	0.2618	160	301	0.2690
Long-legged Buzzard	38	85	0.3223	92	307	0.4565
Levant Sparrowhawk	5	1146	30.6512	8	6696	118.8573
Osprey	6	7	0.1500	9	10	0.1474
Pallid Harrier	5	6	0.1490	1	1	0.1240
Short-toed Snake Eagle	59	80	0.1773	148	187	0.1826
Sooty Falcon	1	1	0.1364	2	2	0.1355
Steppe Buzzard	519	13369	3.3774	999	21779	3.0175
Montagu's Harrier				10	15	0.2116
Steppe Eagle	179	489	0.3440	487	1266	0.3541
Western Marsh Harrier	9	11	0.1819	15	16	0.1599
White Stork	43	25330	68.1339	282	59198	30.4675
Totals	**1,529**	**47,756**	**3.9128**	**3,537**	**104,296**	**4.2397**

There were the same number of species at the two projects, but this is just the result, as stated before, of:

- There are species in similar proportions at the two projects for all the species.
- The values of the passing rates in the table above are absolute numbers, but any count has its own associated range of minimum and maximum values. Thus, the observed differences between each pair of passing rates within a species should be considered as similar. No further statistical test for differences was performed but the data show certain confidence. The passing rates between the 500MW and IPH 200MW projects show a significant statistical correlation (Corr. Coeff. = 0.64 and $p<0.001$), but also the number of records (Corr. Coeff. = 0.98 and $p<0.001$), and the number of individuals (Corr. Coeff. = 0.58 and $p<0.005$). This suggests the approach for the monitoring and outcomes are strongly associated, as could be expected because their proximity.

Passage through the two sites: Timing of passage: month and week

Five species were selected with large numbers at both projects for comparisons. The following figures show the percentages per week and month during April until mid-May for the Black Kite, European Honey Buzzard, Steppe Eagle, and White Stork.

The figures show how the migration patterns during April until mid-May perfectly match for four of the five species. It is only the White Stork the species which differs partially in mid-May. This species has migration behaviour in very large flocks. The migration at the IPH site took place in one single day of week #21, accounting for only four flocks but including 1,500 to 4,500 individuals. These results confirm what was mentioned earlier about global relationship of the overall data.

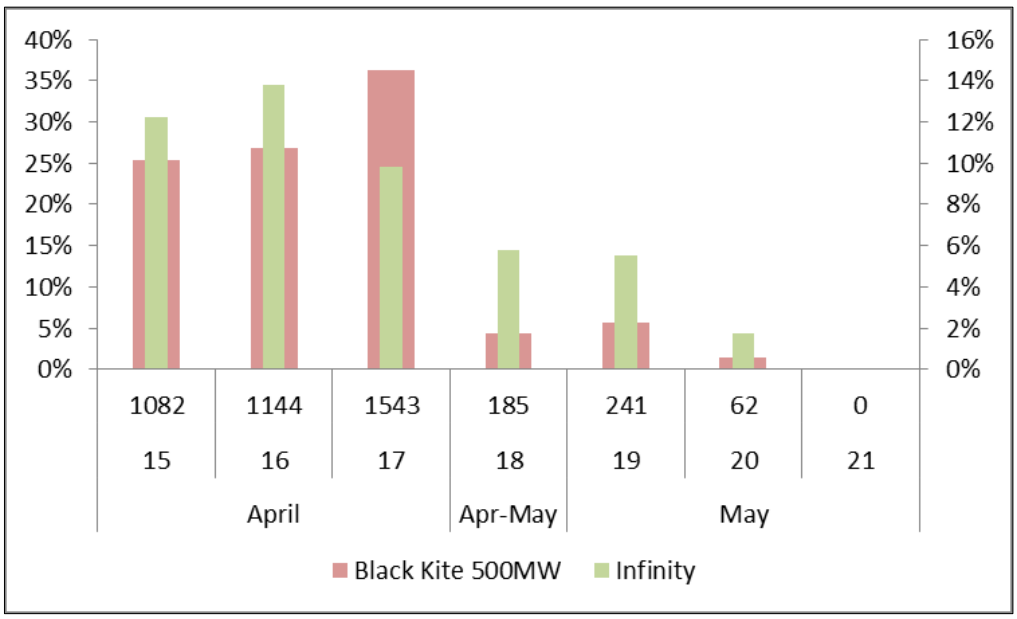

Figure 68: Comparative percentage passages of Black kites per week and month for the two projects during spring 2021

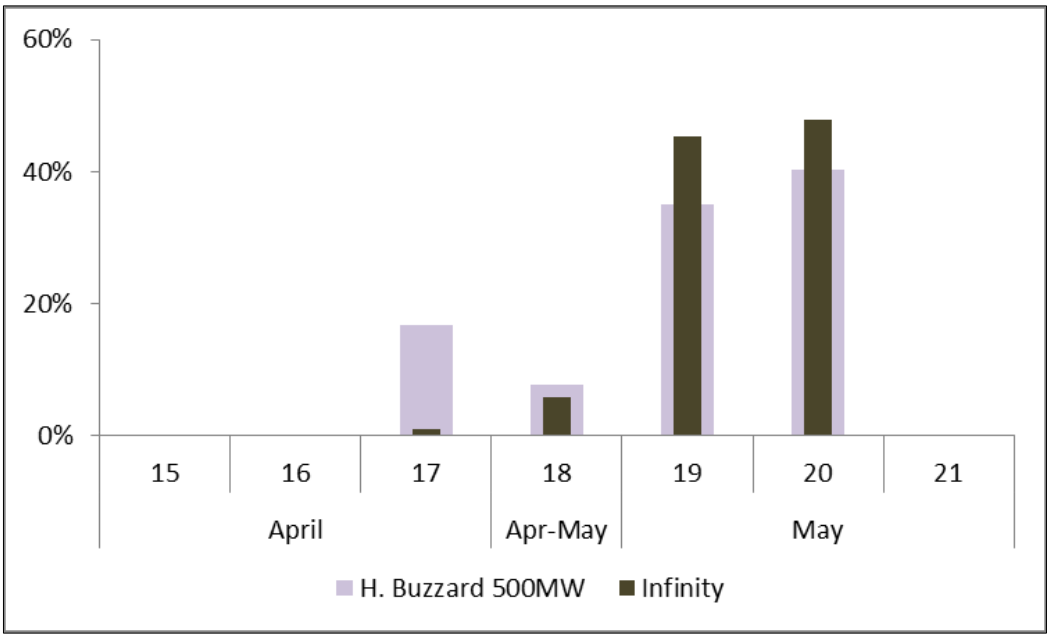

Figure 69: Comparative percentage passages of European Honey Buzzards per week and month for the two projects during spring 2021

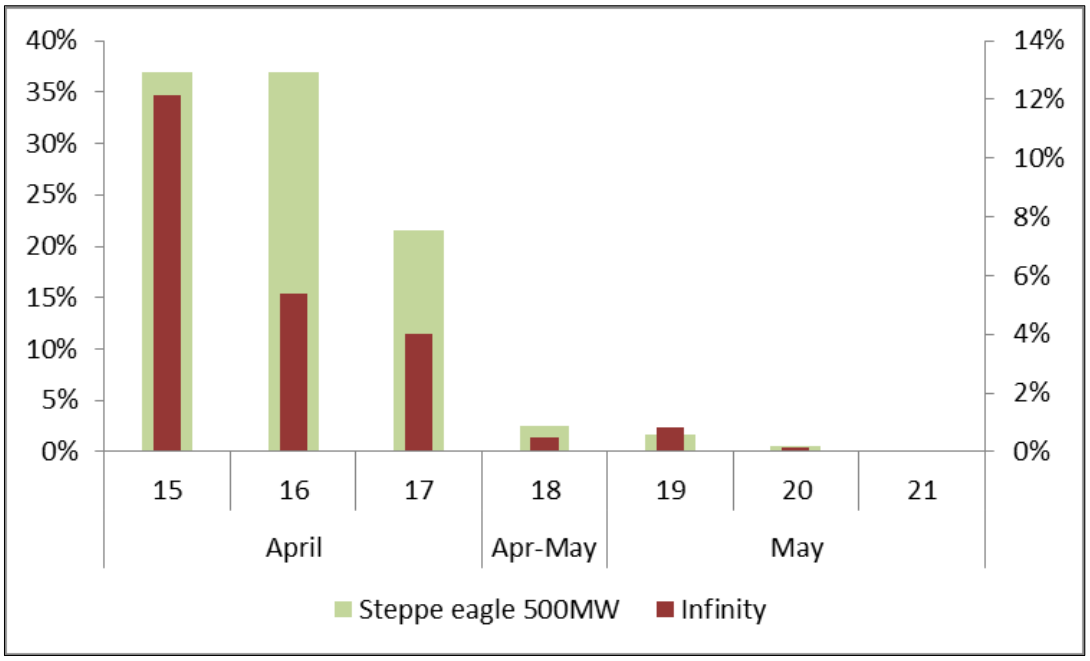

Figure 70: Comparative percentage passages of Steppe eagles per week and month for the two projects during spring 2021

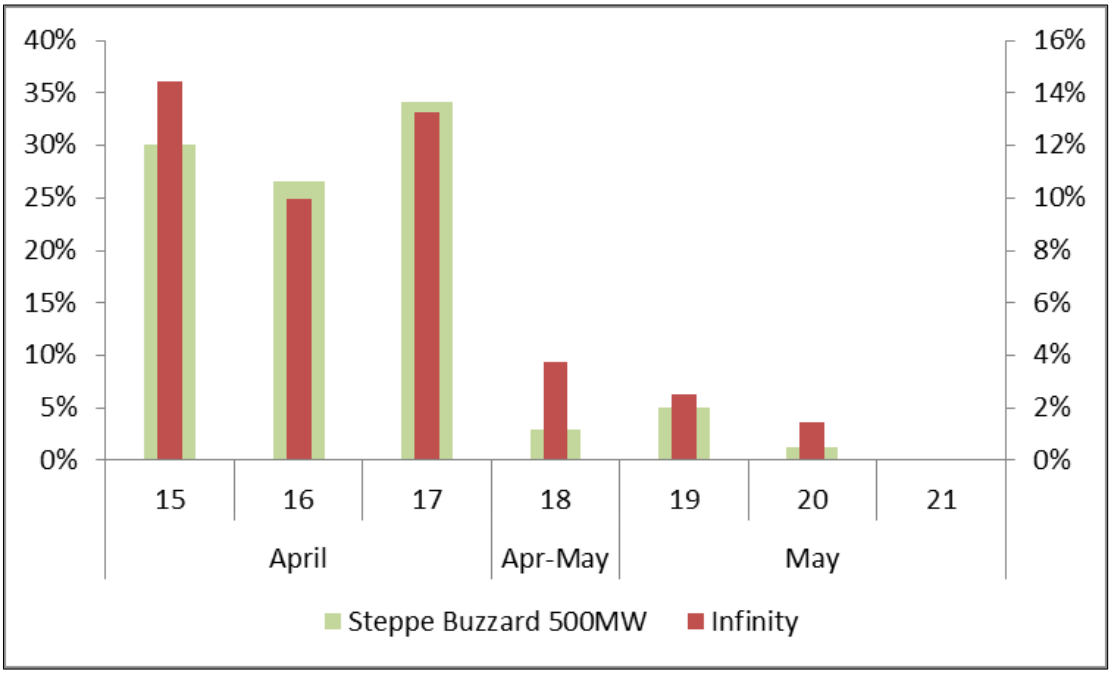

Figure 71: Comparative percentage passages of Steppe Buzzards per week and month for the two projects during spring 2021

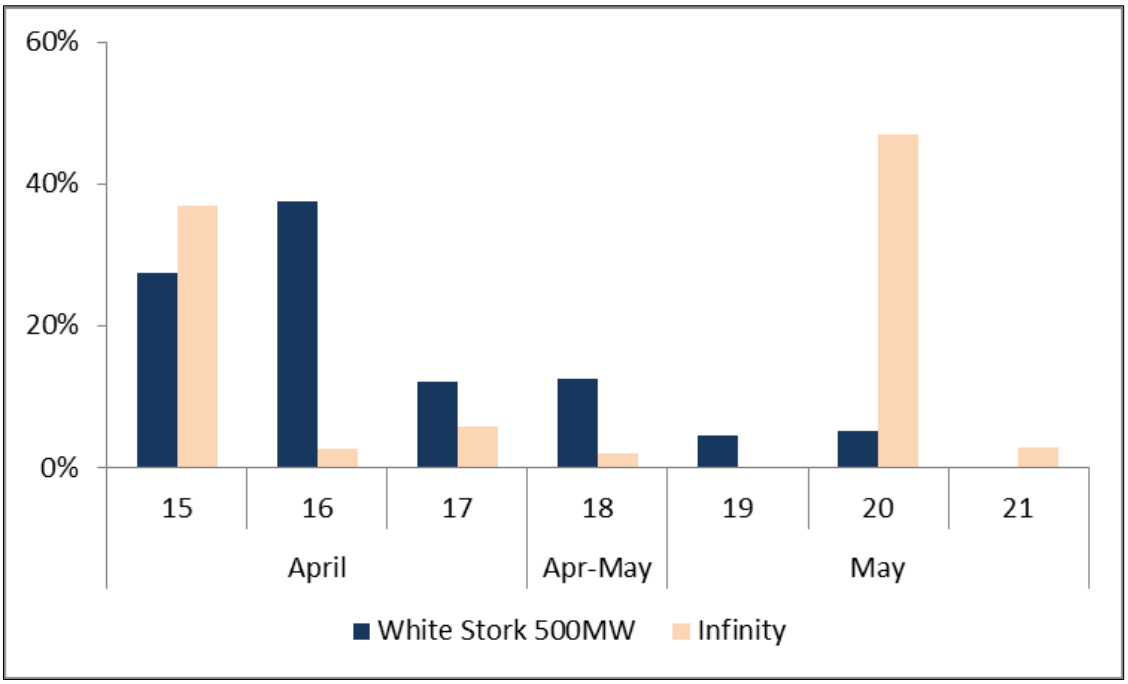

Figure 72: Comparative percentage passages of White storks per week and month for the two projects during spring 2021

Passage through the two sites: daily hours

Following the monthly and weekly passage, the daily hour crossing at both sites were compared. Three out of the five species (Honey and Steppe Buzzards, and White Stork) showed strong and significant association in the passages rates throughout the day between IPH and the 500MW site. Also, for the Black Kite the relationship was almost significant, whilst there was no relation for the Steppe eagle. All species except the eagle behave mostly in flocks.

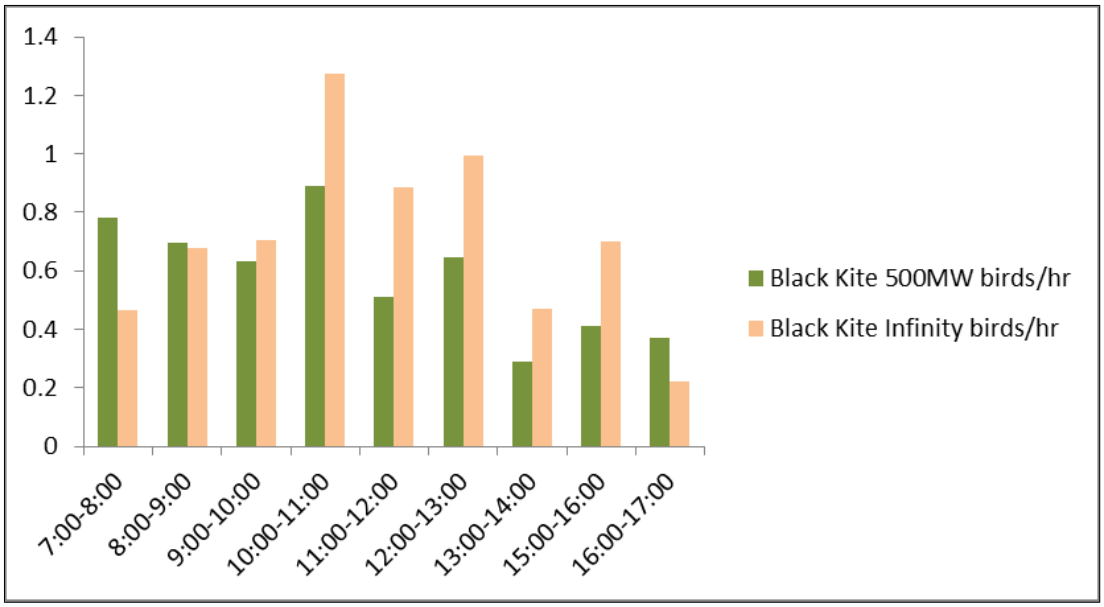

Figure 73: Hourly passage rates for the Black Kite at the two sites

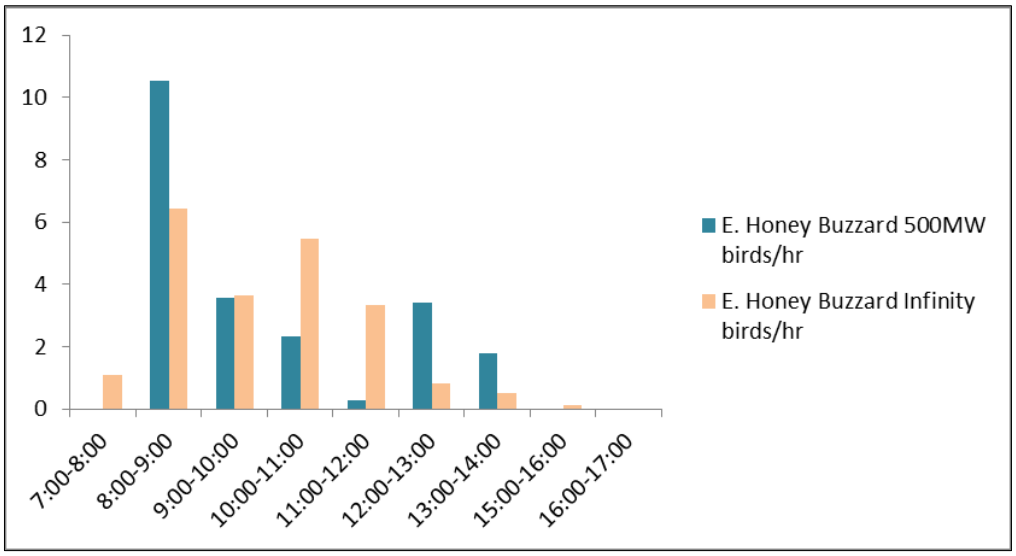

Figure 74: Hourly passage rates for the European Honey Buzzard at the two sites

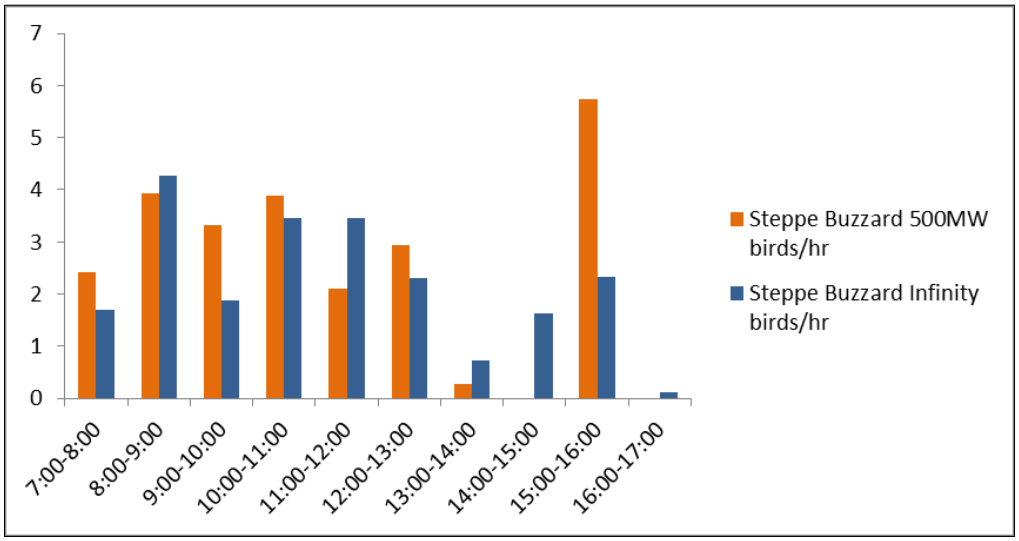

Figure 75: Hourly passage rates for the Steppe Buzzard at the two sites

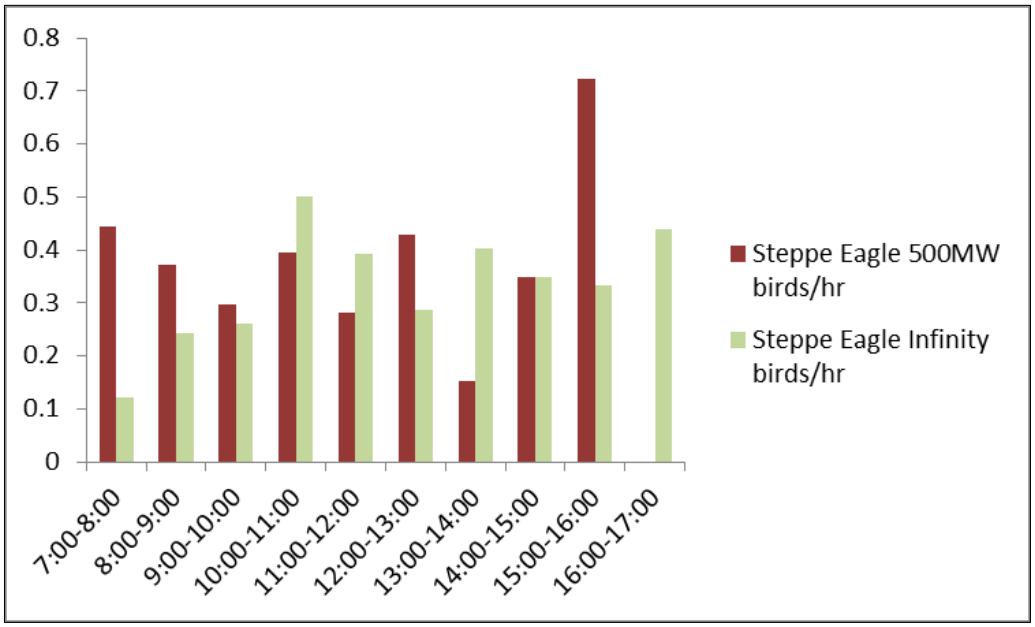

Figure 76: Hourly passage rates for the Steppe eagle at the two sites

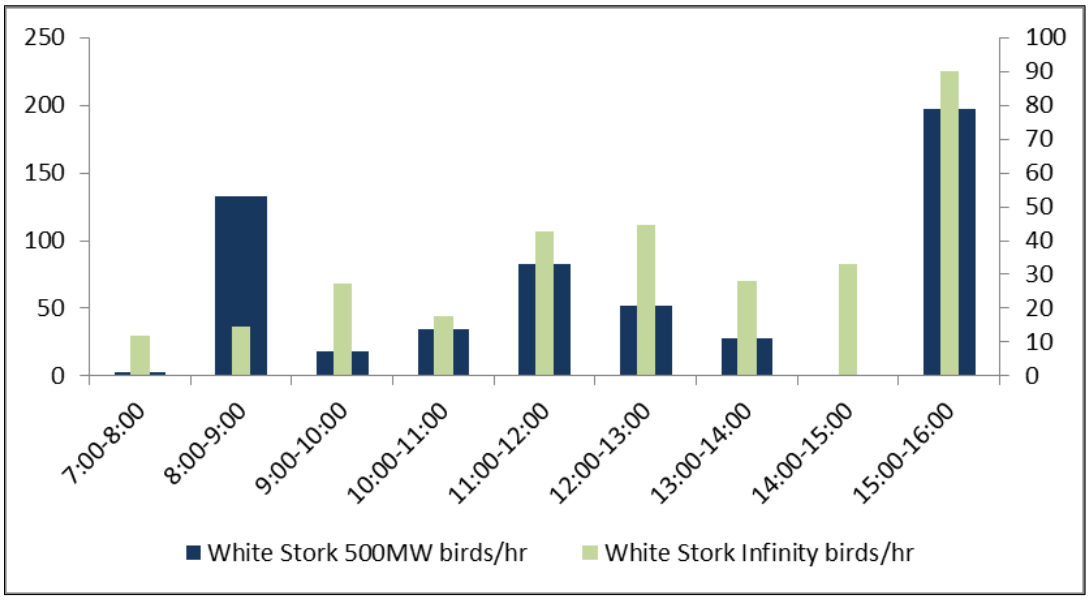

Figure 77: Hourly passage rates for the White Stork at the two sites

(xi) Conclusions

Based on the review of data for the spring seasons 2021 and 2023 the following is concluded:

- The results are consistent with other projects in the region.
- The survey did not identify any key, important or significant habitats for roosting or breed sites within the Project area. This is mainly attributed to the desert and barren nature of the area and lack of trees or cliff shelters.
- The survey did not identify any specific or preferred routes for birds within the Project site. The entire project area also shows consistency in this respect due to the landscape.
- The survey did not identify any site-specific constraints or area of concern that should be avoided.
- Nearby potential areas of attraction (e.g., landfill) seem not to impact or effect on the Project site despite large numbers of some species like the White Stork were recorded in the 500MW joint project.
- As expected, numbers of birds passing through change between seasons. The CRM cannot be considered to establish thresholds for collision estimations, other than considering higher or lower risk. In any case, the species of major and lower concern are the same as in other project within the Red Sea region wherever the project is, e.g., north or south to Ras Gharib.

7.5.3 Autumn Season

As shown in the table below, monitoring times per VP during autumn 2021 differed, either because the lower number of days of monitoring, e.g. August and November which only cover ten and fifteen days, respectively, compared to September and October, which were fully monitored for their entire thirty days.

The time invested in monitoring (*effort*), either on VP basis or overall, introduces a bias when comparing the bird numbers, so it should be standardized by means of using the bird passing rate (birds /hour of observation), see Bibby et al. 1992, Caughley 1977 before making an analysis. Due to lack of standardization, the passing rate is utilized.

Table 30: Monitoring times per Vantage Point in autumn 2021 (hh:mm)

	VP1	VP2	VP3	VP4	TOTALS
August	55:19	63:32	75:45	75:03	269:39
September	83:08	45:45	41:24	57:42	227:59
October	54:24	62:54	82:38	74:24	274:20
November	18:05	27:00	24:00	24:00	93:05
Totals	210:56	199:11	223:47	231:09	**865:03**

(i) Bird Numbers and Conservation Status

Overall results for autumn 2021 showed that the migratory bird populations involved a lower number of species (14) and both total individuals (577) and records (78), see table below, compared to spring. Only two raptor records of one individual each remained unidentified. According to the IUCN Red List, there was one Endangered (EN) species –one individual of an Egyptian vulture- and one Vulnerable (VU), the Sooty Falcon involving five individuals.

Two species comprised the bulk of birds (91.85%), the European Honey Buzzard (57.19%) and the Great White Pelican (34.66%), whilst the remaining, except the Black kite, never reached the ten individuals each. The Table also shows other species using the flyway but not recorded.

Table 31 Species recorded during Vantage Point monitoring in autumn 2021 (number of records and individuals)

SPECIES	IUCN Red List (2019)	National Status	n obs	Individuals
Black Kite	LC	*Pm*	6	12
Black Stork	LC	*Pm*	0	0
Booted Eagle	LC	*Pm*	0	0
Common Kestrel	LC		5	5
Eastern Imperial Eagle	VU	*Pm*	0	0
Egyptian Vulture	EN	*Pm*	1	1
Eurasian Sparrowhawk	LC	*Pm*	0	0
European Honey Buzzard	LC	*Pm*	39	330
Great White Pelican	LC	*Pm*	3	200
Greater Spotted Eagle	VU	*Pm*	0	0
Lanner Falcon	LC	*Pm*	1	1
Lesser Kestrel	LC	*Pm*	0	0
Lesser Spotted Eagle	LC	*Pm*	0	0
Long-legged Buzzard	LC	*Pm/Wv*	3	5
Levant Sparrowhawk	LC	*Pm*	0	0
Osprey	LC	*Pm*	0	0
Pallid Harrier	NT	*Pm/Wv*	7	7
Short-toed Snake Eagle	LC	*Pm/Sm*	1	1

SPECIES	IUCN Red List (2019)	National Status	n obs	Individuals
Sooty Falcon	VU	*Pm/Sb*	4	5
Steppe Buzzard	LC	*Pm*	3	4
Montagu's Harrier	LC	*Pm*	1	1
Steppe Eagle	EN	*Pm/Wv*	0	0
Western Marsh Harrier	LC	*Pm*	2	2
White Stork	LC	*Pm*	1	1
Subtotal			**78**	**577**
Unidentified Raptor			2	2
Total			**2**	**2**

(ii) Temporal Patterns: Monthly and Daily Passes

The temporal pattern of the bird movement through the site was analysed and organized by observations per #week and month and time of the day, from 7:00am to 18:00pm. The figure below shows the percentage of overall migratory birds passing per week and month during the autumn season. After the first days of September, most the birds recorded had passed through the site already including the Honey Buzzard during the weeks 34 to 36, followed by the Great White Pelicans just within the same week. These numbers accounted for 92.17% of the total birds recorded.

Three percent (3%) involved twelve Black kites and six Pallid harriers. The remaining 4.7% included twenty-six (26) birds: five Sooty falcons, four Steppe buzzards, two Western Marsh harriers, and one individual each for the Short-toed eagle and the White Stork. All the latter should be late migrants considering the timing of these species along the Middle East and the Red Sea (Shirihai et al. 2020). These birds passed since the beginning of September till the end of monitoring in November.

Due to the small quantity of birds and species recorded, exploring the possibility of potential higher passing rates at any of the VPs was not encouraged. However, and considering the VP time invested altogether in autumn, the numbers obtained roughly mean that one single bird crossed the project area every 28 hours and 21 minutes, a raw count of one bird/day considering the long monitoring period from August to mid-November.

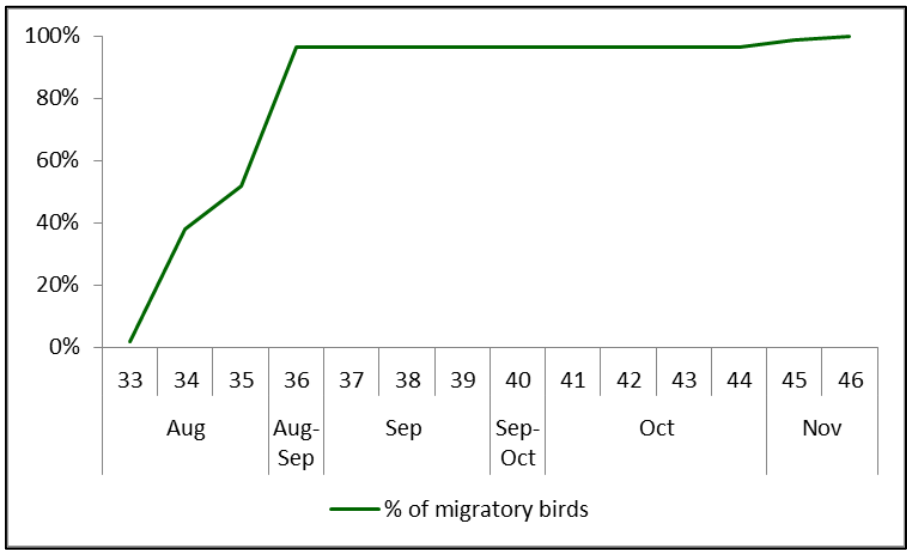

Figure 78: Cumulative percentages of migratory birds passing per week in autumn 2021

The pattern in the figure illustrates the timing and abundance of migration patterns of the E. Honey Buzzard compared to the remaining species, with a major passage by the end of August and early September. This is also reflected in the figure below. As it shows, there is a peak in mid-August (week 34) and a decrease afterward.

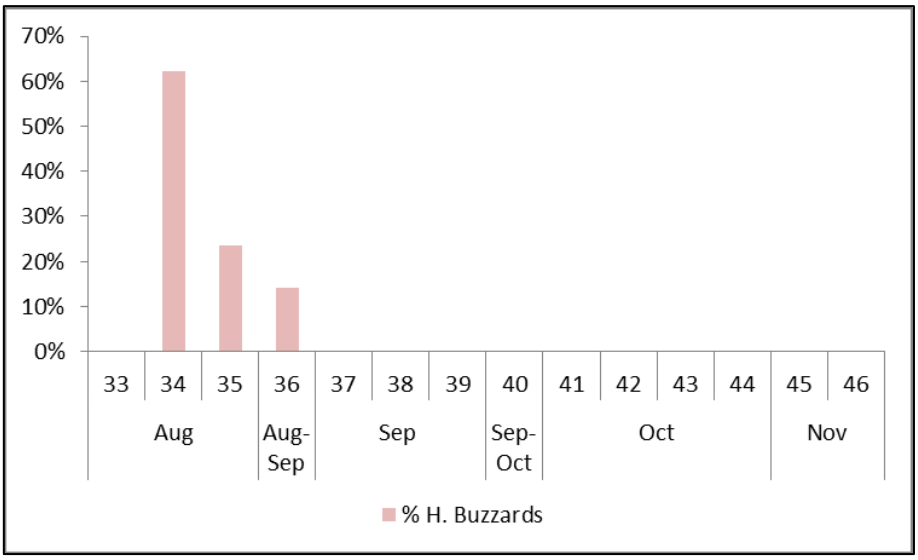

Figure 79: Percentage of E. Honey buzzards (Individuals) crossing the project area per week and month

At the time of monitoring, the use of the passing rates aided in overcoming a source of bias - the recorded time of the day. The day was divided in 1 hour time intervals from 7:00am to 18:00pm. Bird passes increase after dawn and follows a sinusoid trend but showing the highest pass rate before noon. There is a decrease until no passing rate existed after 17:00.

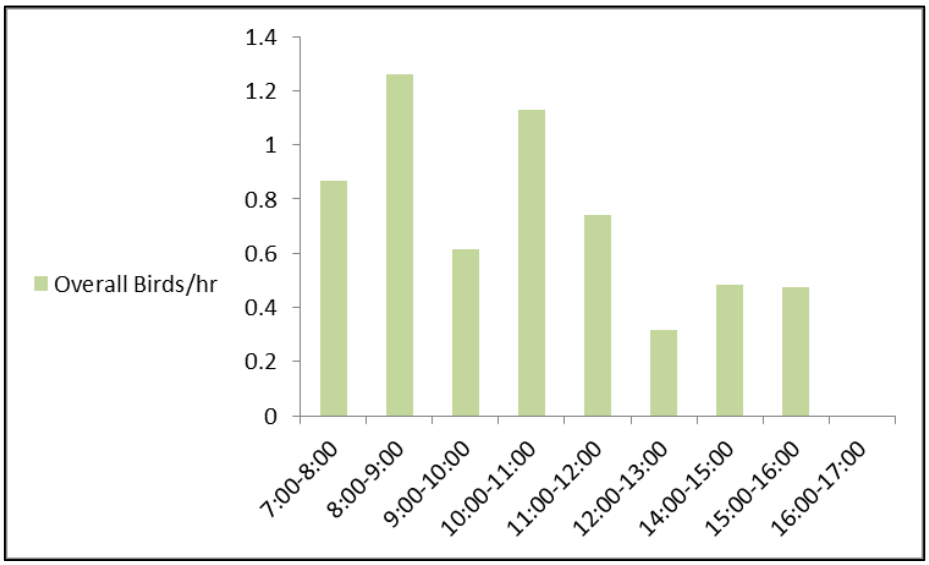

Figure 80 Overall passing rate per hour interval in the day all species pooled

The only species with enough data as to make a further insight into the daily pattern is the European Honey Buzzard, check figure below. The graph suggests a daily pattern with two weak but “waves” in the passing rate. The first one from 7:00-8:00am would involve birds which overnight near the project area. As soon after dawn they leave to continue the migration. Then, a second wave (10:00am-12:00pm) would involve Honey buzzards coming from further away in the Flyway. Birds after 12:00pm would form the daily “tail” of the migration. As expected, because of the influence of the Honey Buzzard numbers, pattern in above and below figures match.

Along the Flyway during the migration, if required, some of those delayed birds in the afternoon would stop throughout the route, causing another migratory wave in the following morning. None of the studies developed within the Flyway up to now, neither for scientific purposes nor for wind energy assessments, have targeted and properly managed the overnight roosting behavior of raptors throughout the region outside of the project footprints themselves.

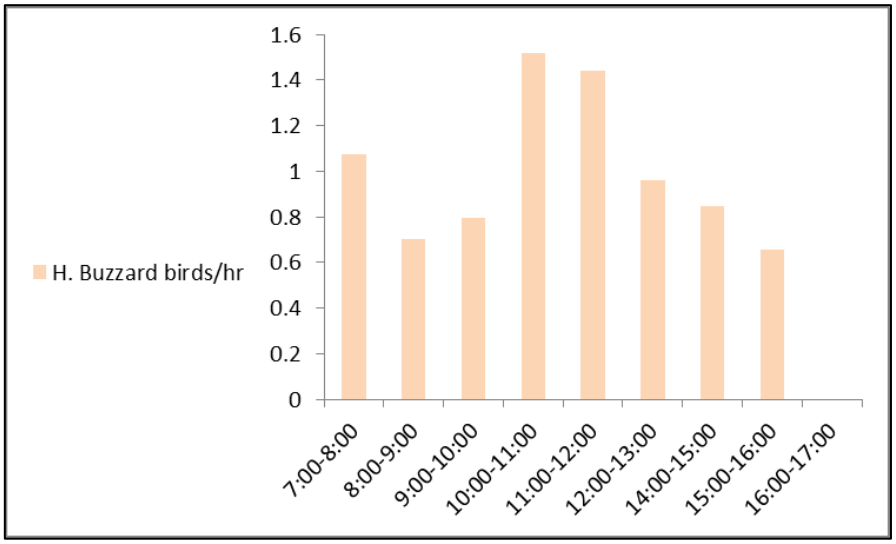

Figure 81 Hourly variation of the passing rate (birds/hour) for the European Honey Buzzard

As seen in the table earlier, there are no other species in the autumn 2021 data with numbers enough as to draw a daily pattern like that for the Honey Buzzard. The Great White Pelicans crossed all at the same time within minutes between 8:00-9:00am in a single day. Despite being a soaring bird, it is a species which may easily cross the sea, land over water, and thus follow a different route compared to other species.

(iii) Flight Direction

A 98.77% of the recorded birds flew south, southwest or southeast. The two species of particular importance - the Honey buzzard (330 birds) and Great White Pelican (200 individuals) also followed this route; check figure below.

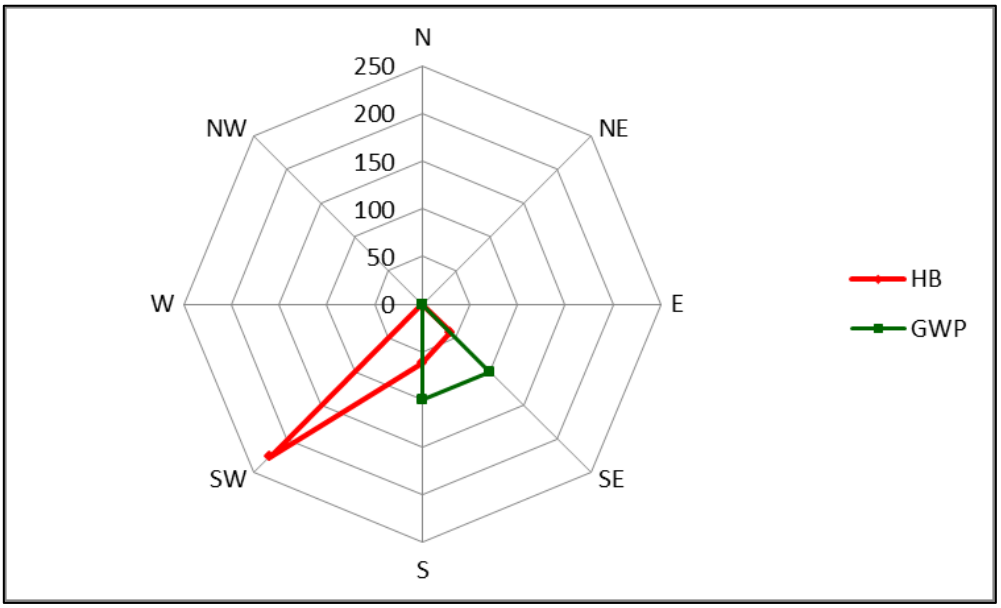

Figure 82: Main flight directions of the Honey Buzzard (HB) and Great White Pelican (GWP)

Only seven birds belonging to a Sooty Falcon (1), Black kite (1), Long-legged Buzzard (4) and an unidentified raptor species (1) were recorded crossing east or northeast. However, though these directions are not aligned with the migration paths, they may represent flight detours for an unknown reason but within the overall north-south migratory direction.

(iv) Cumulative analysis with the Neighbouring Project

As discussed earlier in, the IPH project has an adjacent plot to the east, which has under planning and which includes 173 turbines which ha total capacity of 500MW. The bird monitoring has taken place at the same time as that for IPH during autumn 2021, but having the following differences:

- There were eight (8) Vantage Points
- The overall monitoring time in autumn 2021 was 3,177 hours and 20 minutes.
- The allocated land for this project is 73 sq. km., compared to 37.5 sq. km. for Infinity.

When compared against IPH, the 500MW project has double the number of VPs (eight versus four) and nearly four times the monitoring time (3,177 compared to 865 hours at IPH, this is also the result of the double size of the allocated land for this joining project. Thus, we cannot compare the raw numbers (quantitatively) without data standardization neither species composition (qualitatively). As explained earlier, the more time monitoring is undertaken, the higher the chance to counts more birds and record more species. The site and species composition were compared for each project and the passing rates at the two sites as explained in further details below.

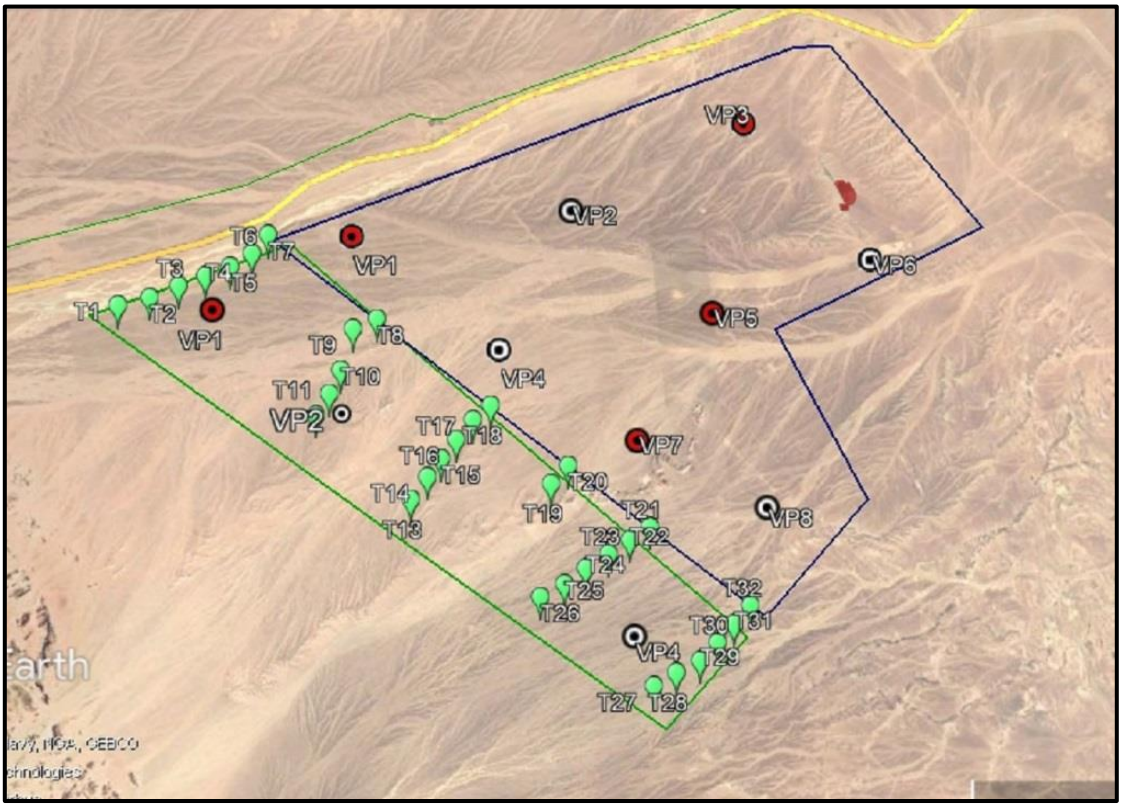

Figure 83: Location of Infinity I (200MW), green outline and turbine layout, and its neighbouring project (500MW), blue outline and respective VPs.

Species composition and numbers at the two projects

The table below presents the species recorded during the autumn 2021 monitoring season sorted per both, number of observations and individuals. A third column express the passing rates (number of birds/total hours of observation) for each project.

There were overall a higher number of species at the neighbouring site (23) compared to IPH (14), but this is just the result of the following:

- Higher monitoring times and the size of the site compared to that of IPH. This could have influenced the difference in reporting of the Montagu`s Harrier, Sooty and Lanner falcons, Steppe Buzzard, Short-toed Snake Eagle, Long-legged Buzzard, or Common Kestrel.
- There are species in similar proportions at the two sites including the Black Kite, Egyptian vulture, and the Honey Buzzard although.
- Only one sighting of a White Stork at IPH was recorded. However, when revisiting the avifauna observations, the existence of the landfill at the adjacent site (discussed previously) may have had a strong influence on the occurrence of sightings of this species. All the White Stork records took place at the two VPs at both sides of the landfill. The use of landfill by this species is widely documented worldwide and the results would reinforce this idea.
- The data collected for the Western Marsh Harrier (156 individuals and 26 records) should be considered with caution. The Marsh Harrier is considered a solitary bird; however, the number and frequency of observations would suggest that there would be approximately six birds per record. This could be due to an error in the recording of this species as it is both atypical for this type of species and also contradicts the experience of other projects in the GoS area.

- The values of the passing rates in the table are absolute numbers, but any count has its own associated range of minimum and maximum values. Thus, the observed differences between each pair of passing rates within a species should be considered as similar, except for the White Stork, where values have largely different. No further statistical test for differences was performed but the data show certain confidence for any species except the stork. Anyway, the passing rates between the 500MW and IPH projects show a significant statistical correlation (Corr. Coeff. = 0.64 and $p<0.001$), suggesting the approach for the monitoring and outcomes are strongly associated, as could be expected because their proximity.

Table 32: Species specific composition (#records and individuals) plus the passing rates for the two projects in autumn 2021

	500MW Project			200MW Infinity I		
SPECIES	**# of observations**	**Individuals**	**Birds/hr.**	**# of observations**	**Individuals**	**Birds/hr.**
Black Kite	37	57	0.0179	6	12	0.0139
Black Stork	2	10	0.0031	0	0	0.0000
Booted Eagle	2	2	0.0006	0	0	0.0000
Common Kestrel	0	0	0.0000	5	5	0.0058
Common Crane	2	207	0.0652	0	0	0.0000
Eastern Imperial Eagle	0	0	0.0000	0	0	0.0000
Eleanora`s Falcon	2	2	0.0006	0	0	0.000

	500MW Project			200MW Infinity I		
SPECIES	**# of observations**	**Individuals**	**Birds/hr.**	**# of observations**	**Individuals**	**Birds/hr.**
Egyptian Vulture	3	10	0.0031	1	1	0.0012
Eurasian Hobby	1	1	0.0003	0	0	0.0000
Eurasian Sparrowhawk	6	6	0.0019	0	0	0.0000
European Honey Buzzard	93	1414	0.4451	39	330	0.3815
Great White Pelican	2	167	0.0526	3	200	0.2312
Greater Spotted Eagle	0	0	0.0000	0	0	0.0000
Lanner Falcon	1	2	0.0006	1	1	0.0012
Lesser Kestrel	1	1	0.0003	0	0	0.0000
Lesser Spotted Eagle	3	4	0.0013	0	0	0.0000
Long-legged Buzzard	8	10	0.0031	3	5	0.0058
Levant Sparrowhawk	2	27	0.0085	0	0	0.0000
Osprey	0	0	0.0000	0	0	0.0000
Pallid Harrier	5	5	0.0016	7	7	0.0069
Short-toed Snake Eagle	2	2	0.0006	1	1	0.0012
Sooty Falcon	14	16	0.0050	4	5	0.0058
Steppe Buzzard	17	25	0.0079	3	4	0.0046
Montagu's Harrier	10	10	0.0031	1	1	0.0012
Steppe Eagle	8	10	0.0031	0	0	0.0000
Western Marsh Harrier	26	156	0.0491	2	2	0.0023
White Stork	80	1274	0.4010	1	1	0.0012
Totals	**327**	**3418**	**1.0759**	**78**	**577**	**0.6670**

Different passage through the two sites

The figure below shows the weekly numbers of Honey Buzzards migrating through the two projects and the overall percentage over the entire migration season they represent. The passing times fit with the existing knowledge for the species (Shirihai et al. 2020). Differences in the passing times could be the result of multiple to include wind direction and speed which force birds to a shift in their flight paths over the area depending on the weeks.

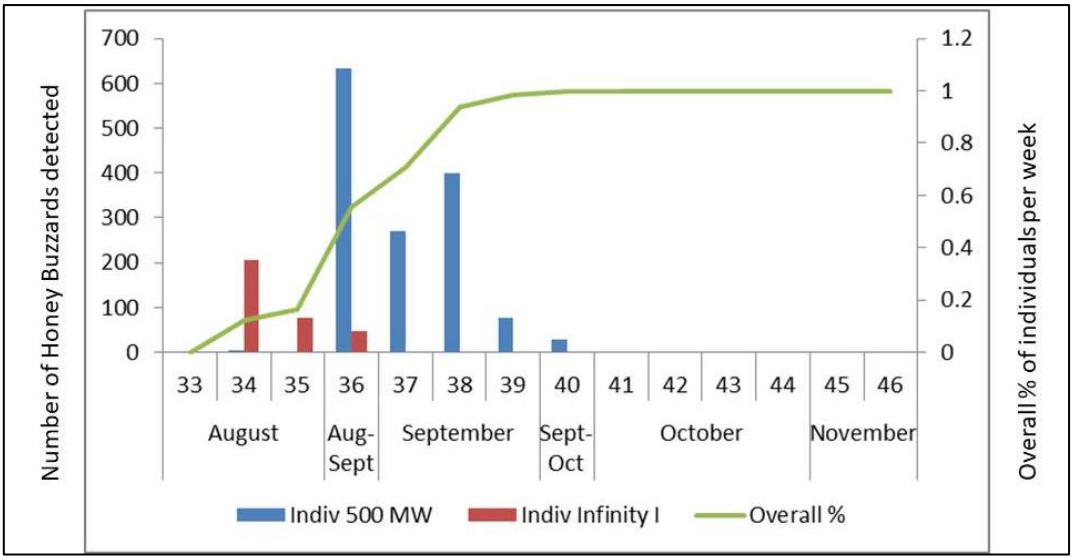

Figure 84: Honey Buzzards per week and month for the two projects, and overall percentage per week during autumn 2021

The cumulative curve of percentages, shows the difference with Infinity (Figure 78), with a more delayed passage at the 500MW project. By the week 36 at IPH all migratory birds in the autumn season had passed. However, at the joint site only around 65% did sp.

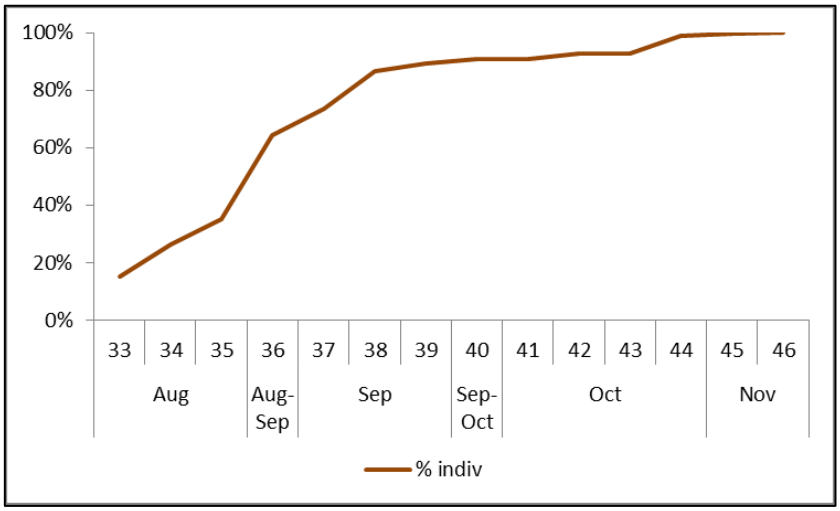

Figure 85: Cumulative percentage of migratory birds passing per week in autumn 2021 at the 500 MW area.

(v) Conclusions

Based on the review of data for the autumn 2021 season the following is concluded. Despite it is based only on the outcomes of a single autumn season data, shows consistency with other projects in the region.

- The survey did not identify any key, important or significant habitats for roosting or breed sites within the Project area. This is mainly attributed to the desert and barren nature of the area and lack of trees or cliff shelters.
- The survey did not identify any specific or preferred routes for birds within the Project site. The entire project area also shows consistency in its landscape, mostly plain and undulating but not as to affect the migratory flight of the birds.

- The survey did not identify any site-specific constraints or area of concern that should be avoided.
- Nearby potential areas of attraction (e.g. landfill) seems not to impact or effect on the Project site despite large numbers of some species like the White Stork were recorded in the 500MW joint project.
- During autumn the number of birds and records is much lower compared to spring, revealing the same trend as for other projects in the GoS.

7.6 Bats

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to bats.

7.6.1 Baseline Assessment Methodology

The baseline assessment of the Project site was based on a literature review and site surveys both of which are discussed in further details below.

Literature Review

This was based on previous studies, data, surveys, and records available in published scientific papers, books, and journals on bats of Egypt and the Gulf of Suez. The conservation status of the bat species listed from the literature review are based on IUCN's Red List of Threatened Species (IUCN, 2021).

Site Surveys

A site survey was undertaken at the Project site that included the use of a bat detector. The detector used was the Song Meter SM4 Acoustic Recorder.

The survey was based on route transects where five (5) transects have been surveyed that run throughout the Project area in east-west direction (refer to figure below). The transects were selected to take into account two (2) key factors: (i) vegetation onsite (mainly within Wadi systems; and (ii) the turbine layout as provided by the Developer.

As discussed with IFIs and their advisor, the survey was undertaken during April and May taking into account the required deadline for the submission of the ESIA study. In general, such months are considered the most suitable period of the year to assess bat activity as bats become active after the hibernation which may last from December to March.

The survey was undertaken for a period 3-5 nights each month to cover the transects. The survey started after sunset and continued to four (4) hours after that, where this was considered the most active period for bats, as bats usually rest and sleep during the day and are active during night as they search for prey to feed on.

With regards to the transect, along each route transect, at every 100 m point, the surveyor stopped and the bat detector was used to document any bat activity. Each point lasted for 10 minutes. If bat activity is encountered, the data was recorded automatically by the bat detector for further in-depth desktop analysis.

The route-transects are presented in the figure below. In addition, the table presents the dates and coordinates for the route transects.

Table 33: Dates and Coordinates for Route Transects

Transect	Date
1	11 April 2023
	7 May 2023

2	12 April 2023
	8 May 2023
3	16 April 2023
4	10 May 2023
5	12 May 2023

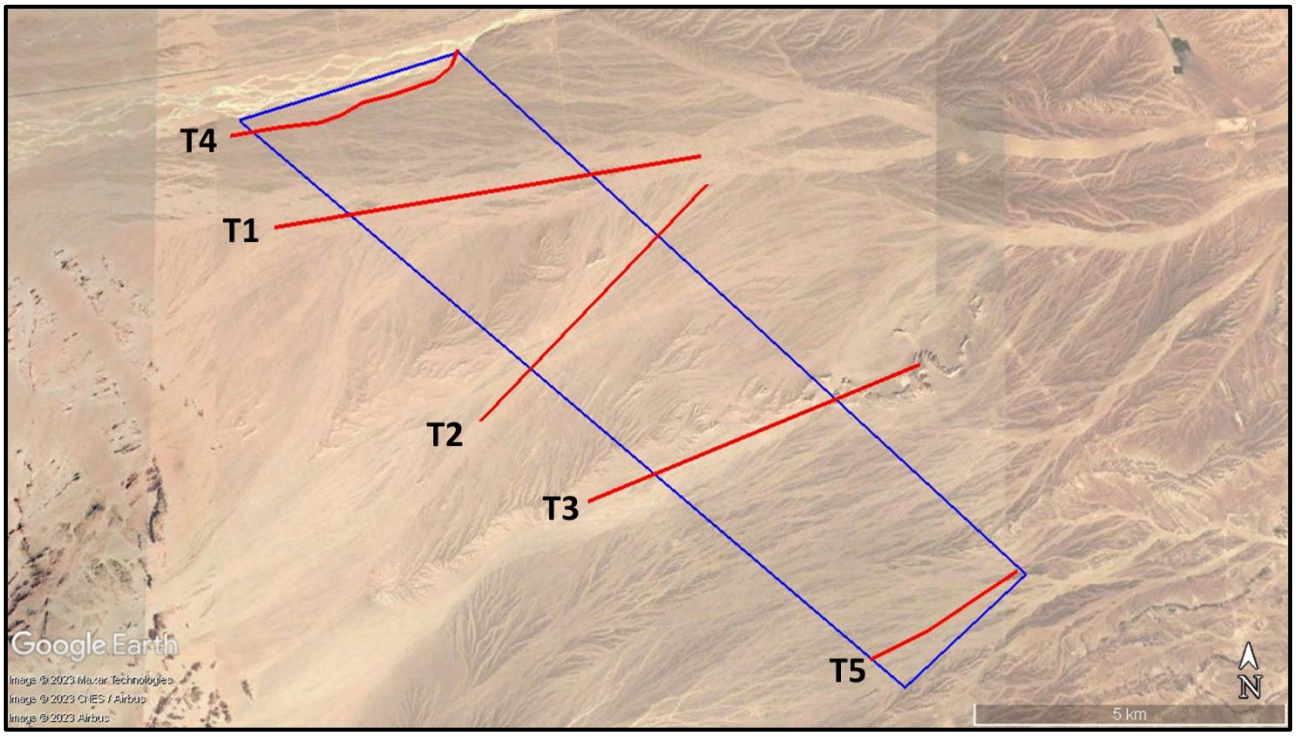

Figure 86: Transects for Bats Assessment

Based on the above, recordings of the sound waves were then analysed and compared with a comprehensive bat detection software / database (Kaleidoscope and Batexplorer) for the sound waves of all bats species known to match and determine the species of the recorded bat accordingly.

Should bat recordings be confirmed, the assessment aimed to provide quantitative and qualitative data about bats in terms of following:

- Species identification;
- Activity index (the significant of bat activity is based on the concept of activity index which is the number of bat contracts per surveying hour);
- Map with locations of detected bats within the area;
- Weather conditions and its effect on bat activity. The bat recorder that will automatically records temperature, and wind speed and other meteorological data could be obtained from met mast data; and
- Significance of bat activities for the project including degree of bat activity and species encountered (if any) and identification of any further recommendations to be considered if required (e.g. monitoring at height).

Finally, the methodology also included visits within the Project site and surrounding areas to locate any potential rooting sites for bats. This included inspections through field observations for potential roosting sites. Any observed potential roosting sites (such as caves, cervices, etc.) were noted and inspected for roosting activity or any indication of roosting activity (e.g. search for fecal remains).

7.6.2 Results

Literature Review

Based on literature, a total of 22 bat species are known to occur in Egypt as a whole. Out of which, at least ten species are known to have a presence within the Project site and its vicinity as part of their distribution range. In addition to those ten species, there are at least four more species that have their distribution range adjacent to the area of Gulf of Suez. All ten species listed in the literature are species of Least Concern according to the IUCN Red List of Threatened Species, see table below.

Table 34: List of Bat Species Recorded in Project Site and Vicinity Based on Literature Review

Family	Scientific name	Common name	IUCN Red List of Threatened Species
Hipposideridae	*Allesia tridens*	Geoffroy's Trident Leaf-nosed Bat	Least Concern
Nycteridae	*Nycteris thebaica*	Cape Long-eared Bat	Least Concern
Vespertilionidae	*Pipistrellus kuhlii*	Kuhl's Pipistrelle	Least Concern
	Pipistrellus rueppellii	Ruppel's Pipistrelle	Least Concern
	Nycticeinops schliefenni	Schlieffen's Bat	Least Concern
	Eptescisu bottae	Botta's Serotine	Least Concern
Rhinopomatidae	*Rhinopoma microphyllum*	Greater Mouse-tailed Bat	Least Concern
	Rhinopoma hardwickii	Lesser Mouse-tailed Bat	Least Concern
	Rhinopoma cystops	Egyptian Mouse-tailed Bat	Least Concern
Emballonuridae	*Taphozous nudiventris*	Naked-rumped Tomb Bat	Least Concern

Site Surveys

The table below presents the overall outcomes of the surveys undertaken within the Project site for each transect accordingly.

Table 35: Outcomes of Transect Survey

Transect	Date	# of noising records	# of bat passes	# of calls	Start frequency	Peak frequency	End frequency	Duration (m.s)	Call shape
1	11 April 2023	8	1	9	17.9	17.2	15.8	9.9	QCF: quasi constant frequency
	7 May 2023	19	0	0	0	0	0	0	0
2	12 April 2023	5	0	0	0	0	0	0	0
	8 May 2023	40	0	0	0	0	0	0	0
3	16 April 2023	5	0	0	0	0	0	0	0
4	10 May 2023	1	0	0	0	0	0	0	0
5	12 May 2023	18	0	0	0	0	0	0	0

As noted above, only one (1) recording is noted as per details above on 11 April 2023. The call is most likely for the *Tadarida aegyptiaca* (Egyptian free-tailed bat) which is of Least Concern

It is important to note that bat activity in general is correlated to insect activity. Where insects are present it is likely that bat activity will be present given that they feed on them. Within the site, nocturnal insect activity is

expected to be very low, if not absent, due to the arid nature of the Project site and the very low vegetation coverage (as discussed in "Section 7.47.4 earlier). Vegetation coverage is the main source for many insects (e.g. moths) where they breed and feed.

In addition, based on the biodiversity survey undertaken earlier, it does not seem that the Project site supports any roosting sites for bats. Potential areas for roosting sites could be within the mountainous areas to the west of the Project site.

7.7 Archaeology and Cultural Heritage

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to archaeology and cultural heritage.

7.7.1 Baseline Assessment Methodology

The baseline assessment of the Project site was based on a literature review and a field survey, each of which is discussed below.

(i) Literature Review

Literature review included a comprehensive review of archives, publications, and studies on previous archaeological and cultural heritage work and surveys undertaken in the area, and which are available through desktop review as well as through the Red Sea Antiquities Inspection Office and Suez Antiquities Inspection Office. Such literature review included information available through the French Institute for Oriental Archaeology, French Institute in Cairo, and data published by the French mission working at in Sukhna city.

(ii) Field Survey

A field survey was undertaken by an archaeology and cultural heritage expert. The objective of the field survey was to ascertain the presence of any surface archaeological or cultural heritage remains within the Project site. The survey was undertaken in May 2021 to cover the entire Project site boundary. The monitoring equipment used were GPS devices, digital cameras and data loggers The surface area was walked by the expert in order to inspect the entire ground surface. Based on the survey, should any sites of interest be recorded the following will be undertaken:

- Sketch plans and /or a photograph as appropriate
- GPS coordinates for the area
- Undertake an analysis to categorize the sites and archaeological features and making an assessment of their significance.

Several points distributed over the site area were inspected in addition to (6) points near the boundaries of the project site. The inspection revealed:

- No archaeological evidence was found
- Some areas (6 points) surrounding the sites were inspected and the same methodology was applied in terms of first visual inspection; No archaeological evidence was found.

(iii) Stakeholder Consultation

The consultant to conduct meetings with relevant governmental entities to include: (i) Red Sea Antiquities Inspection Office; and (ii) Egyptian Antiquities Sector Office at the General Authority for Antiquities. The

objective was to discuss the results and outcomes of the assessment, and identify any key issues of concern or additional requirements they might have.

7.7.2 Results

This section presents the results in accordance with the methodology discussed above. Based on the literature review, it is concluded that there are no registered archaeological sites within the Project area itself and the area adjacent to the Project area. The closest sites that are considered of great archaeological, historical and cultural heritage value are described in the table below and presented in the figure that follows.

It is important to note that in 2008, an official letter has been issued by the Supreme Council of Antiquities (SCA) to NREA which states that the SCA has no objection on the development of wind farms within the NREA land plots allocated for wind energy developments. The official letter is presented in the figure below.

Table 36: Nearest Archaeological Sites

Site	Description	Distance to Project
Wadi Jarf / Red sea coast	A harbour complex which was used regularly during the second half of the Old Kingdom and the Middle Kingdom (from 2550 to 1700 b.c.e.). It was used by the expeditions seeking turquoise and other products from south Sinai. Moreover, it's also known for its very famous wadi jarf papyrus which dates to the reign of king khufu and which describes the organization of labour under the supervision of their leader Merer who recorded the diary of the mission on a long papyrus sheet.	69.2km to the north
Saint Anthony Monastery (Deir erl Qidis Antun)	Saint Anthony's disciples founded the monastery between 361 and 36 (Starkey.2012:205)	85.3km to the north
Saint Paul Monastery (Deir el Qidis Nulus):	The monastery is located in front of mount el galala. The caves in this area were used by Christian monks who used the limited resources available in the harsh desert for living, while the cave and chapel of Saint Paul in particular were considered the base for the current monastery (Starkey.2012: 207).	67.3km to the north

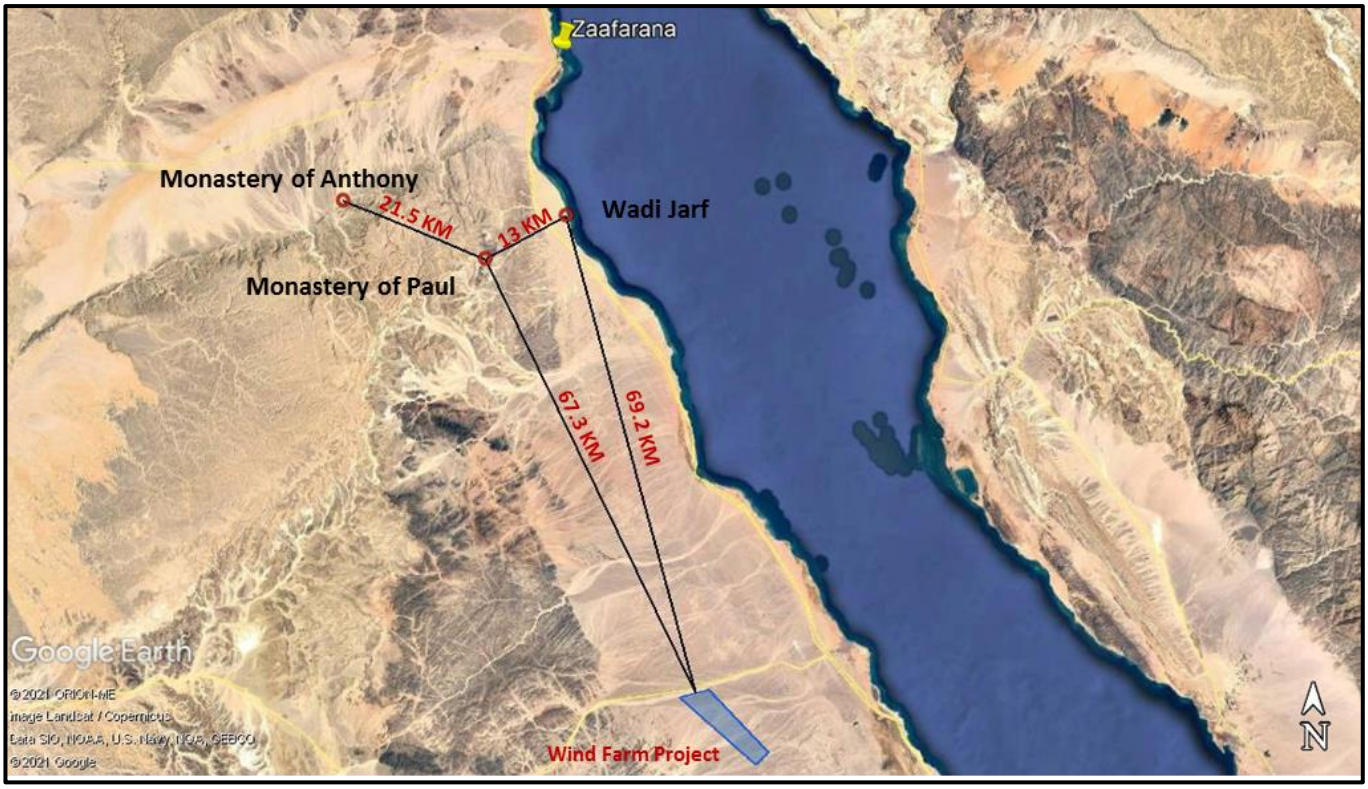

Figure 87: Location of Closest Archaeological Sites to the Project Area

6. **A letter from the Supreme Council of Antiques**

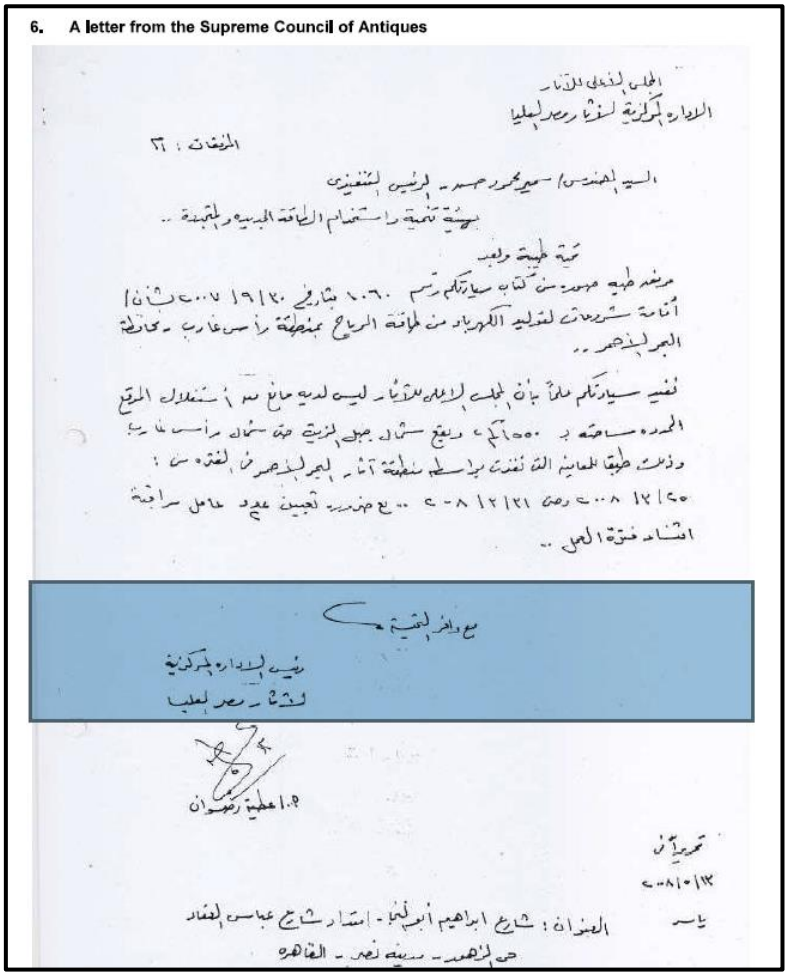

Figure 88: Letter Issued by SCA

7.8 Air Quality and Noise

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to air quality and noise.

7.8.1 Baseline Assessment Methodology

Assessment of baseline conditions was based on an onsite air quality and noise monitoring program undertaken at the Project site. Additional details are discussed below.

(i) Selection of Parameters

Monitoring was undertaken for the following parameters: (i) gases to include Carbon monoxide (CO), Sulphur Dioxide (SO_2) and Nitrogen Dioxide (NO_2), (ii) Suspended Particulate Matter to include Total Suspended Particulate (TSP) and Respirable Particulates (i.e. Particulate Matter smaller than 10.0 (PM10) and 2.5 microns (PM2.5) in diameter); and (iii) Noise Pressure Levels (NPL). These parameters were selected based on the following rationale:

Such parameters are likely to be present within the Project site given its characteristic and attributes. Suspended particulate matter is expected given the barren nature of the site. On the other hand, pollutants (such SO_2, NO_2,) are expected onsite but rather at minimal concentrations as the site is relatively in a remote area; nevertheless, motor emissions particularly from vehicles passing casually through the site (or from the main road) could be a source of such pollutants. Finally, noise levels are expected from vehicular movement and to some extent from onsite and surrounding areas and activities.

Such parameters are likely to be affected mainly during the Project's construction and operational activities. All air pollutant parameters selected are expected to be slightly impacted and increase specifically during the Project's construction activities. Emissions from vehicles and machinery used onsite and their movement onsite will increase gaseous emissions, suspended particulate matter, as well as noise pressure levels.

(ii) Selection of Locations

To assess the air quality and noise baseline conditions within the Project area, 3 monitoring points were selected as shown in the figure below. Monitoring was undertaken for 24 hours at each point respectively. The coordinates for the monitoring points and location are presented in the table and figure that follows.

Table 37: Location of Monitoring Points

Locations	Latitude	Longitude
M1	28°18'1.56"N	32°50'27.11"E
M2	28°13'51.13"N	32°58'0.90"E
M3	28°16'26.06"N	32°55'23.45"E

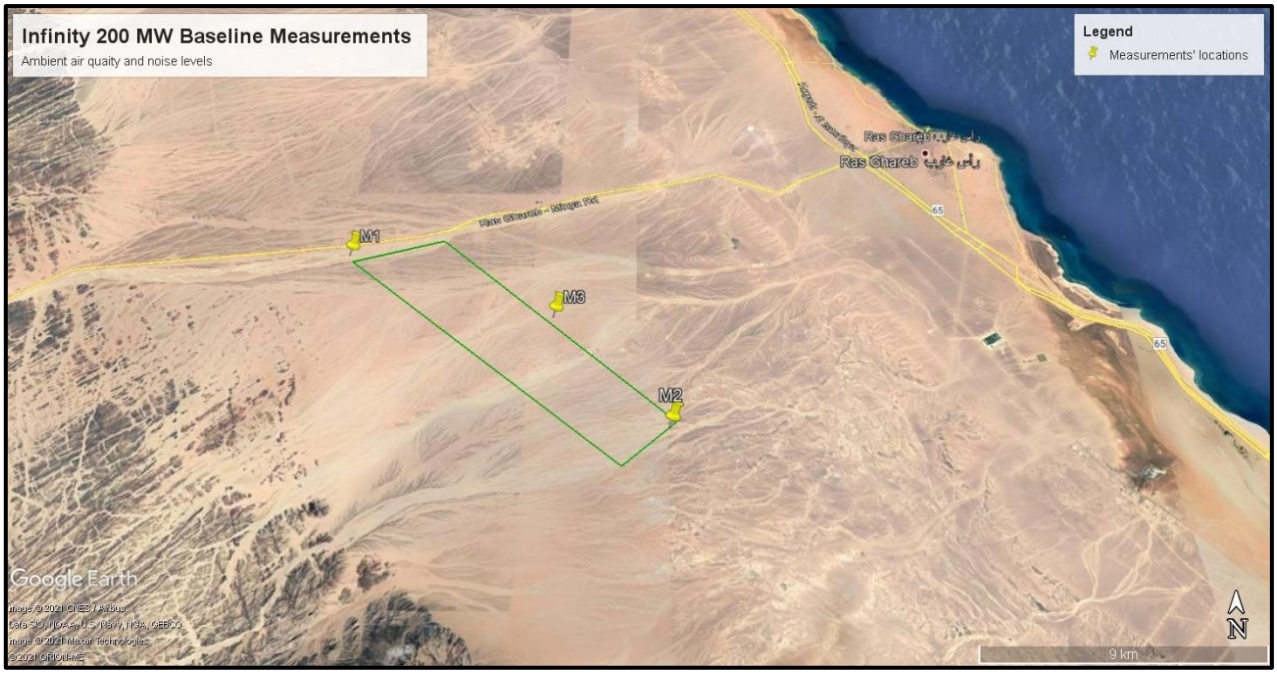

Figure 89: Location of Monitoring Points

(iii) Equipment

Ambient Air Quality Monitoring equipment is an integrated system of which includes several analysers with data recording devises as follows:

- Ambient Particulate Matter TSP-PM2.5 And PM10 sampler
- Sulphur Dioxide SO2 Analyzer (Thermo Scientific SO2 Analyzer model 43-USA)
- Nitrogen Oxides NO, NO2 & NOX Analyzer (Thermo Scientific NOx Analyzer - Model 42- USA)
- Carbon Monoxide CO Analyzer (Thermo Scientific Carbon Monoxide CO Analyzer model 48 -USA)

The following devices have been used during the measurement activities of noise level:

- CASELLA Mediator, Integrating Sound Level Meters, Type I (precision grade), compliant with IEC 1672 Class 1 standard.
- CASELLA Outdoor Weatherproof Microphone Kit
- GPS unit (Garmin MONTANA 650)

(iv) Legislative Requirements

With regards to air quality, the results of the measurements were compared to the national limits as set within Annex 5 of the Executive Regulation (D1095/2011) for ambient air quality. The table below identifies the corresponding applicable national ambient air quality permissible limits. The limits included for 'industrial' areas were used for comparison given the industrial nature of the site that includes petroleum activities and wind farms.

Table 38: Applicable National Ambient Air Quality Permissible Limits (Annex 5 of the Executive Regulation (D1095/2011) for ambient air quality)

Pollutant	Location	Maximum Limit (µg/m³)			
		1 Hour	8 Hours	24 Hours	1 Year
Sulfur Dioxide (SO_2)	Urban	300	---	125	50

Pollutant	Location	Maximum Limit (µg/m³)			
		1 Hour	8 Hours	24 Hours	1 Year
	Industrial	350	---	150	60
Carbon Monoxide (CO)	Urban Industrial	30 mg/m³	10 mg/m³	--- ---	--- ---
Nitrogen Dioxide (NO_2)	Urban Industrial	300 300	--- ---	150 150	60 80
Total Suspended Particles (TSP)	Urban Industrial	--- ---	--- ---	230 230	125 125
Respirable Particulates (PM_{10})	Urban Industrial	--- ---	--- ---	150 150	70 70
Solid Particulates < 2.5 µm	Urban Industrial	--- ---	--- ---	80 80	50 50

With regards to noise, the results were compared to the national limits set in Annex 7 of the Executive Regulation (D710/2012) for the 'Day' and 'Night' intervals. The table below lists the different area classifications and their corresponding applicable permissible limits for noise. Similarly, the limits included for 'industrial' areas were used for comparison given the industrial nature of the site that includes petroleum activities and wind farms, which is set at 70dB(A) for both night and day.

Table 39: Applicable National Permissible Limits for Noise (Annex 7 of the Executive Regulation (D710/2012))

Type of Area	Permissible Limit for Noise Intensity [dB (A)]	
	Day (7 am to 10 pm)	Night (10 pm to 7 am)
Sensitive areas to noise	50	40
Residential suburb with low traffic and limited activities service	55	45
Residential areas in the city and have commercial activities	60	50
Residential areas are located on roads less than 12 m and have some workshops or commercial activities or administrative activities or recreational activities … etc.	65	55
Residential areas located on roads equal or more than 12 m, or industrial zones with light industry and some other activities	70	60
Industrial areas (heavy industries)	***70***	***70***

In addition to the above, identified below are the limits as included within the IFC General EHS Guideline which are also considered appliable for this Project. Similar to rationale above, limits included for 'industrial' areas were used for comparison given the industrial nature of the site that includes petroleum activities and wind farms, which is set at 70dB(A) for both night and day.

Table 40: IFC and EU Limits for Noise and Air Quality

Parameter	(SO_2)	(PM_{10})	(PM2.5)	Noise
Maximum Permissible Limits IFC General ESH Guidelines	125 µg/m³ (interim Target 1) 50 µg/m³ (interim Target 2) 20 µg/m³ (guideline)	150 µg/m³(interim Target 1) 100 µg/m³ (interim Target 2) 75 µg/m³ (interim Target 3) 50 µg/m³ (guideline)	75 µg/m³(interim Target 1) 50 µg/m³ (interim Target 2) 37.5 µg/m³ (interim Target 3) 25 µg/m³ (guideline)	70 LA_{eq}/ dBA
EU Ambient AQ standards	350 µg/m3 (1 hour) 125 µg/m3 (24 hours)	50 µg/m3 (24 hours)	25 µg/m3 (Stage 1) 20 µg/m3 (Stage 2)	

7.8.2 Results

Air Quality

The tables below present the overall results for the air quality monitoring that was undertaken. As noted in the tables below, at all monitoring points and for all parameters monitored, the results are significantly lower than the maximum allowable ambient air levels indicated within the legal limits.

In particular, there was no key source of pollutant emissions or activities throughout the monitoring period which could affect or impact air quality levels as presented in the table below.

Table 41: Ambient Air Quality Measurements Results (24 hours)

Parameter in µg/m3		(CO)	(SO_2)	(TSP)	(PM_{10})	(PM2.5)	O3	NO_X	TVOC
Concentrations (µg/m³)	M1	0.45	10.30	79	68	32	355	29.22	4.55
	M2	0	10.30	40	28	8	260	33.47	5.23
	M3	0.45	10.30	40	28	8	273	26.44	5.23
National Maximum Permissible Limits (µg/m³)		-	**150**	**230**	**150**	-	-	-	-
International Maximum Permissible Limits (µg/m³) – IFC General ESH Guidelines		-	**125**	-	**150**	**75**	-	-	-

Noise

The following tables present the overall results for the noise monitoring that were undertaken. As noted in the tables below, the results for Monitoring Points M2 and M3 exceeds the national allowable limits at daytime. Additionally, all Monitoring Points M1, M2 and M3 exceed national limits during night-time.

No key source of noise emission or activity were noted throughout the monitoring period. Therefore, the exceedance of noise levels is mainly attributed due to the intensity and speed of the wind at the measurement sites, despite efforts to mitigate the effect of wind speed on measurements.

Table 42: Outcomes of Ambient Air Quality at the Respective Monitoring Point

Maximum permissible noise level limits		
Point #	**Day Time (7:00am-10:00pm)**	**Night Time (10:00pm-7:00am)**
M1	61.65	82.39
M2	76.13	78.57
M3	79.13	81.47
National limits (LA_{eq}/dBA)	70	60
IFC limits (LA_{eq}/dBA)	70	70

7.9 Infrastructure and Utilities

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to infrastructure and utilities.

7.9.1 *Baseline Assessment Methodology*

Assessment of baseline conditions was based on an onsite survey undertaken for the Project and surrounding areas as well as consultations with relevant entities that are managing such infrastructure and utility elements as applicable. Additional details are discussed below.

7.9.2 *Existing Roads and Networks*

Based on the survey undertaken in the area, the following main roads are noted within the area:

- The access to the Project area is via the Suez-Hurghada road, a major four-lane highway that runs throughout the Red Sea coast and throughout various Governorates in Egypt. The highway is located around 15km to the east of the Project site and is considered a main highway that is fit for heavy transports;
- From the Suez-Hurghada road an exit is taken to the Ras Ghareb-El Shaikh Fadel road, an asphalt road with two lanes, running 600m north of the Project site. This road has very little traffic load compared to its capacity and is fit for heavy transports.
- The Project site itself can be accessed through unpaved tracks that are established by the General Petroleum Company for their exploration activities within the site. As noted in the figure below, there is a dirt road that goes into the Project area.

The figure below presents the main roads within the area in relation to the Project site.

Figure 90: Main Road Networks in the Area

7.9.3 *Water Management*

Based on consultations with Ras Ghareb Water Company there are no existing or planned water connections to the Project area. In addition, it was indicted that developments in such areas in general have to rely on water trucks and tankers from Ras Ghareb to deliver water requirements to the site while the drinking water is mostly bottled water.

7.9.4 *Waste Management (solid waste, wastewater and hazardous waste)*

With regards to wastewater, this is disposed through the Ras Ghareb Water Company whom have tankers that collect wastewater and dispose it at the Ras Ghareb Wastewater Treatment Plant (WWTP).

Regarding solid waste management, the Red Sea Governorate has only one controlled dumpsite for the disposal of solid waste. This is known as the Ras Gharib Public dumpsite, located 8km east of the Project site (refer to

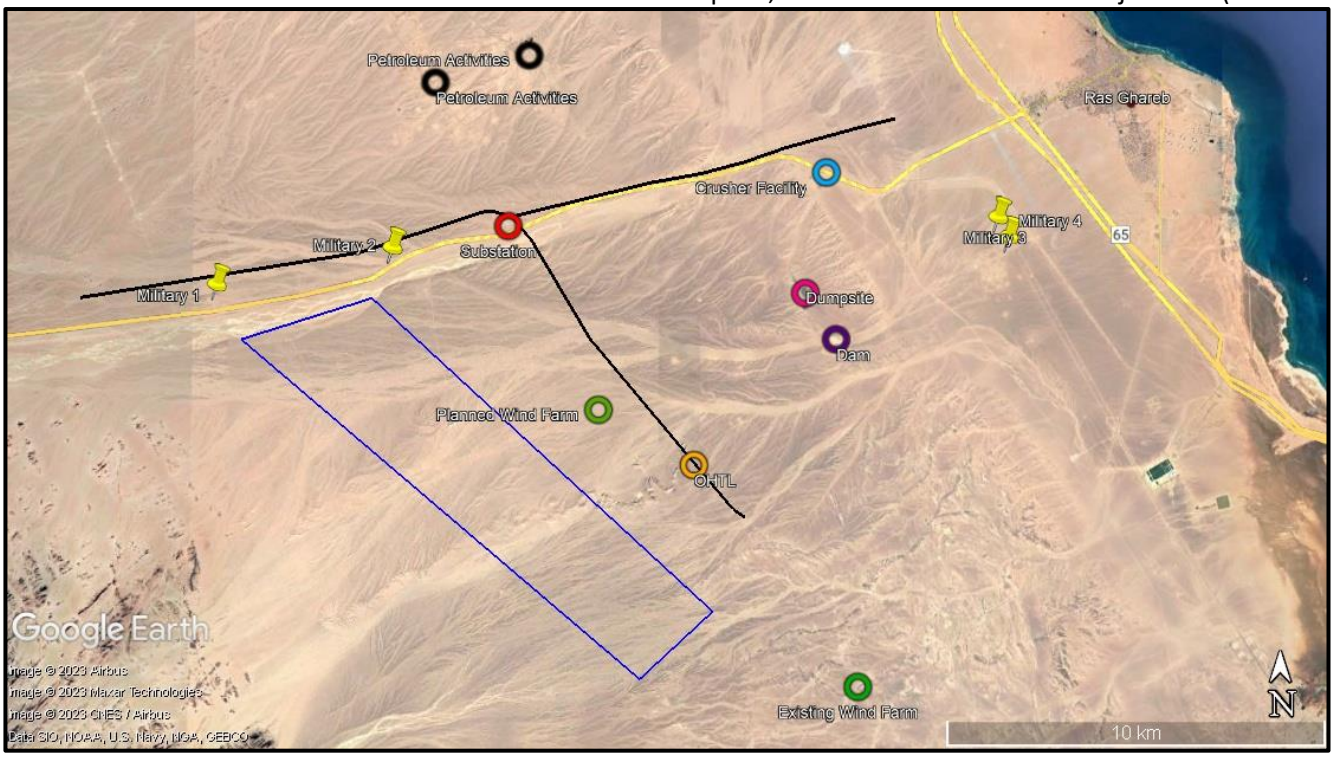

Figure 17). The dumpsite is owned and operated by the Ras Ghareb City Council and will be relocated to another location in 2023 that is still to be determined.

In addition, concerning waste recycling, there are facilities available for collecting and recycling various waste streams. One such facility is HEPCA, located in Hurghada, which specializes in recycling materials such as cardboard, plastic, metal, and glass. Another entity, Geocycle, operates a processing facility in Sokhna, where they recycle diverse waste streams, including both hazardous and non-hazardous materials.

Finally, with regards to hazardous waste management, in Egypt there are currently 2 approved hazardous waste disposal facilities in Alexandria and Helwan which are about 600 and 400 km respectively from site. The hazardous waste facilities are managed by the Nasiriya Hazardous Waste Treatment Centre (NHWTC) in Alexandria and in Arab Abu Saed the 2 facilities are privately owned and managed by First and EcoConServ Services.

7.9.5 *Civil and Military Radars and Aviation*

Based on a survey undertaken for the Project area and its surrounding, five (5) military posts have been identified as noted within the table and figure below. However, no additional details could be obtained on radar systems in the area. In addition, no details are available on civil aviation radars in the area.

Table 43: Location of Military Posts

Point	Latitude (N)	Longitude (E)	Description of the land use
1	28.307287°	32.834600°	Army unit #1. The unit is inactive and abandoned.
2	28.316020°	32.882035°	Army unit #2 that seems to be abandoned. However, no additional details could be obtained. The unit is currently being demolished and is no longer in use.
3	28.315553°	33.040814°	Air defence unit that seems to be active. However, no additional details could be obtained.
4	28.318479°	33.048392°	Army unit #3 that is likely to be active. However, no additional details could be obtained
5	28.323128°	33.045500°	Army unit #4 that is likely to be active. However, no additional details could be obtained

Figure 91: Project Site and Army Units

Figure 92: Army Unit #2

Figure 93: Army Unit #1

7.9.6 Radio, TV and Telecommunication Infrastructure

Based on a survey undertaken for the Project area and its surrounding, two (2) telecommunication towers have been identified as noted within the table and figure below. Those belong to Orange and Etisalat with a height of about 70m. Those are located around 500m the north of the Project site.

As discussed previously under "Section 4.5", the ESIA team held meetings with officials from telecommunication companies in Egypt to include Vodafone, Etisalat and Orange. The officials explained that the presence of telecommunication towers in the region means that there are other towers in the area that are connected through microwave connections through Lines of Sight (LoS). However, LoS connections could not be provided and it was explained that this can be provided as it will require a site visit that needs to be undertaken but it must be requested through a formal letter to be submitted. They stated that in general, LoS needs to be free from any obstacle along with a buffer of 30m to maintain the effectiveness of the network and the continuity of the connection.

The ESIA Consultant established communication with the Ministry of Communication, who stated that following up on this issue should be through the National Telecom Regulatory Authority (NTRA), as the national authority responsible for regulating and administering the telecommunication sector.

An official letter was sent to conduct a meeting with officials in NTRA. NTRA stated that communication on this matter should be through NREA and not the ESIA consultant. Therefore, no additional information could be obtained on this issue.

Similarly, the ESIA consultant held meetings with the Radio and Television Unit in Ras Gharib who indicated that there are radio and television towers in the area in general that are used for receiving and transmitting microwave signals, radio waves, TV waves, and VHF waves. They explained that to determine the impacts on radio and television towers, the Radio and Television Union in Cairo should be contacted.

The ESIA consultant established formal communication with the Radio and Television Union in Cairo. They indicated that they have studies the site and therefore is no impact from the Project on radio and TV infrastructure in the area. The official letter is provided in the figure that follows.

Table 44: Coordinates of Telecommunication Towers

Point	Latitude (N)	Longitude (E)	Description of the land use
1	28.307287°	32.834600°	2 telecommunication towers – 1 for Orange and 1 for Etisalat.

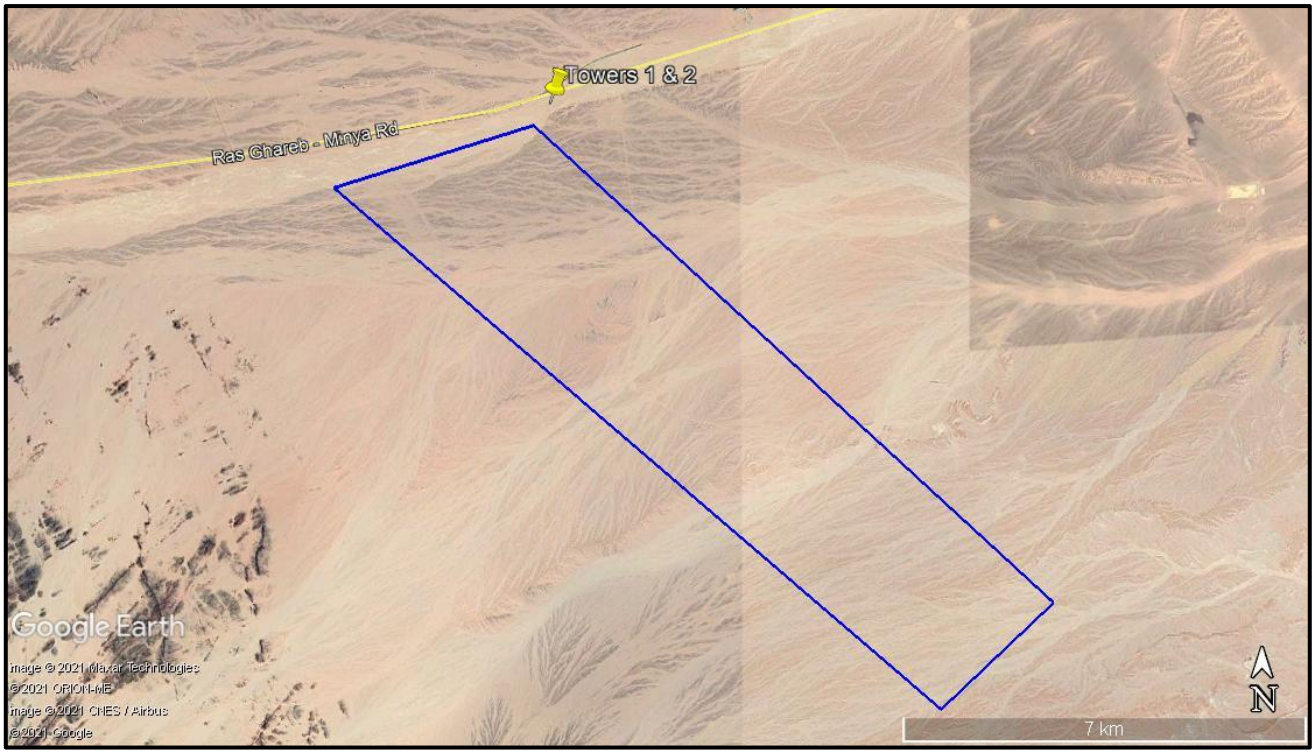

Figure 94: Project Site and Telecom Towers

الهيئة الوطنية للإعلام
قطاع الهندسة الاذاعية

القاهرة في ٢٠٢١/٧/٢٨

السيد الدكتور / طارق جنينة
رئيس مجلس الادارة والعضو المنتدب لشركة اكوكنسرف
تحية طيبة وبعد ...

يطيب لي في البداية أن أبعث لسيادتكم خالص التمنيات وأصدق التحية لشركتكم الموقرة .

وبالاشارة الى الطلب المقدم منكم بشأن طلب دراسة تقييم الاثر البيئى والاجتماعى لمشروعى Sicmiens Gamesa NIAT & Infinity Power Holding لتوليد الطاقة من الرياح فى خليج السويس ·

نتشرف بأن نحيط علم سيادتكم بأنه قد تمت دارسة التأثيرات المحتملة على أبراج البث والارسال الاذاعى والتليفزيونى طبقا لاحداثيات المقدمة من شركتكم وجد انه لايوجد تأثير للمشروع على شبكات الميكروويف · مع تمنياتنا بدوام التوفيق والسداد لشركتكم الموقرة ومزيد من التقدم والازدهار ·

وتفضلوا بقبول وافر الشكر والتقدير ...:

رئيس قطاع الهندسة الإذاعية
مهندسة / مايسة علي كامل

RECEIVED
1 AUG 2021
EcoConServ

Figure 95: Official Letter from Radio and Television Union in Cairo

7.9.7 Petroleum Facilities

Based on a survey undertaken for the Project area and its surrounding, one (1) petroleum unit was located that include what seems like closed exploration wells and /or seismic exploration sites. In addition, such location was supported by an internal road network to provide access to the site.

The table below presents the location of the petroleum unit, while the figure that follows presents the unit and road network (which is presented in red in the figure below. Please note that road network was mapped based on satellite image review and is not considered official or representative).

It is important to note that a Work Coordination Agreement has been signed between NREA and the General Petroleum Company in 2005 for an area of 700km^2 in which wind farm developments will take place (including the Project site). The Agreement includes several articles for the development projects to include for example:

- The General Petroleum Company has agreements for oil exploration and utilisation within concession areas located within the agreed area.
- Wind turbines will be allocated in rows with a distance of 1km between each row and the next
- A distance of around 260m will be respected between each wind turbine

- The tower height of the turbines should be around 100 m above ground
- The dimensions of the concrete foundation should be around 20m×20m and depth of 4m below ground
- Cables should be laid out next to the rows of turbines at a depth ranging from 1.5-2m and enclosed within special pipes with a diameter of around 15cm that connects to a substation that will be constructed on an area of 500m×500m
- Within the same trench, communication cables will be included that will connect with a control room in the main administrative building
- The wind rows will be serviced with internal roads with a width of 4m located adjacent to each row and these roads should be designed without an asphalt layer and should be able to withstand a load of 15ton/axle
- Other requirements will include an administrative building, service buildings, accommodation facilities, etc.

General Petroleum Company has the right to undertake surveys, measurements or any other exploration activities along with any other company associated with it. The agreement identifies several provisions that should be met for any well drilling or survey activities some of which include: (i) ensure appropriate areas are available within the wind farms for installation of equipment and machinery to undertake required surveys; (ii) turn off turbines when required for security reasons or reduce noise impacts on survey results; (iii) provide the General Petroleum Company with final, detailed and accurate as built drawings for all infrastructure elements above and underground (e.g. cables, roads, etc.).

NREA will inform the General Petroleum Company before commencement of any activity of any wind farm development in the area.

A meeting was held with General Petroleum Company in Ras Gharib to discuss and obtain additional information on the wells onsite and the requirements included within the Work Coordination Agreement. Consultations indicated that there are exploratory wells in the Project land and nearby sites, that are currently closed. However, it was indicted that to provide additional information for the Projects site (e.g. number of wells, their status, any underground infrastructure etc.), this would be undertaken through official communication with the head Office in Cairo.

An official meeting request was sent by the ESIA Consultant to obtain information on the above and additional requirement that should be considered as part of the detailed design. The Company indicated that communication on this matter should be through NREA and not the ESIA consultant. Therefore, no additional information could be obtained on this issue.

Table 45: Coordinates of Petroleum Units

Point	Latitude (N)	Longitude (E)	Description of the land use
1	28.323961°	32.953603°	Petroleum Unit #1

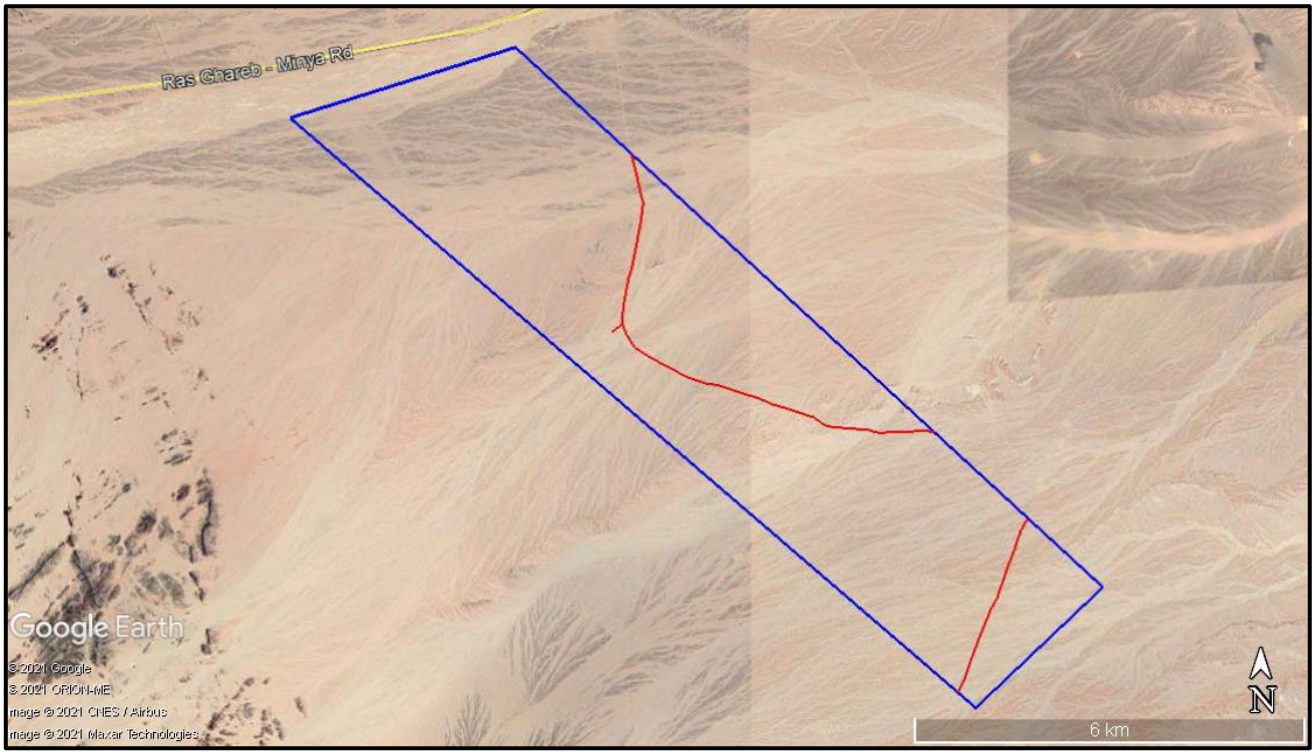

Figure 96: Project Site and Petroleum Units

Figure 97: View of the Petroleum Units Onsite

7.9.8 Other Wind Farms

There are several operating and planned wind farm development Projects within the GoS area. Within the Project area, there is another existing and operational wind farm known as the RGWE Wind Energy (250MW). The Wind Farm is located around 3km to the south of the Project site as noted in the figure below (closest point to the Project is at 28.224500°; 33.004364°).

Consultations were undertaken with the O&M Manager from RGWE whom indicated that there is an agreement with NREA that should be informed of any wind farm project to be developed in the area to agree on proper setback distance so that RGWE project is noted affected from a technical stand point of view.

In addition, there is another planned wind farm located exactly east of the Project site.

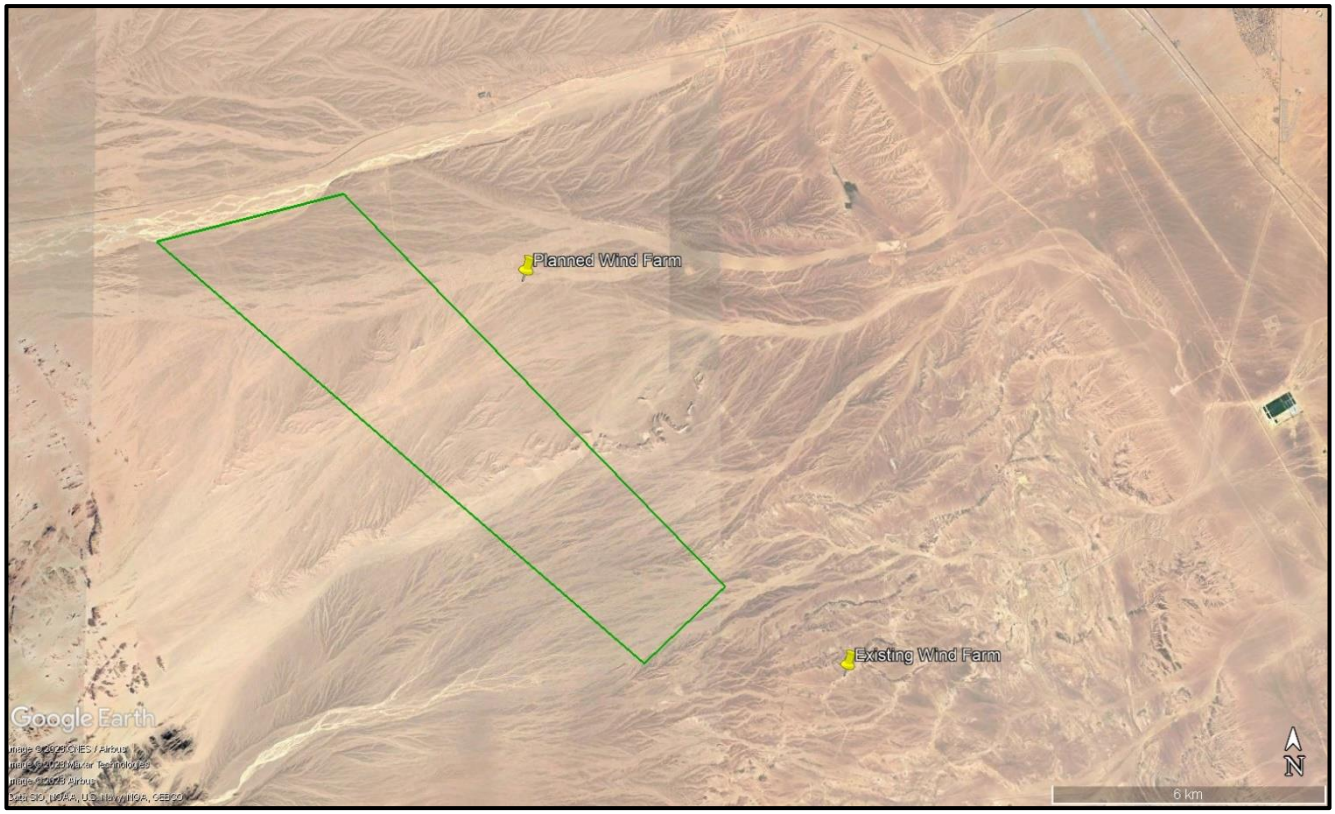

Figure 98: Nearby Wind Farms

7.10 Public Health and Safety

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to public health and safety.

As discussed earlier, the closest human settlement to the Project site is located 18km to the east (Ras Gharib city); of which is considered at a distance from the area. *These are considered sensitive receptors.*

In addition, as discussed within the land use section (refer to "Section 7.2") it was concluded that the Project site in particular is uninhabited and vacant with no indication or evidence of any physical or economical land use activities. *Therefore, there are no additional receptors to be considered,* such receptors are not considered key sensitive receptors defined as areas where the occupants are more susceptible to the adverse effects of a wind farm. This includes but not limited to educational facilities (e.g. school or university), places of worship (e.g. mosque), dwelling houses or units, health care facilities (e.g. hospital or health centre), workforce accommodation, etc.

7.11 Socio-economics

This section provides an assessment of baseline conditions in relation to socio-economics.

7.11.1 Baseline Assessment Methodology

Socioeconomic conditions were assessed mainly through collection of secondary data on key socio-economic indicators of local communities as available – such as Central Agency for Public Mobilization and Statistics, Red Sea Governorate Information Centre and other. Such baseline was also verified through consultations with relevant stakeholders to include Red Sea Governorate official and Ras Gharib City Council officials.

7.11.2 Results

Basic Demographic Characteristics

Population Profile:

Based on information from the Statistical Yearbook 2020, the total population of the Red Sea Governorate was 381,815, which represents around 0.4% of the total national population. Further information about the population in the Project area is presented in the following table. As noted, the population of Ras Gharib in particular was estimated at around 64,474.

Table 46: Population (Red Sea Governorate Information Centre, 2020)

Area	Households	Population		Total Population
		Male	Female	
Red Sea Governorate	100,477	198,488	183,326	381,815
Ras Gharib	16,118	34,214	30,260	64,474
Hurghada	25,912	50,365	48,102	98,467
Safaga	18,430	35,671	34,363	70,034
Quseir	18,692	36,265	34,768	71,033
Marsa Alam	5,500	11,509	9,294	20,903
Shalateen	7,777	15,700	13,656	29,556
Halayeb	7,196	14,465	12,683	27,348

Ras Gharib represents 17% of the total population of the Red Sea Governorate, where the majority of population is located in Hurghada, due to the large-scale touristic activities in the city. However, services and population activities are concentrated in Ras Gharib City. The following figure shows the distribution of the population in the Red Sea Governorate according to each city.

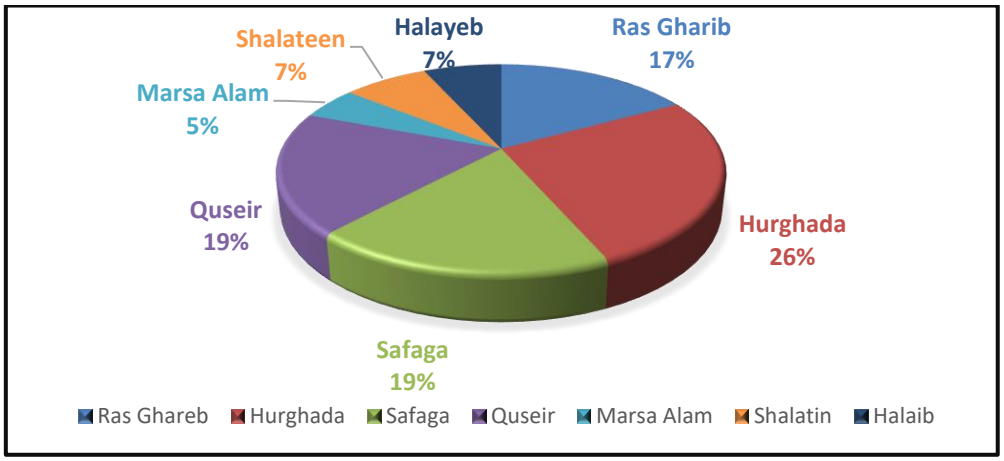

Figure 99: Distribution of Population Density According to Districts in the Red Sea Governorate

Bedouin communities in Ras Gharib are mostly unsettled, and live deep in the desert, away from the city and the villages. They currently settle permanently in Ras Gharib town, Zaafarana and Wadi Dara. Such Bedouin groups generally engage in traditional economical activities such as agriculture and animal husbandry and in addition, they are also employed in the development projects in the area (mainly the petroleum companies) either as guides, security guards, or contractors (more details in are provided throughout this section).

The demographic trend also includes migrant workers from neighbouring governorates. The predominant majority of these migrant workers work for oil companies located in the area, and a very small number work in farms in Wadi Dara village.

Age and Gender Distribution

Data from CAPMAS Statistical Yearbook 2020 indicate that the population in the Red Sea Governorate is predominantly young. Based on the outcomes of the 2014 population consensus, up to 86.7% of the population of the Red Sea Governorate are under the age of 45. With respect to gender, statistical data indicates a male/female ratio in the Governorate (194,759: 171,241).

Rate of Natural Increase

The total population in the Red Sea Governorate has grown by 25.30/1000 (*Red Sea Governorate Information Centre, Statistical Yearbook of Red Sea Governorate, 2019-2020*), which is the highest rate over the past five years in terms of the natural increase rate. However, it is considered amongst the lowest 10 governorates in terms of birth rate.

The following table illustrates demographic trends in the Red Sea Governorate:

Table 47: Demographic Trends (Statistical Yearbook of Red Sea Governorate, 2019-2020)

Demographic Trends	Value
Average Household Size (persons)	3.8
Natural Growth Rate (per 1,000 persons)	25.30
Urban Population (% of total Egyptian population)	0.39
Birth Rate (Births per 1,000 persons)	28.70
Mortality Rate (Deaths per 1,000 persons)	4.10

A household is defined as family (and non-family) members who share a residence and operates as a single social and economic unit. According to CAPMAS Poverty Map for 2018, the average family size in the city of Ras Gharib is estimated at four persons.

Labour Profile

CAPMAS statistical data indicates that the official unemployment rate decreased to 9.9% in the second quarter of 2018, marking the lowest rate in the past eight years. The job outlook has improved due to steadily accelerating economic growth, with Gross Domestic Product (GDP) growing by 5.4% year-on-year in the third quarter of the year 2017/2018 (January-March), according to data issued by the Ministry of Planning, Monitoring and Administrative Reform.

This followed a growth of 5.2% and 5.3%, respectively, in the first and second quarters, and despite low household incomes and high inflation rates, more of the country's unemployed youth are being absorbed by the labour market, despite the low wages. Workforce research results for the second quarter (April - June) of 2018 in Egypt are provided in the table below.

Table 48: Workforce Research (CAPMAS, Workforce Research Results for the Second Quarter of 2018)

Workforce2	Total No. of Employed Persons 26.161 Million		Total No. of Unemployed Persons 2.875 Million		Unemployment Rate 9.9%		Labour Force (by Occupation)		
	Males 80.8%	Females 19.2%	Males 53.1%	Females 46.9%	Males3	Females4	Agriculture	Industry	Service
29.036 Million	21.138 Million	5.023 Million	1.527 Million	1.348 Million	6.7%	21.2%	28.2%	24.7%	47.1%

2 Including the number of employed and unemployed persons.
3 Out of the total number of males (15 years of age and above) nationwide.
4 Out of the total number of females (15 years of age and above) nationwide.

The table above shows that the service sector forms the biggest part of the employment sector in the Governorate which accounts for around 47% of the workforce. The agriculture sector constitutes around 28% of the total workforce, while the industry sector constitutes the lowest percentage of the working population, accounting for around 25%. In addition, the data shows that the rate of unemployment is higher amongst females compared to males.

The following table shows data from the Directorate of Manpower in the Red Sea Governorate, excluding the informal sector. The Governorate's workforce—as a percentage of the local population is estimated at 34.61%.

Table 49: The Distribution of the Project Area's Population by Work Status & Sex - Red Sea Governorate (Directorate of Manpower in the Red Sea Governorate, 2018)

Workforce	Total No. of Employed Persons 89.20 Thousand		Total No. of Unemployed Persons 25.7 Thousand		Unemployment Rate 21.7%	
	Males	Females	Males	Females	Males	Females
116.60 Thousand	77.5%	22.5%	59.8%	40.2%	17.6%	27.3%

According to the Statistical Yearbook 2018 of the Red Sea Governorate, the service sector constitutes 60.3% of the Governorate's workforce. Hurghada City represents the largest proportion of employment, due to the presence of coastal touristic areas, followed by Safaga City.

According to Ras Gharib City Council officials, the majority of the workforce can be divided into three main categories: Government/Public Sector, Oil and Gas (O&G) Petroleum Sector, and Fishing.

There is also a percentage of wageworkers. Agricultural activities are relatively minor, compared to petroleum-related activities. In addition, tourism-related activities are limited in Ras Gharib, even though some residents work in the tourism sector in other cities in the Governorate, such as Hurghada and Safaga.

Based on discussions with City Council officials, it was indicated that there is a rise in the unemployment rate in Ras Gharib City due to the limited tourism in the Governorate during recent years, which increased the lack of employment opportunities.

Table 50: Labour Status of Ras Gharib & Zaafarana (CAPMAS Poverty Map, 2018)

Employment Information	Ras Gharib City	Zaafarana Village
Male Workforce (aged 15+) from Total Population	46%	57%
Female Workforce (aged 15+) from Total Population	25%	12%
% of Employed Adults (aged 24+) from the Total Workforce	57%	58%
Distribution of Workforce by Sector		
Self-Employed Males	49%	19%
Self-Employed Females	24%	33%
Male Workers in the Agricultural Sector	1.6%	37.2%
Female Workers in the Agricultural Sector	0.05%	84.2%
Workers in the Public Sector	57%	19%

Ras Gharib City attracts many migrant workers from neighbouring governorates, such as Beni Suef, Minya, Assyut, Sohag, Qena and Luxor. Workers also come from the Delta Governorates and Sinai, and the majority of them work for oil companies, while few of them work as farmers, particularly in Wadi Dara Village.

Economic Activities and Well Being

Economic activities in the city of Ras Gharib and its affiliated villages include oil and gas production, as well as agricultural activities. According to the representative of Ras Gharib city Council, tourism is not a key economic activity in the city, compared to other regions in Red Sea Governorate.

According to Ras Gharib City Council officials, government employees earn between 1,200 and 3,000 Egyptian pound (EGP) per month, while employees of oil and gas companies earn between 6,000 and 20,000 EGP per month. As for wageworkers (e.g. plumbers, electricians and service workers), they earn between 80 and 120 EGP per working day.

According to City Council officials, family expenses can reach 5,000 EGP, which is disproportionate compared to the current level of income. CAPMAS Poverty Map 2013 indicated that consumption[5] in Ras Gharib City marked 7320.52 per capita, compared to 6066.47 in Zaafarana Village.

Cultivated Lands: The area of cultivated lands in the Red Sea Governorate in 2012/2013 is almost 0.02% of the total nationwide cultivated lands. The Red Sea Governorate relies on rain and underground water in agriculture, which causes fluctuations in cultivated areas.

Fisheries: The Red Sea Governorate contributes to supplying fish, since the Governorate's coastline extends across 1,080 km and 240 km wide. The southern part of the Governorate is rich in fish resources.

Livestock: 78.74% of the total number of livestock is butchered in state-owned slaughterhouses. The Red Sea Governorate has no livestock feed or poultry feed plants. Heifers account for 35% of cattle butchered in state-owned slaughterhouses.

Industrial Activity: The total number of registered industrial firms is 53, operating in four industrial zones. The total number of workers in registered industrial firms is 4,340 workers (*Source: Red Sea Governorate Official Website, 2018).*

Social Services Profiles

- *Education*

Education is one of the most important criteria for measuring the progress of people and their ability to advance and improve their standard of living. According to CAPMAS, September 2018 announced that Egypt's illiteracy rate dropped from 39.4% in 1996 to 29.7% in 2006, and then to 25.8% in 2017.

Ras Gharib City contains 18 schools covering the three basic stages of education (primary, preparatory and secondary), which include two experimental schools. Additionally, there are two secondary vocational training schools. According to Ras Gharib City Council officials, the main objective of the two secondary vocational training schools is to provide their students with the necessary basic skills that enable them to work in oil companies.

CAPMAS Poverty Map 2018 shows that 20.23% of males and 21.14% of females of Ras Gharib City received basic education. Likewise, the percentage of males and females who finalized their basic education in Zaafarana is approximately 19% and 15% respectively. The following table details the educational status of inhabitants of Ras Gharib and Zaafarana.

Table 51: Education Mapping of Ras Gharib & Zaafarana (CAPMAS Poverty Map, 2018)

Education Information	Ras Gharib City	Zaafarana Village
University Degree Holders/Males	19%	9%
University Degree Holders/Females	15%	0%
Male School Enrolment/Males (age: 6-18)	99.28%	72.2%
School Enrolment/Females (age: 6-18)	99.45%	74.3%
School Drop-outs/Males	0.21%	0%

5 Household spending is the amount of final consumption expenditure made by resident households to meet their everyday needs, such as food, clothing, housing (rent), energy, transport, durable goods (notably cars), health costs, leisure, and miscellaneous services. It is typically around 60% of gross domestic product (GDP) and is therefore an essential variable for economic analysis of demand (Source: OECD National Accounts Statistics: National Accounts at a Glance, https://data.oecd.org/hha/household-spending.htm).

Education Information	Ras Gharib City	Zaafarana Village
School Drop-outs/Females	0.23%	0%

According to CAPMAS Poverty Map 2018, the illiteracy rate in Ras Gharib City is estimated at 20.4% for males and 16.1% for females, while the illiteracy rate in Zaafarana was 37.15% among males and 45% among females.

Table 52: Education Mapping of Ras Gharib City (The Statistical Yearbook, Ras Gharib City Information Centre, 2018)

Area	University Degrees		Above Intermediate Education		Intermediate Education		Less than Intermediate Education		Workers	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Ras Gharib	133	31	112	39	281	199	301	70	232	68

- *Health*

Data from the Health Affairs Directorate in the Red Sea Governorate showed that the Governorate is free of the following diseases:

- Endemic diseases
- Infectious diseases
- Diseases related to water and air quality

The data indicated that non-communicable diseases include diabetes, and hypertension. Other common diseases include digestive system and cardiovascular diseases. Cancer is also increasing, and the most common cancers include breast, liver, bladder and lymph nodes. In addition, there are other communicable diseases to include diarrhoeal diseases (especially in children), cold and flu, fever and inflammations or infections of the ear, nose or throat, as well as skin rashes and infections.

The Red Sea Governorate suffers from a lack of specialized health services which are suitable for the middleclass. Furthermore, these services are concentrated in Hurghada City, and are absent in some other cities, such as Shalateen and Halayeb. The following tables show the health services available in the Governorate.

According to the statistics of the Directorate of Health Affairs (DHA) in Red Sea Governorate, there are 7 hospitals in Governorate with approximately 330 beds, they are government hospitals; one of them is a public and central hospital, in addition to 13 Private hospitals with 399 beds.

Table 53: Ministry of Health Hospitals & Other Entities in the Red Sea Governorate (The Statistical Yearbook, Red Sea Governorate Information Centre, 2018)

Item	Value
Hospitals Affiliated with the Ministry of Health	7
Hospitals of the General Authority for Health Insurance	0
Medical Treatment Institutions	0
Educational Hospitals	0
No. of Public & Central Hospitals	1
No. of Specialized Hospitals	1
Public Sector Hospitals (Including Military Hospitals)	4
Private Sector Hospitals	13
No. of Haemodialysis Centres Affiliated with the General Authority for Health Insurance	0
No. of Ambulance Vehicles	48

Ras Gharib City contains one central hospital, one ambulance station, and one civil defence unit, in addition to a limited number of private clinics and health centres. All health services are concentrated in Ras Ghareb City. The central hospital serves all the areas and villages administratively affiliated with Ras Gharib Local Government Unit (LGU). The hospital is equipped with an Emergency room section, and has outpatient clinics. There is an ambulance unit on Zaafarana--Ras Gharib Road north of Ras Ghareb city, near the Project site; these is the nearest ambulance unit to the project area.

Human resources is one of the main factors for the success and continuity of health services, and the absence of qualified medical staff affects the quality of services provided. The following table illustrates available human resources in the health sector in the Red Sea Governorate.

Table 54: Number & Categories of Health Sector Workers in the Red Sea Governorate (CAPMAS, Census of Population Activities of the Governorates, Arab Republic of Egypt, 2016)

Area	No. of Doctors		No. of Pharmacists		No. of Dentists		No. of Nursing Staff		No. of Assistants	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Red Sea Governorate	255	137	60	170	49	29	79	412	102	0

Investment and Development

There is large focus on investment in the Red Sea Governorate, and many fields of investment are available (touristic, industrial, services), which positively impact comprehensive development in the Governorate.

The following table shows the fields of investment in the Red Sea Governorate and Ras Gharib City

Table 55: Fields of Investment in the Red Sea Governorate & Ras Gharib City (Red Sea Governorate Official Website, 2018)

Item	Red Sea Governorate	Ras Gharib
Mineral Production	The Red Sea is one of the important Egyptian governorates in the field of mineral production, as it contains deposits of most of metallic and non-metallic minerals, decoration stones and construction materials. The Red Sea Governorate stretches across the larger part of Eastern Desert, which forms one-fourth of Egypt's total area (about 250,000 km^2),and contains huge mineral resources.	There are several metal productions sites in Ras Gharib, including: Gold in Abu-Marwat Iron in Abu-Marwat White sands in Dakhl Valley Gypsum in the northwest of El-Dob Valley Marble in Al-Shaikh Fadl Road and El-Dob Valley Granite in Al-Shaikh Fadl Road
Fish Production	The Red Sea Governorate is an important region that can be utilized to increase fish production, as it has a 1,080 km-long coastline, with an average width of 240 km. There are various coral reef sites, with 3-5 square mile-area each. Different kinds of fish pass by these sites in certain seasons. Fish food is four times more abundant in the southern part of the Red Sea coast compared to the northern part.	There are several fish production sites in Ras Gharib: Al-Mallaha fish farm which is located between Ras Gharib and Shoqair, with an area of 15,000 acres and a total annual production of more than 250 tons. Suez Gulf fish farm with an area of 12,000 acres, and a total annual production of more than 400 tons. Gamsha Gulf fish farm with an area of 9000 acres and total annual production of more than 350 tons.

Item	Red Sea Governorate	Ras Gharib
Agricultural & Livestock Projects	Agriculture is a basic element in the regional comprehensive and integrated development in the Red Sea Governorate either through providing the food supply required for the development in the region or taking part in the attraction of new population from the crowded places over the Nile banks and confronting the expected increase in the population and consumption. The southern triangle (Shalateen, Halayeb, Abu-Ramad) is one of the most important places for the agricultural investment in addition to other cities in the Governorate.	Suggested areas for agricultural investment in Ras Gharib include: Cultivation of 500,000 acres in Wadi Araba (to the south of Zaafarana), which can be irrigated by groundwater from El-Bowerat well. Cultivation of Gharib basin using groundwater in the area, as it is possible to extract 4,000 m3 of medium-salinity water per day, which can be used in irrigating citrus fruits and barley. Cultivation of Wadi Dara village.
Touristic Investment	The General Tourist Planning of the Red Sea Governorate Red Sea Governorate contains a number of planned touristic zones.	Zaafarana Sector Gamsha Sector
	Available Elements for Supporting the Establishment of Touristic Projects in the Red Sea Governorate: A colourful, rocky mountain range extends along the Red Sea coast, providing a wonderful backdrop to the beach. The area is teeming with mines that had been exploited during ancient ages; mines that once rendered Egypt as one of the richest nations in ancient times, which were used to excavate gold, diamonds and valuable stones like Schist, white granite, etc. The beaches of the Red Sea coast are renowned for their clear blue waters, calm waves, and a paradise of colourful underwater coral reefs, which contains a multitude of rare and colourful fish. The yearlong moderate climates attract tourists both in summer and in winter to Red Sea Governorate resorts. The Governorate hosts various national parks, which contain a multitude of biological diversity. The Governorate contains valleys and archaeological, religious and curative sites. The Red Sea is also renowned for its black sands, which are used to cure rheumatoid and psoriasis.	
	Touristic Projects Proposed for Implementation in the Governorate: Touristic villages, hotels, motels and camps in Safaga, Qoseir and Marsa Alam, the southern triangle (Shalateen, Abu-Ramad & Halayeb), as well as Zaafarana. Project lands are allocated according to vacant areas. Cinemas, amusement parks and malls proposed to be established in Hurghada, Safaga, Qoseir & Marsa Alam. Fairs, aquariums, sports centres, golf courses, billiard halls and bowling alleys proposed to be implemented in Hurghada, Safaga, Qoseir, Marsa Alam & Zaafarana. Centers for providing diving equipment in Hurghada, Safaga, Qoseir & Marsa Alam. Tourist companies that provide safari trips in Hurghada, Safaga, Qoseir & Marsa Alam. Shipyards in Hurghada, Safaga, Qoseir & Marsa Alam. Internal shipping lines connecting the ports of Hurghada, Safaga & Marsa Alam with the ports of Al-Tour, Nuweiba, Taba & Sharm El-Sheikh, as well as Port Tawfik in Suez. Additionally, an international shipping line is proposed to connect the Governorate's ports with the ports the Red Sea and the Arabian Gulf. Establishing integrated projects for underwater imaging in Hurghada and Marsa Alam. An international conference centre in Hurghada. A hotel school in both Hurghada and Qoseir. Schools for teaching diving and swimming, drawing on graduate divers and specialized trainers in Hurghada, Safaga & Marsa Alam. Utilizing the islands in the construction of suitable projects in accordance with environmental laws. Small and medium industries for providing hotel equipment.	

8 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

This Chapter first provides an overview of the strategic environmental and economic impacts related to the Project development, after which it assesses the anticipated impacts from the Project throughout its various phases on all E&S receptors and attributes.

8.1 Overview of Strategic Environmental and Economic Impacts

8.1.1 Governmental Vision for the Energy Sector

The GoE has taken bold steps to adopt an energy diversification strategy with increased development of renewable energy and implementation of energy efficiency, including assertive rehabilitation and maintenance programs in the power sector (IRENA, 2018).

To this extent, in 2013, the Arab Republic of Egypt (through the Supreme Council of Energy) had developed and adopted the ISES 2015 – 2035, which provides an ambitious plan to increase the contribution of renewable energy to 42% of the country's electricity mix by 2035.

To promote renewable energy sources and in order to open the way for private sector to effectively participate in the implementation of renewable energy project, the Renewable Energy Law (Decree Law 203/2014) has been issued. With this law, investors had the opportunity to identify and develop renewable grid-connected electricity production through the BOO scheme as discussed earlier in "Section 1.1".

In line with the above, this development allows for more sustainable development and shows the commitment of the Government of Egypt to realizing its energy strategy and meeting the set targets for renewable energy sources.

8.1.2 Energy Security

Recently, most policy makers around the world are grappling with issues related to energy security, energy poverty, and an expected increase in future demand for all energy sources – and Egypt is no exception. Almost certainly, the most spoken words by policy makers and government bodies in Egypt in the last couple of years revolved around 'energy security'.

Through various strategies and visions, Egypt has emphasised on the importance of energy security. This includes for example the Egypt Sustainable Development Strategy, Egypt Vision 2030, in which the sustainable development targets include energy and in which Goal I specifically address security of supply to ensure the availability of reliable energy supplies to satisfy the future development needs of the country through adoption of a more diverse energy mix. Similarly, the ISES 2015 – 2035 addresses energy import dependence and diversification of electricity generation.

In line with the above, the Project in specific will contribute to increasing energy security through reliance on an indigenous, inexhaustible and mostly import-independent energy resource. The estimated electricity generation from the Project is estimated at around 800 Gigawatt hours (GWh) per year on average; which will serve the annual electricity needs of around 300,000 local households.

The above has been calculated based on statistics obtained from Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS). The total household electricity consumption in Egypt for 2016 – 2017 (latest statistics available online) was 64,100 GWh (CAPMAS, 2018). In addition, in 2016 – 2017 the total number of household beneficiaries from the public electricity network was 23,383,521 Households (CAPMAS, 2017). Therefore, average electricity consumption per household per year can be assumed to be around 2,700 (kWh/household).

8.1.3 Environmental Benefits

The negative environmental impacts from generating electricity through conventional fossil fuel burning at thermal power plants are very well known. This most importantly includes air pollutant emissions such as ozone, Sulphur Dioxide (SO2), Nitrogen Dioxide (NO2), Particulate Matter (PM), and other gases which are the cause of some serious environmental concerns such as smog, acid rain, health effects, and many others.

In addition, the burning of fossil fuels results in carbon dioxide emissions; a primary greenhouse gas emitted through human activities which contributes to global warming. The main human activity that emits CO_2 is the combustion of fossil fuels for electricity production and transportation. Concurrently, global climate change has become an issue of concern and so reducing greenhouse gas emissions have also emerged as primary issues to be addressed as the world searches for a sustainable energy future.

Generating electricity through wind power is rather pollution-free during operation. Compared with the current conventional way of producing electricity in Egypt through thermal power, the clean energy produced from renewable energy resources is expected to reduce consumption of fossil fuels, and will thus help in reducing GHG emissions, as well as air pollutant emissions. The Project will likely displace around 400,000 metric tons of CO_2 annually.

The above has been calculated based on statistics obtained from Egyptian CAPMAS. Carbon Dioxide (CO2) emissions for 2016 – 2017 (latest statistic available) was 210 million tons, in which the electricity sector accounted for 43.3% of (i.e. around 91 million tons) (CAPMAS, 2019). In addition, the total electricity generated for 2016 – 2017 was around 190,000 GWh (CAPMAS, 2018). Therefore, CO2 emissions (Tones) per kWh is around 479g per kWh.

In addition, there is an important benefit in relation to wind farm developments related to water conservation because unlike certain power generation methods, wind projects do not require significant amounts of water for cooling or steam generation. Conservation of water is particularly important in arid regions like Egypt, where water scarcity is a significant challenge.

8.2 Landscape and Visual

This section identifies the anticipated impacts on landscape and visual from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

8.2.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the EPC Contractor for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Construction activities would create a temporary effect on the visual quality of the site and its surroundings and may disturb the natural appearance of the desert terrain. The visual environment during the construction phase would include the presence of elements typical of a construction site such as equipment and machinery to include excavators, trucks, front end loaders, compactors and others.

However, as discussed in “Section 7.1”, there are no key sensitive visual receptors within the Project site and surrounding vicinity with the exception of Ras Gharib city which is located 18km from the Project site. However, such impacts during construction will not be visible from the city due to the distance from the Project site.

The visual environment created during the construction period would be temporary, of a short-term duration, limited to the construction phase only. For the duration of construction, the visual impacts will of a negative nature and be noticeable, and therefore of a medium magnitude. As there are no key sensitive visual receptors which would be affected, the receiving environmental is determined to be of a low sensitivity. Given all of the above, such an impact is considered to be of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the EPC Contractor during the construction phase and which include:

- Ensure proper general housekeeping and personnel management measures are implemented which could include:
  - Ensure the construction site is left in an orderly state at the end of each work day.
  - To the greatest extent possible construction machinery, equipment, and vehicles that are not in use should be removed in a timely manner and kept in locations to reduce visual impacts to the area.
  - Ensure proper storage, collection, and disposal of waste streams generated as discussed in detail in "Section 8.4.2".
- Implement restoration and rehabilitation measures to restore the site's visual quality through for example re-contouring the land and removing temporary structures (e.g. batching plant).

Following the implementation of these mitigation measures, the significance of the residual impact is categorised as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by EPC Contractor during the construction phase:

- Inspections of the works should be carried out at all times to ensure the above measures are implemented.

8.2.2 Potential Impacts during the Operation Phase

Visual impacts associated with wind energy projects typically concern the turbines themselves (e.g. colour, height, and number of turbines) and impacts relating to their interaction with the character of the surrounding landscape and the visual receptor which might be present.

Turbines are tall structures (200m in the case of the Project) that can be seen from several kilometres away and impose a change on the landscape of the area where they are installed. However, visual impacts depend on several factors such as distance, size, visibility, landscape and geography, and the presence of potential sensitive visual receptors.

Nevertheless, visual impacts created from the development of the Project are not considered an issue of concern due to the following:

- There are no critical or sensitive visual receptor within the Project area and the 10km radius. The closest sensitive receptor would be Ras Gharib city which is located at around 18km from the Project site. As noted within Table 15 earlier, at such a distance there are no relevant impacts from the turbines in terms of visibility.
- Project area is considered a barren and desert area and in general is located within an industrial area with petroleum activities for which its aesthetical value loses some importance.

- There are several existing and under construction wind farm developments in the area as well as several electricity distribution and transmission lines so the addition of this Project will not be a significant impact to the visual and landscape characteristics of the area.
- Being visible is not necessarily the same as being intrusive. Aesthetic issues are by their nature highly subjective. For some viewers, a Wind Farm could be regarded as manmade structures with visual burdens while to others it represents a positive impact in the sense that they introduce a break in the otherwise dull and monotonous view.

In addition to the above, the rotating blades will be visible from vehicles passing across the Ras Ghareb - El Sheikh Fadl Road which is located less than 1km north of the Project site (refer to Figure 90 earlier). The turbines can attract visual attention and potentially distract drivers passing along the highway.

Given all of the above, the potential impacts on landscape and visual are of a long -term duration throughout the Project operation phase. The impacts will be of a negative nature, and medium magnitude given that such elements of the Project will be visible. However, given the key visual receptors in the project route and its surroundings the receiving environment is considered of low sensitivity. Given all of the above, such an impact is considered of low significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Project Operator during the operation phase and which include:

- In coordination with the Traffic and Transport Authority, install clear and informative signage in Arabic and English language at Ras Ghareb - El Sheikh Fadl Road to alert drivers of the wind farm ahead and provide guidance on safe driving practices.

Following the implementation of these mitigation measures, the significance of the residual impact is categorised as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by Project Operator during the operation phase:

- Inspections on highway to ensure signage is installed.

8.3 Land Use

This section identifies the anticipated impacts on land use from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

8.3.1 Potential Impacts during the Planning and Construction and Operation Phase

As noted earlier, the Project site location does not conflict with any of the relevant governmental entities formal planning context. Therefore, there are no impacts on formal land use from the Project.

With regards to informal or 'actual land use' as discussed earlier, the following is concluded:

- The Project site itself in general is uninhabited and vacant and does not include any physical or economical land use activities (with the exception of the petroleum activities as discussed further below in "Section 8.10"). Therefore, physical and economical displacement impacts are considered irrelevant.

- The Project site is owned by NREA and will be utilised for the Development of the Project. However, as discussed earlier, Bedouin Groups in general implement the Ghafra system in such land areas to include the Project site. Therefore, the Developer should be aware of Al-Ghafra system, and other aspects of Bedouin culture. The Developer's understanding of Bedouin culture plays a major role in regulating the relationship between them and the tribes in the region. Inappropriate management of such issues could result in potential conflicts with such groups.

Nevertheless, should the above issues not be taken into account as part of the planning phase of the Project, it could result in impacts that are considered of long-term duration, of negative nature, and of medium magnitude and medium sensitivity given that it could result in land use impacts and disputes with both Bedouin Groups and the General Petroleum Company. Given all of the above, the impact is considered of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Developer during the planning phase and which include:

- Establish coordination with the Bedouin Groups for inclusion and engagement in employment and procurement opportunities as part of the employment and procurement procedure that is discussed in further details in "Section 8.14".

- Implementation of SEP that includes specific references for engagement and coordination with Bedouin groups. Please refer to SEP for additional details.

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the EPC Contractors during the construction phase and which include:

- Monitoring the effectiveness of the grievance mechanism that allows the Bedouin community to raise concerns, provide feedback, and seek resolution for any perceived impacts or conflicts. Regularly review the mechanisms' accessibility, transparency, and responsiveness.

- Submission of employment and procurement procedure that includes references for Bedouin groups; and

- Submission of proof of coordination and agreement with Bedouin groups as part of the SEP such as engagement records.

8.4 Geology, Hydrology and Hydrogeology

This section identifies the anticipated impacts on hydrology and hydrogeology from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

8.4.1 Potential Impacts from Flood Risks on the Project Site

In general, it is important to investigate potential risks of local flood hazard from the wadi systems (as discussed previously under "Section 7.3.1") during the rainy season and especially during flash flood events which in turn could affect the Project components. Such risks must be taken into consideration throughout the planning phase of the Project as they could inflict damage to the Project and its various components.

Nevertheless, should the above issues not be taken into account as part of the planning phase of the Project, it could result in impacts that are considered of long-term duration, of negative nature, and of medium magnitude and high sensitivity given that it could result in infrastructure damage as well as impacts on health and safety. Given all of the above, the impact is considered of moderate significance.

Taking the above into account, the Developer has undertaken a standalone flood risk assessment for the Project site. The study relied on the design of many simulated models based on multi-source data such as climate satellite images, rainfall data collected from the nearest meteorological stations, and the digital elevation models for the region and processing them by ARC-GIS software. Site visit were also conducted to investigate the results of the studies and verify the models that have been designed. The study also takes into account climate change impacts and risks.

This section presents the key outcomes and conclusions of this study.

- **Protection for turbines:** The turbines were considered to be completely safe and are far from the expected places of surface runoff (the drainage lines) during severe rainstorms. However, taking into consideration the possibility of heavy rainstorm event with unlikely occurrence probability of once in a hundred years (maximum possible according to calculations), it is recommended to build a one-meter height fence of concrete around the turbines or any structures on the site, as practiced in the region to protect the electric or communication towers. This is an optional conservative recommendation.
- **Site access paved or asphaltic roads:** Since drainage lines in which surface runoff may occur are very wide and shallow, which indicates a weak to medium runoff intensity (as opposed to those concentrated in narrow and specific paths), their impact on the roads within the site is not significant. There is no evidence of violent drifts in the paths of the roads crossing these drainage lines. Therefore, in some places, simple cement culverts with a diameter of one meter at most can be placed below the road crossing these valleys in specific locations to accommodate the surface flow and prevent its flow up the road.
- **Electricity cables:** Cables need to be buried under the ground at a depth of about a meter, taking all measures for insulation and protection against subsurface infiltrated water into consideration.

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

8.4.2 Potential Impacts from Improper Management of Waste Streams during Construction and Operation

Given the generic nature of the impacts on soil and groundwater for both phases of the Project (construction and operation) those have been identified collectively throughout this section. Generally, this includes potential impacts from improper housekeeping practices (e.g. improper management of waste streams, improper storage of construction material and of hazardous material, etc.).

Improper housekeeping practices during construction and operation (such as illegal disposal of waste to land) could contaminate and pollute soil which in turn could pollute groundwater resources. This could also indirectly affect flora/fauna and the general health and safety of workers (from being exposed to such waste streams). Generally, such impacts can be adequately controlled through the implementation of general best practice housekeeping measures as highlighted throughout this section, and which are expected to be implemented by the EPC Contractor throughout construction phase and Project Operator during the operation phase.

The potential impacts from improper management of waste steams could be of a long-term duration throughout the construction and operation phase. Such impacts are negative in nature, and could be noticeable and are therefore of medium magnitude. However, they are considered of low sensitivity as they are generally controlled through the implementation of general best practice housekeeping measures. Given all of the above, such an impact is considered to be of minor significance.

Following the implementation of the mitigation measures highlighted throughout this section, the residual significance can be reduced to not significant.

(i) Solid Waste Generation

Solid waste is expected to be generated from construction and operational activities. Solid waste generated will likely include construction waste (such as debris) and municipal solid waste (during construction and operation such as cardboard, plastic, food waste, etc.).

Municipal solid waste and construction waste generated will likely be collected and stored onsite and then disposed to the closest approved dumpsite (Ras Gharib Public Dumpsite) or, if possible, reused in the construction activities.

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the EPC Contractor during the construction phase and the Project Operator during the operational phase unless stated otherwise:

- Coordinate with Ras Gharib City Council for the collection of solid waste from the site to the municipal approved dumpsite (the closest dumpsite being Ras Gharib Public Dumpsite) or for recycling (as discussed in further details below);
- Prohibit fly-dumping of any solid waste to the land;
- Distribute appropriate number of properly contained litter bins and containers properly marked as "Municipal Waste";
- Adhere to waste hierarchy principles with associated mitigation measures to include prevent, minimize, reuse, recycle, recover and dispose.
- EPC Contractor only - during construction, distribute a sufficient number of properly contained containers clearly marked as "Construction Waste" for the dumping and disposal of construction waste.
- EPC Contractor only – during construction, it is recommended that recycling measures are implanted. It is recommended that recycling is undertaken in the following approach: (i) separation and disposal of recyclables in a separate container (cardboard, paper, glass, metal, etc.); and (ii) separation and disposal of non-recyclable materials in a separate container (e.g. food waste). Each container must be clearly marked. In addition, EPC Contractor must seek ways to reduce construction waste by reusing materials (for example through recycling of concrete for road base coarse);
- Implement proper housekeeping practices on the construction site at all times; and
- Maintain records and manifests that indicate volume of waste generated onsite, collected by contractor, and disposed of at the landfill. The numbers within the records are to be consistent to ensure no illegal dumping at the site or other areas.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include the rm EPC Contractor during the construction phase and the Project Operator during the operational phase unless stated otherwise:

- Inspection of waste management practices onsite;
- Review of records and manifests for volume of waste generated to ensure consistency; and
- Regular environmental reporting on implementation of the waste management practices onsite.

(ii) Wastewater Generation

Wastewater is mainly expected to include black water (sewage water from toilets and sanitation facilities), as well as grey water (from sinks, showers, etc.) generated from workers during the construction and operation phase. Wastewater quantities are expected to be minimal. It is expected that wastewater will be collected and stored in fully contained septic tanks and then collected and transported by transportation tankers to be disposed at the closest Wastewater Treatment Plant (WWTP) (being Ras Gharib WWTP).

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the EPC Contractor during the construction phase and the Project Operator during the operational phase unless stated otherwise:

- Coordinate with Ras Gharib Water Company to hire a private contractor for the collection of wastewater from the site to the closest WWTP (being Ras Gharib WWTP);
- Prohibit illegal disposal of wastewater to the land;
- Maintain records and manifests that indicate volume of wastewater generated onsite, collected by contractor, and disposed of at the WWTP. The numbers within the records are to be consistent to ensure no illegal discharge at the site or other areas;
- EPC Contractor only - ensure that constructed septic tanks during construction and those to be used during operation are well contained and impermeable to prevent leakage of wastewater into soil; and
- Ensure that septic tanks are emptied and collected by wastewater contractor at appropriate intervals to avoid overflowing.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include the EPC Contractor during the construction phase and the Project Operator during the operational phase unless stated otherwise:

- Inspection of wastewater management practices onsite;
- Review of records and manifests for volume of wastewater generated to ensure consistency; and
- Regular environmental reporting on implementation of the wastewater management practices discussed above.

(iii) Hazardous Waste Generation

Hazardous waste is expected to be generated throughout both the construction and operation phase and this could include consumed oil, chemicals, paint cans, etc. Hazardous waste generated will likely be collected and stored onsite and then disposed at the approved hazardous waste disposal facilities managed by the Hazardous Waste Management Project and supervised by the governorate and the EEAA.

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the EPC Contractor during the construction phase and the Project Operator during the operational phase unless stated otherwise:

- Coordinate and hire a private contractor for the collection of hazardous waste from the site to the approved hazardous waste disposal facilities;
- Ensure that hazardous waste is disposed in a dedicated area that is enclosed; of hard surface; with proper signage and suitable containers as per hazardous waste classifications and that they are labelled for each type of hazardous waste.
- Ensure hazardous waste storage area is equipped with spill kit, fire extinguisher and anti-spillage trays and a hazardous waste inventory is available.
- Prohibit illegal disposal of hazardous waste to the land;
- Possibly contaminated water (e.g. runoff from paved areas) must be drained into appropriate facilities (such as sumps and pits). Contaminated drainage must be orderly disposed of as hazardous waste;
- Ensure that containers are emptied and collected by the contractor at appropriate intervals to prevent overflowing; and
- Maintain records and manifests that indicate volume of hazardous waste generated onsite, collected by contractor, and disposed of at the hazardous waste disposal facilities. The numbers within the records are to be consistent to ensure no illegal discharge at the site or other areas.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include the EPC Contractor during the construction phase and the Project Operator during the operational phase unless stated otherwise:

- Inspection of hazardous waste management practices onsite;
- Review of records and manifests for volume of hazardous waste generated to ensure consistency; and
- Regular environmental reporting on implementation of the hazardous waste management practices onsite.

(iv) Hazardous Material

The nature of construction and operational activities entail the use of various hazardous materials such as oil, chemicals, and fuel for the various equipment and machinery. Improper management of hazardous material entails a risk of leakage into the surrounding environment either from storage areas or throughout the use of equipment and machinery.

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the EPC Contractor during the construction phase and the Project Operator during the operational phase unless stated otherwise:

- Ensure that hazardous materials are stored in proper areas and in a location where they cannot reach the land in case of accidental spillage. This includes storage facilities that are of hard impermeable surface, flame-proof, accessible to authorized personnel only, locked when not in use, and prevents incompatible materials from coming in contact with one another;
- Maintain a register of all hazardous materials used and accompanying Material Safety Data Sheet (MSDS) must present at all times. Spilled material should be tracked and accounted for;
- Incorporate dripping pans at machinery, equipment, and areas that are prone to contamination by leakage of hazardous materials (such as oil, fuel, etc.);
- Regular maintenance of all equipment and machinery used onsite. Maintenance activities and other activities that pose a risk for hazardous material spillage (such as refuelling) must take place at a suitable location (hard surface) with appropriate measures for trapping spilled material;
- Ensure that a minimum of 1,000 litters of general-purpose spill absorbent is available at hazardous material storage facility. Appropriate absorbents include zeolite, clay, peat and other products manufactured for this purpose; and
- If spillage on soil occurs, spill must be immediately contained, cleaned-up, and contaminated soil disposed as hazardous waste.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include the EPC Contractor during the construction phase and the Project Operator during the operational phase unless stated otherwise:

- Inspection for storage of hazardous materials to include inspections for potential spillages or leakages; and
- Report any spills and the measures taken to minimize the impact and prevent from occurring again.

8.4.3 Potential Impacts from Erosion and Runoff during the Construction Phase

Site preparation activities which are to take place onsite by the EPC Contractor for installation of the various Project components to include wind turbines, substation, cables, etc. are expected to include land clearing activities, excavation, grading, etc.

The nature of construction activities discussed above could disturb soil, exposing it to increased erosion during rainfall events. If onsite erosion and runoff are not controlled, they can result in siltation of surface water. Generally, such impacts can be adequately controlled through the implementation of general best practice housekeeping measures as highlighted throughout this section, and which are expected to be implemented throughout construction phase.

The potential impacts from erosion and runoff are of short-term duration as it is limited to the construction phase. Such impacts are negative in nature, and could be noticeable and are therefore of medium magnitude. However, they are considered of low sensitivity as they are generally controlled through the implementation of general best practice housekeeping measures. Given all of the above, such an impact is considered to be of minor significance.

Following the implementation of the mitigation measures highlighted throughout this section, the residual significance can be reduced to not significant.

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the EPC Contractor during the construction phase:

- Avoid executing excavation works under aggressive weather conditions.
- Place clear markers indicating stockpiling area of excavated materials to restrict equipment and personnel movement, thus limiting the physical disturbance to land and soils in adjacent areas.
- Erect erosion control barriers around work site during site preparation and construction to prevent silt runoff where applicable.
- Return surfaces disturbed during construction to their original (or better) condition to the greatest extent possible.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include the EPC Contractor during the construction phase:

- Inspection for erosion and runoff control to include inspections for implementation of mitigation measures.

8.5 Biodiversity

This Section identifies the anticipated impacts on biodiversity from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

It is important to note that biodiversity assessed in this Chapter excludes birds (avi-fauna) and bats, which are discussed separately in the Chapters that follow.

8.5.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the EPC Contractor for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, although alterations are considered to be minimal, such activities would still likely result in the alteration of the site's habitat and thus potentially disturb existing habitats.

Other impacts on the biodiversity of the site are mainly from: (i) improper management of the site, which could include improper conduct and housekeeping practices by workers (i.e. hunting of animals, discharge of hazardous waste to land, etc.); (ii) disturbance to fauna from the construction activities, (iii) potential for road-kills; (iv) poaching and persecution such as the Egyptian Dabb Lizard and Dorcas Gazelle as well as migratory raptors (Sakers and eagles) that could be targeted for falconry trade.

However, as discussed earlier, the Project site is general is considered of low ecological significance but special consideration should be given to the globally threatened to the Egyptian Dabb Lizard *Uromastyx aegyptia* and Dorcas Gazelles *Dorcas Gazelle* since the Project site provides a typical habitat for such species. Impacts on these species, as mentioned earlier, could be from road-kills, improper conduct by workers (e.g. hunting, persecution) and for the Egyptian Dabb Lizard direct impacts from construction activities (e.g. excavation activities).

Given all of the above, the potential impacts on biodiversity created during the construction phase would be of a long-term duration as they would result in a permanent change in the natural biodiversity of the site. Such impacts are considered of negative nature and of a medium magnitude given that the change in the natural biodiversity of the site will be noticeable in limited individual footprints. In addition, as the site is considered of low ecological significance but due to the presence of the Egyptian Dabb and Dorcas Gazelles, the receiving environmental is determined to be of a medium sensitivity. Given all of the above, such an impact is considered to be of moderate significance.

Additional Surveys and Studies

The following identifies the additional studies and mitigation measures to be applied by the EPC Contractor during the construction phase and which include:

- As discussed earlier an ESIA study has been undertaken for the 300km^2 area in which the Project site is located. The environmental permit issued for the 300km^2 ESIA requires adherence to all specifications and conditions include within the 300km^2 ESIA study. The ESIA study identifies the following specifications in relation to biodiversity: (i) installation of turbines and other technical installation should be avoided in areas settled by the Egyptian Dabb Lizard; (ii) execution of reconnaissance on Dabb Lizard burrow sites prior to detailed design. Installation of turbines and other construction measures are to be avoided at a distance of 250 m from Dabb Lizzard burrows.

  The above entails adhering to a buffer distance of 250m from each burrow recorded. However, this is not considered a feasible or practical solution given that burrows can change and are not fixed (an active burrow this year can become inactive next year given that they continuously move to other locations).

  Therefore prior to construction a detailed Egyptian Dabb Lizard survey should be undertaken for all construction active areas through a biodiversity expert. The expert should have an educational background in a related field (bachelor's degree at a minimum) (e.g. biology, biodiversity or similar) with demonstrated work experience and track record in planning and implementing biodiversity assessments, surveys and studies in the region including reptiles in particular.

  The survey should include: (i) exploration survey that should aim to locate abundance of active and inactive or deserted burrows and document occupation status of such borrows; (ii) undertake intensive survey on component areas for relocation to outside of construction active areas to a similar habitat. The surveys should take into account the construction schedule for the various Project components and repeated at suitable interval (e.g. every 6 months). If the species is present in these areas the biodiversity expert will design and implement a pre-construction capture and relocation program based on demonstrated good practice for the relocation of this type of species.

Mitigation Measures

- Implement proper management measures to prevent damage to the biodiversity of the site. This could include establishing a proper code of conduct and awareness raising / training of personnel and good housekeeping which include the following:

  - Emphasize on the potential presence of Dorcas Gazelles and its importance as part of induction training and the required code of conduct for handing this species in case it is encountered which should include:

(i) giving it plenty of space; (ii) refraining from feeding or petting it; (iii) slowly backing away and leaving the area; and (iv) refraining from alerting it to the workers' presence

- Prohibit hunting of any wildlife at any time and under any condition by construction workers onsite;
- Ensure proper storage, collection, and disposal of waste streams generated as discussed in detail in "Section 8.4.2";
- Restrict activities to allocated construction areas only, including movement of workers and vehicles to allocated roads within the site and prohibit off-roading to minimize disturbances; and
- Avoid unnecessary elevated noise levels at all times. In addition, apply adequate general noise suppressing measures as detailed in "Section 8.9.1".

- Install temporary facilities in areas with lower ecological value (areas with no vegetation, away from wadis) and construction buffer to be minimised as much as practicable to reduce the magnitude of habitat loss.

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the EPC Contractor during the construction phase and which include:

- Submission of an Egyptian Dabb Lizard survey report
- Inspection of the works should be carried out at all times

8.5.2 Potential Impacts during the Operation Phase

The only impacts anticipated during the operation phase are related to disturbance and displacement of mammal species and improper management of the site as discussed earlier. This could include improper conduct and housekeeping practices by workers (i.e. hunting of animals, discharge of hazardous waste to land, etc.).

The potential impacts on biodiversity would of a long-term duration throughout the operation phase of the Project. Such impacts are of negative nature and of a medium magnitude. However, as the site is considered of low ecological significance, the receiving environmental is determined to be of low sensitivity. Given all of the above, such an impact is considered to be of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Project Operator during the operation phase and which include:

- Implement proper management measures to prevent damage to the biodiversity of the site. This could include establishing a proper code of conduct and awareness raising / training of personnel and good housekeeping which include the following:
  - Emphasize on the potential presence of Dorcas Gazelles and its importance as part of induction training and the required code of conduct for handing this species in case it is encountered which should include: (i) giving it plenty of space; (ii) refraining from feeding or petting it; (iii) slowly backing away and leaving the area; and (iv) refraining from alerting it to the workers' presence
  - Prohibit hunting of any wildlife at any time and under any condition by workers onsite;

- Ensure proper storage, collection, and disposal of waste streams generated as discussed in detail in "Section 8.4.2"; and

- Restrict activities to allocated areas only, including movement of workers and vehicles to allocated roads within the site and prohibit off-roading to minimize disturbances.

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm Operator during the operation phase and which include:

- Inspection of the works should be carried out at all times.

8.6 Birds

This section identifies the anticipated impacts on birds (avifauna) from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation and monitoring measures, additional requirements, etc.) have been identified to eliminate or reduce the impact to acceptable levels.

8.6.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the EPC Contractor for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Such activities in particular could impact avifauna which could use the site for as a resting ground– to include soaring and non-soaring resident and migratory species. Generally, such construction activities would not result in any major alteration of the site's habitats given that such activities are limited to the relatively small individual footprint of these facilities and where the actual area of disturbance is relatively minimal.

Such potential impacts are created during the construction phase only and thus are of long-term duration. However, such impacts are considered of negative nature and of a low magnitude given that the construction activities' actual area of disturbance is relatively minimal. The receiving environmental is determined to be of a medium sensitivity. Given all of the above, such an impact is considered to be minor significance.

Mitigation Measures by the Developer/EPC Contractors

- Implementation of proper housekeeping measures to reduce impacts including:

  - Restrict activities to allocated construction areas only, including movement of workers and vehicles to allocated roads within the site and prohibit off-roading to minimize disturbances.

  - Prohibit hunting of birds at any time and under any condition by construction workers onsite.

  - Implement proper measures, which would prevent attraction of birds to the site. This includes measures such as prohibiting illiterate dumping and ensuring waste streams are disposed appropriately in accordance with the measures identified in "Section 8.4.2".

- Avoid unnecessary elevated noise levels at all times. In addition, apply adequate general noise suppressing measures. This could include the use of well-maintained mufflers and noise suppressants for high noise generating equipment and machinery, developing a regular maintenance schedule of all vehicles, machinery, and equipment for early detection of issues to avoid unnecessary elevated noise level, etc.

- Develop a protocol to swiftly report and dispose of any dead or injured wildlife or animals recorded onsite.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirement

The following summarizes the monitoring requirements for the projects which must be undertaken and which include:

- EPC Contractors to submit construction schedule and plan and demonstrate that construction is planned to avoid areas of concern during breeding season.

- Submission of dead animal handling protocol

8.6.2 Potential Impacts during the Operation Phase

Wind turbines are associated with impacts on birds from risks of collision and electrocution for both migratory and resident birds .

Egypt is one of the main crossroads for migratory soaring birds (MSBs) crossing from breeding grounds in Europe and Asia to their wintering areas in Africa. High wind energy potentials in the Gulf of Suez (GoS) stimulated rapid development of wind energy facilities, which poses additional risk to migratory birds using the area. Principal risks to these species are from fatal collisions with turbines and with overhead powerlines and disturbance/barrier effects.

Based on the foregoing and given the importance of the area for bird migration routes and the implementation of related international commitments, the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE) initiated the “Active Turbine Management Program” (ATMP) aiming to determine the optimum wind turbines operations periods during the heavy bird migratory seasons (spring and autumn) during pre, under, and post-construction phases of wind farms.

This program aims to ensure the protection and risk mitigation of the environment while increasing the feasibility and the productivity of the wind turbines over the project lifetime. Therefore, RCREEE has succeeded in launching the study and providing an innovative coordination and execution strategic framework among public and private stakeholders, including three governmental institutions; the New and Renewable Energy Authority (NREA), the Egyptian Environmental Affairs Agency (EEAA) and the Egyptian Electricity Transmission Company (EETC) by releasing a Bird Migration Protocol (BMP) called the ”Executive Framework for Strategic Cumulative, Environmental & Social Assessment & Program of Ornithological monitoring and Active Turbine Management for Wind Energy Developments in Gulf of Suez”. One of the objectives of the Bird Migration Protocol is to strengthen the protection of birds in their migration path in Egypt from the potential effects of wind-energy projects through a series of practical activities in the GoS area, as well as facilitate cooperation among relevant stakeholders.

Objective

The goal of this section is to provide field documentation of migration patterns of MSBs across the Project Area for wind turbines, and to assess potential associated collision risks. This report will aim to present the following in particular for Project based on the spring 2021 and 2023 data and autumn 2021 data. The objective of the assessment within this section is to:

- Identify number of birds flying at risk height for wind turbines; and
- Evaluate the Collision Risk of the different species according to Collision Risk Modelling (CRM).

Collision Risk Modelling and Flying at Risk for Spring

The Collision Risk Model (CRM) is a simplified model developed to predict the potential impact of wind turbines on birds. There are several CRM models, of which the most widely used is the Band model (SNH 2012). The CRM provides an order of magnitude for the occurrence and possibility of collisions to aid authorities in designing, operating and permitting sites for wind farms.

The model for the two types of turbines selected appears in the table below.

Table 56: Turbine specifications used for the CRM

Model	Envision EN182 7.8MW	Goldwind GWH182 7.2MW
Rated Capacity	7.8MW	7.2MW
Rotor Diameter	182m	182m
Hub-Height	110m	110m
Maximum speed of the blade tips	89 m/s	89m/s
Blade Chord Length	5.08m	4.85m
Number of WTGs	26	28

Data inputs for the CRM analysis were derived from the results of the VP surveys, as well as the above-mentioned turbine specifications and the following assumptions:

Rotation speed (rpm)	7.5	Average value calculated from manufacturer's Specifications for similarly-sized turbine.
Percent of time operational	Monthly values ranging from 64% to 85%	Project specific data not available, representative values taken from SOSS example
Maximum blade width (m)	4.5	From manufacturer's specifications
Pitch (degrees)	47.5	Mean value from manufacturer's specifications

Given the same size of the two turbine models (both 110m hub height and 182m rotor diameter), the Goldwind layout / turbines was used given that they have higher number (28 compared to 26 of the Envision) and therefore the CRM would present a "worst case" scenario which utilizes the specifications of height from the ground to the tip height – 110 + 91 m equal to 200 m.

In addition to bird densities derived from VP survey data, CRM makes use of physical and observational characteristics of avifauna species. Input values used in the CRM analysis are presented in the table below. Data on physical dimensions of birds were derived from Cornell Lab of Ornithology's Birds of the World (https://birdsoftheworld.org), while information specific to the VP survey observations, such as typical flight speeds derived from Alerstam et. Al. (2007),, flight styles, and maximum effective radius of observation/identification were generated using input from the databases.

Table 57: Physical and observational characteristics of each bird species included within the CRM analysis.

Scientific name	English Common Name	Length (m)	Wingspan (m)	Flight type	Flight speed
Milvus migrans	Black Kite	0.55	1.37	gliding	11.7

Ciconia nigra	Black Stork	1	1.55	gliding	16
Aquila pennata	Booted eagle	0.51	1.38	gliding	11.3
Grus grus	Common Crane	1.08	1.9	flapping	16.67
Falco tinnunculus	Common Kestrel	0.31	0.68	flapping	13.9
Aquila heliaca	Eastern Imperial Eagle	0.71	1.9	gliding	18.06
Neophron percnopterus	Egyptian Vulture	0.62	1.6	gliding	13.9
Gyps fulvus	Eurasian Griffon	1.01	2.52	gliding	19.4
Falco tinnunculus	Eurasian Kestrel	0.31	0.68	flapping	13.9
Accipiter nisus	Eurasian Sparrowhawk	0.34	0.67	flapping	19.4
Pelecanus onocrotalus	Great White Pelican	1.56	2.93	flapping	15.6
Clanga clanga	Greater Spotted eagle	0.71	1.8	gliding	11.7
Pernis apivorus	Honey Buzzard	0.6	1.5	flapping	18.06
Falco naumanni	Lesser Kestrel	0.31	0.66	flapping	13.9
Clanga pomarina	Lesser spotted eagle	0.67	1.68	gliding	11.7
Accipiter brevipes	Levant Sparrowhawk	0.37	0.74	flapping	11.1
Buteo rufinus	Long-legged Buzzard	0.53	1.3	gliding	16.67
Circus pygargus	Montagu's Harrier	0.49	1.23	gliding	8.4
Pandion haliaetus	Osprey	0.66	1.59	gliding	11.4
Circus macrorus	Pallid Harrier	0.46	1.1	gliding	11.1
Falco vespertinus	Red-footed falcon	0.32	0.75	flapping	12.8
Falco cherrug	Saker Falcon	0.51	1.12	flapping	22.2
Circaetus gallicus	Short-toed Snake-Eagle	0.66	1.77	gliding	11.3
Falcon concolor	Sooty falcon	0.36	0.88	flapping	11.3
Buteo buteo	Steppe Buzzard	0.46	1.23	gliding	16.67
Aquila nipalensis	Steppe Eagle	0.7	1.9	gliding	18.06
Circus aeruginosus	Western Marsh-Harrier	0.48	1.3	gliding	11.1
Ciconia ciconia	White Stork	1.02	1.65	gliding	16

The table below shows the number of birds at a collision height of 120 m, according to the wind turbine planning for 2021. Published and validated avoidance rates (AR) were not available for several of the species, yet the AR parameter is well-known to be a very important parameter in Band CRM analysis, with outcomes very sensitive to slight variations (Cook et. al, 2012). For each species included within the CRM analysis, a "most realistic" AR parameter value, bounded by a "conservative" low parameter estimate (95%), and a high estimate (99.9%) was developed, reflecting an upper bound, based on a comprehensive review of available literature. Considering these two boundaries, the extent of avoidance rates considered in the literature were incorporated.

The flight duration of the target species was recorded to the nearest 15-second interval. Estimate of the birds' altitude above ground level at the point of first detection and thereafter at 15-second intervals, where heights were classified flight based on turbine specifications and to be at least divided into two classes: at collision risk and above collision risk. Although at the time of the undertaking of the survey the specifications of turbines were not finalized, the scenarios proposed all present a small area below collision risk, while above collision risk is 200m. The table shows the percentage of records at risk height for each species plus the time such flights were at risk height. Data were recorded during the three seasons considering the tip height of the turbine being 120m.

Table 58: Observational data from the VP surveys used to derive bird density inputs for the spring CRM analysis in spring 2021 For all species shows the percentage and time of flights at risk height.

Species	No risk	Risk 120	% Risk	Total
Black Kite	2728	861	23.99%	3589
Black Stork	271	84	23.66%	355
Booted Eagle	72	11	13.25%	83
Common Kestrel	2	7	77.78%	9
Eastern Imperial Eagle	28	1	3.45%	29
Egyptian Vulture	32	10	23.81%	42
Eurasian Sparrowhawk	5	6	54.55%	11
European Honey Buzzard	4467	14	0.31%	4481
Great White Pelican	83	0	0.00%	83
Greater Spotted Eagle	12	2	16.67%	14
Lanner Falcon	0	1	100.00%	1
Lesser Kestrel	0	1	100.00%	1
Lesser Spotted Eagle	120	11	8.40%	131
Levant Sparrowhawk	1145	1	0.09%	1146
Long-legged Buzzard	79	11	12.22%	90
Osprey	7	1	12.50%	8
Pallid Harrier	1	2	66.67%	7
Short-toed Snake Eagle	112	31	21.68%	143
Sooty Falcon	1	0	0.00%	1
Steppe Buzzard	19321	4756	19.75%	24077
Steppe Eagle	1584	323	16.94%	1907
Western Marsh Harrier	8	4	33.33%	12
White Stork	13522	12425	47.89%	25947

Table 59: Observational data from the VP surveys used to derive bird density inputs for the spring CRM analysis in spring 2023. For all species shows the percentage and time of flights at risk height.

Species	No Risk	Risk 200	Total	% Risk
Black Kite	2609	2747	5356	51.29%
Black Stork	142	190	332	57.23%
Booted Eagle	101	25	126	19.84%
Common Crane	680	0	680	0.00%
Crested Honey Buzzard	0	3	3	100.00%
Egyptian Vulture	26	22	48	45.83%
Griffon vulture	2		2	0.00%
Honey Buzzard	17583	5293	22876	23.14%
Imperial Eagle	12	1	13	7.69%
Common Kestrel	10	31	40	77.50%
Lesser Spotted Eagle	106	25	131	19.08%
Levant Sparrowhawk	0	5	5	100.00%
Long-legged Buzzard	14	17	31	54.84%
Marsh Harrier	4	8	12	66.67%
Montagu's Harrier	0	6	6	100.00%
Osprey	0	4	4	100.00%
Pallid Harrier	0	2	2	100.00%

Short-toed Eagle	135	47	182	25.82%
Sooty falcon	0	2	2	100.00%
Sparrowhawk	8	18	26	69.23%
Greater Spotted Eagle	10	11	21	52.38%
Steppe Buzzard	10454	6128	16582	36.96%
Steppe Eagle	2545	1173	3718	31.55%
White Pelican	4150	919	5069	18.13%
White Stork	20996	9217	30213	30.51%

Table 60: Published Avoidance rates (AR) for several bird species

Species	Low	Mid	High
Golden Eagle[6] *Aquila chrysaetos*	98.1	99.58	99.9
Imperial Eagle *Aquila heliaca*	98.1	99.58	99.9
Steppe Eagle[1] *Aquila nipalensis*	98.1	99.58	99.9
Honey Buzzard[2] *Pernis apivorus*	95	99	99.5
Saker Falcon[1] *Falco cherrug*	99.5	99.8	99.9
Eurasian Griffon[3] *Gyps fulvus*	98	99	99.5
Egyptian Vulture[4] *Neophron percnopterus*	99	99.58	99.9
Great White Pelican *Pelecanus onocrotalus*	95	99	99.5
Eurasian Sparrowhawk[1] *Accipiter nisus*	99	99.5	99.9
Common Buzzard[1] *Buteo buteo*	97.8	99.5	99.9
Long-legged Buzzard[1] *Buteo rufinus*	97.8	99.5	99.9
Short-toed Snake-Eagle[5] *Circaetus gallicus*	98.1	99.58	99.9
Eurasian Marsh-Harrier[5] *Circus aeruginosus*	95	99	99.9
Pallid Harrier[5] *Circus macrourus*	95	99	99.9
Lesser Kestrel[1] *Falco naumanni*	87.3	96.9	99.9
Eurasian Kestrel[1]*Falco tinnunculus*	87.3	96.9	99.9
Common Crane[2] *Grus grus*	95	99	99.5
Black Kite[6] *Milvus migrans*	98	99.2	99.85
Black Stork[2] *Ciconia nigra*	95	99	99.5
Booted Eagle[2] *Aquila pennata*	95	99	99.5
Greater spotted Eagle[2] *Clanga clanga*	95	99	99.5
Lesser spotted eagle *Clanga pomarina*	95	98	99
Levant Sparrowhawk *Accipiter brevipes*	95	98	99
Montagu´s Harrier *Circus aeruginosus*	95	98	99
Osprey *Pandion haliaetus*	98	99.2	99.5
White Stork[2] *Ciconia ciconia*	95	99	99.5

The output of the CRM should be interpreted as a magnitude of the impact rather than a true value of the number of fatalities. At the current stage the 120m (2021) and 200 m (2023) collision risk was calculated. The tables below show the estimated fatalities according to three avoidance rates. A rank of high (red), medium (yellow), low (green), and negligible collision risk was established based on the outputs of the CRM after scaling the fatalities to make them comparable among species.

Table 61: Collision Risk estimates for hub height 120m in spring 2021

[6] Whitfield and Madders (2006a), [2]Cook et al.(2012), Vasilakis et al. (2012), [4] Whitfield and Madders(2009), [5]Whitfield and Madders (2009), SNH (2010),

Species	Avoidance 99.5%	Avoidance 98%	Avoidance 95%
Black Kite	45	180	450
Black Stork	5	18	46
Booted Eagle	1	4	11
Common Kestrel	0	0	1
Eastern Imperial Eagle	0	1	4
Egyptian Vulture	1	2	5
Eurasian Sparrowhawk	0	0	1
European Honey Buzzard	56	225	562
Great White Pelican	1	4	11
Greater Spotted Eagle	0	1	2
Lanner Falcon	0	0	0
Lesser Kestrel	0	0	0
Lesser Spotted Eagle	2	7	17
Levant Sparrowhawk	15	59	147
Long-legged Buzzard	0	0	0
Osprey	0	0	1
Pallid Harrier	0	0	1
Short-toed Snake Eagle	2	7	18
Sooty Falcon	0	0	0
Steppe Buzzard	346	1383	3453
Steppe Eagle	25	98	245
Western Marsh Harrier	0	1	2
White Stork	334	1330	3294

Table 62: Collision Risk estimates for hub height 200m in spring 2023

Species	Avoidance 99.5%	Avoidance 98%	Avoidance 95%
Black Kite	34	137	343
Black Stork	2	8	21
Booted Eagle	1	3	9
Common Kestrel	0	1	3
Common Crane	0	0	0
Eastern I. Eagle	0	0	1
Egyptian Vulture	0	1	3
E. Sparrowhawk	0	1	2
Greater S. Eagle	0	1	1
Honey Buzzard	145	580	1449
Lesser S. Eagle	1	3	8
L. Sparrowhawk	0	0	0
Long-l. Buzzard	0	1	3
Marsh Harrier	0	0	1
Montagu's Harr.	0	0	1

Osprey	0	0	0
Pallid Harrier	0	0	1
S-t Snake Eagle	1	5	12
Sooty Falcon	0	0	0
Steppe Buzzard	105	420	1050
Steppe Eagle	24	94	235
G.White Pelican	32	128	321
White Stork	191	764	1902

The repeated VP surveys in the same area each year will record different levels of flight activity and CRMs derived from these surveys produce different estimates of collision risk (Pers. obs., e.g., ECO Consult 2022). The table below shows the variation in % of the bird numbers between 2021 and 2023. Those highlighted in green are species with lower counts in 2023, and those highlighted in red those showing higher counts. These variations result in different CRM estimates depending on data input. This is relevant for species like the Honey Buzzard, Steppe eagle, White Stork, and Steppe buzzard, which are the most abundant. These have implications when estimating any risk and establishing the mitigation plan. The changes are negligible for species with low numbers whatever the year considered like the small falcons. Those which are not regular every year, like the Great White Pelican or the Levant Sparrowhawk, show great variations between years, so a precautionary principle for mitigation should be considered.

Table 63: Variation in total bird numbers (5) between springs 2021 and 2023

Species	Bird numbers change between 2021-2023
European Honey Buzzard	**-410.51%**
Common Kestrel	-344.44%
Eurasian Sparrowhawk	-136.36%
Sooty Falcon	-100.00%
Steppe Eagle	**-94.97%**
Booted Eagle	-51.81%
Greater Spotted Eagle	-50.00%
Black Kite	-49.23%
Short-toed Snake Eagle	-27.27%
White Stork	**-16.44%**
Egyptian Vulture	-14.29%
Lesser Spotted Eagle	0.00%
Western Marsh Harrier	0.00%
Black Stork	6.48%
Steppe Buzzard	**31.13%**
Osprey	50.00%
Eastern Imperial Eagle	55.17%
Long-legged Buzzard	65.56%
Pallid Harrier	71.43%
Great White Pelican	**97.59%**
Levant Sparrowhawk	**99.56%**
Lanner Falcon	--
Lesser Kestrel	--

Knowledge About Existing Fatalities and Current Operational Wind Farms

The CRM makes several assumptions when data were not available including the monthly proportion of time operational (proportion of time when a turbine is rotating). It excludes occurrences when the wind is below cut-in wind speed, when the rotors may be stationary or idling; occurrences when the rotors are stopped and feathered for protection in very high wind speeds; and down-time for operations and maintenance (O&M). These proportions vary over the year, reflecting different wind conditions in different seasons, and the increased opportunities for maintenance access in summer. The frequency distribution of winds nor the tested effect that weather conditions (wind speed and direction, temperature) and their influence on flight altitudes, direction and bird sightings over the site were not available. These weather variables have been demonstrated to affect bird's occupancy and flight.

Because of the above, also represented is the proportion of risk flights according to time of the day, to inform how the risk varies and how the situations could require more or less active mitigation attention.

Some non-systematic processed information comes from the existing wind farms in the region, within the NREA area or current operational monitoring, e.g., Lekela West Bakr. A peer-review of the existing reports showed (pers. obs.) that there is still required a process on collecting and analysing the post-construction fatality data. Thus, only qualitative information was used about fatalities in the region. One of the representative papers is that from Riad[7] (2022) which collated data from March 2019 to May 2022 form wind farms in the NREA area, recording 59 fatalities with wind turbines. The most affected species in order of importance were the White stork, followed by a second group formed by the Black kite, Steppe Buzzard and Honey Buzzard, and all the remaining species: Lesser Spotted and Steppe eagles, Eurasian Sparrowhawk, Montagu´s and Marsh harriers, and Common Kestrel.

Collision Risk Modelling and Flying at Risk for Autumn

The CRM is a simplified model developed to predict the potential impact of wind turbines on birds. There exist several CRM models developed / improved around the world, being one of the most used that known as the Band model (SNH 2012). It must be clear that the CRM was not developed to provide a threshold of collisions, but an order of magnitude which would help the authorities –when it was designed- as a way to decide on project permitting purposes. A full and detailed development of the model can be read in Band, Madders, and Whitfield (2001) Developing field and analytical methods to assess avian collision risk at wind farms. In: De Lucas, Janss, and Ferrer (Eds). Birds and wind farms: Risk assessment and mitigations.

The turbine model selected is similar to that presented for the CRM for the spring season.

In addition to bird densities derived from VP survey data, CRM using the Band model requires certain data on the physical and observational characteristics of each bird species. Input values used in the CRM analysis are presented in table below. Data on physical dimensions of birds were derived from Cornell Lab of Ornithology's Birds of the World (https://birdsoftheworld.org), while information specific to the VP survey observations, such as typical flight speeds, flight styles, and maximum effective radius of observation/identification were generated using input from the databases.

Table 64: Physical and observational characteristics of each bird species included within the CRM analysis.

Scientific name	English Common Name	Length (m)	Wingspan (m)	Flight type	Flightspeed (m/sec)
Ciconia nigra	Black Stork	1.00	1.55	gliding	16.0
Pernis apivorus	Honey Buzzard	0.6	1.5	flapping	18.06
Pelecanus onocrotalus	Great White Pelican	1.56	2.93	flapping	15.60
Neophron percnopterus	Egyptian Vulture	0.62	1.6	gliding	13.90
Aquila pennata	Booted eagle	0.51	1.38	gliding	11.3

[7] Riad, S. 2022. Egypt. Acad. J. Biolog. Sci., 14(2): 19-33 (2022)

Scientific name	English Common Name	Length (m)	Wingspan (m)	Flight type	Flightspeed (m/sec)
Gyps fulvus	Eurasian Griffon	1.01	2.52	gliding	19.40
Circaetus gallicus	Short-toed Snake-Eagle	0.66	1.77	gliding	11.30
Aquila nipalensis	Steppe Eagle	0.70	1.9	gliding	18.06
Aquila heliaca	Eastern Imperial Eagle	0.71	1.9	gliding	18.06
Falco tinnunculus	Common Kestrel	0.31	0.68	flapping	13.90
Falco naumanni	Lesser Kestrel	0.31	0.66	flapping	13.90
Falco cherrug	Saker Falcon	0.51	1.12	flapping	22.20
Grus grus	Common Crane	1.08	1.9	flapping	16.67
Circus aeruginosus	Western Marsh-Harrier	0.48	1.3	gliding	11.10
Circus macrorus	Pallid Harrier	0.46	1.1	gliding	11.10
Milvus migrans	Black Kite	0.55	1.37	gliding	11.7
Accipiter nisus	Eurasian Sparrowhawk	0.34	0.67	flapping	19.40
Buteo buteo	Steppe Buzzard	0.46	1.23	gliding	16.67
Buteo rufinus	Long-legged Buzzard	0.53	1.3	gliding	16.67
Falco tinnunculus	Eurasian Kestrel	0.31	0.68	flapping	13.90
Clanga clanga	Greater Spotted eagle	0.71	1.80	gliding	11.7
Clanga pomarina	Lesser spotted eagle	0.67	1.68	gliding	11.7
Accipiter brevipes	Levant Sparrowhawk	0.37	0.74	flapping	11.1
Pandion haliaetus	Osprey	0.66	1.59	gliding	11.4
Circus pygargus	Montagu's Harrier	0.49	1.23	gliding	8.4
Falco vespertinus	Red-footed falcon	0.32	0.75	flapping	12.8
Falcon concolor	Sooty falcon	0.36	0.88	flapping	11.3
Ciconia ciconia	White Stork	1.02	1.65	gliding	16.0

There are advantages and disadvantages of conducting a CRM in autumn with such a low amount of data. The table below shows the number of birds at collision height of 200 m according to the last wind turbine planning. The two most abundant species (H. Buzzard and G. White Pelican) have statistically equal frequencies with 50% of birds at risk and 50% at non-risk height (non-significant Chi-square tests). It is related to the species passing in lower numbers for which the heights were mostly at risk.

The purpose of this modelled hypothetical scenario was to generate an upper bound collision risk estimate or "worst case" scenario. Published and validated Ars are not available for several of the species, yet the AR parameter is well-known to be a very important parameter in Band CRM analysis, with outcomes very sensitive to slight variations (Cook et. al, 2012). For each species included within the CRM analysis, we developed a "most realistic" AR parameter value, bounded by a "conservative" low parameter estimate (95%), and a high estimate (99.9%), reflecting an upper bound, based on a comprehensive review of available literature. Considering these two boundaries, we cover all extent of avoidance rates considered in the literature.

The flight duration of the target species was recorded to the nearest 15-second interval. Estimate of the bird's flight height above ground level at the point of first detection and thereafter at 15-second intervals, where heights were classified flight based on turbine specifications and to be at least divided into two classes; at collision risk and above collision risk. Although at the time of the undertaking of the survey the specifications of turbines were not finalized, the scenarios proposed all present a small area below collision risk, while above collision risk is 200m. The table below shows the percentage of records at risk height for each species plus the time such flights were at risk height. Data were recorded during the three seasons considering the tip height of the turbine being 200m.

Table 65: Observational data from the VP surveys used to derive bird density inputs for the autumn CRM analysis. For all species shows the percentage and time of flights at risk height.

Species	No risk	Risk200	% risk	Total	
Black Kite	4	8	66.67%	12	
European Honey Buzzard	149	181	54.85%	330	

Great White Pelican	100	100	50.00%	200	
Lanner Falcon	-	1	100.00%	1	
Long-legged Buzzard	-	5	100.00%	5	
Montagu's Harrier	-	1	100.00%	1	
Pallid Harrier	1	5	83.33%	6	
Short-toed Snake Eagle	-	1	100.00%	1	
Sooty Falcon	1	4	80.00%	5	
Steppe Buzzard	-	4	100.00%	4	
Western Marsh Harrier	-	2	100.00%	2	
White Stork	1	-	0.00%	1	
Totals	**256**	**312**	**54.91%**	**569**	

The table below shows the estimated results of the CRM for the autumn season for the three avoidance rates considered. The outcomes were scaled as done for the spring data and classified as high (red colour), medium (yellow), low (green), and negligible (none) risk. The two most potentially affected species are the Honey Buzzard and the Great White Pelican.

Table 66: Estimated number of fatalities according to the CRM for autumn 2021 for wind turbines of 200 m tip height

Species	Avoidance 99.5%	Avoidance 98%	Avoidance 95%
Black Kite	0	0	1
European Honey Buzzard	2	7	19
Great White Pelican	1	5	12
Lanner Falcon	0	0	0
Long-legged Buzzard	0	0	0
Montagu's Harrier	0	0	0
Pallid Harrier	0	0	0
Short-toed Snake Eagle	0	0	0
Sooty Falcon	0	0	0
Steppe Buzzard	0	0	0
Western Marsh Harrier	0	0	0
White Stork	0	0	0

(i) Sensitivity of the Project Site

The baseline assessments have recorded high numbers of migratory soaring birds over the Project site and its vicinity. Some of those recorded species have an important status on the international or national levels. The baseline assessment concludes that the site is considered within a highly sensitive area in terms of avifauna. Additionally, the Project site is considered to be located along an intensive migration route. Taking all of the above into account, the receiving environment is considered of high sensitivity.

(ii) Magnitude of the Impact

The collision risk model (CRM) assessment data in the tables above are helpful for assessing impacts. The results suggest:

- In general, collision risk to all species is significantly lower in the autumn compared with the spring migration period.

- For the majority of MSBs passing through the project site airspace during spring and autumn migration, the risk of collision is low or zero.
- Most species had low or zero predicted collision rates when assessed either seasonally or annually. Six species had higher CRM estimates (Steppe Buzzard, European Honey-buzzard, Black Kite, Greater White Pelican, Steppe Eagle).
- Based on the predicted seasonal and annual collision rate estimates, two species have the potential to be substantially impacted by the project: Honey Buzzard and Steppe Buzzard. The impacts for both species are likely to be greatest during spring migration without mitigation. In the autumn season, impacts are of lower risk.
- Six globally threatened MSBs pass through the project airspace. These are Steppe Eagle and Egyptian Vulture, (IUCN – Endangered), Eastern Imperial Eagle, Sooty Falcon, Greater Spotted Eagle (IUCN – Vulnerable) and Pallid Harrier (IUCN-Near Threatened). All these species had a very low predicted collision rate (around 1) with the lowest avoidance rates (95%) with the exception of the Steppe Eagle.

The CRM estimates indicate that for most MSB species including those globally threatened or near-threatened the impacts are likely to be low, however uncertainty relating to migration activity between years may mean that impacts could be higher and, in some cases, reach or exceed acceptable thresholds. Overall, there is potential for a noticeable change to occur and acceptable limits are likely to be breached for non-threatened species but not for the majority of MSBs, therefore the assessment concludes medium magnitude of impact

Based on the above, the impact significance for the wind power project is assessed as Moderate, based on a high receptor sensitivity and a medium magnitude of effect.

Residual Impacts

The Project will need to implement comprehensive turbine shutdown on demand and associated flight activity monitoring programs to mitigate turbine collision risk and identify and respond to emerging risks. The shutdown program will need to have the capacity to implement extended shutdown in response to predicted high migration intensity and/or environmental conditions that may lead to elevated risk situations. This type of shutdown will need to be implemented until the high collision risk situation has abated. Comprehensive and systematic fatality monitoring around turbines will be required to provide feedback on shutdown efficacy and as a trigger for adjusting the scale of shutdown required. Provided these measures are implemented to Good International Industry standards, evidence from operational wind projects in the Gulf of Suez operating this level of mitigation suggests that the significance of residual impact can be reduced to not significant

The following identifies the mitigation and monitoring measures to be applied during operation phase. Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Mitigation and Monitoring Measures

(i) Site Specific Design Requirements

As discussed within "Section 6.1" earlier the Strategic Environmental and Social Impact Assessment was undertaken for the 300km^2 area identified specific requirements for site constraints related to avifauna. This included requirements such as the below:

- Avoid continuous lighting of turbines. Use minimum number of intermittent flashing lights in accordance with civil aviation authority requirements

- Paint turbine blades to increase blade visibility by using blades with black and white aviation markings
- Adhere to a buffer area of 1km from any adjacent wind farms that is parallel to the bird migration pattern
- Minimum distances between wind turbines to be not less than 3 x 12 rotor-diameter to provide corridors for bird migration;
- Restrict turbine height to a maximum total tip height of 120 m (as collision risk increases with height);
- Avoid turbines with lattice towers in order to reduce suitable perching sites;
- Utilize underground electricity cables. If the use of overhead lines cannot be avoided (e.g. 220 kV OHL), such overhead lines should be designed according to the guidelines "Protecting birds from power-lines, Nature and environment No. 140, Council of Europe Publishing"; and
- Analogous measures should be applied at any substation to be built in that area.

However, EEAA have now approved the development of 200m turbines within the GoS where the above conditions have been revised. Such conditions are now typically included within the environmental permit issued for each Project. Therefore, for this project such site-specific requirements are expected to be identified once the ESIA is submitted to EEAA and the environmental permit is issued. Based on the consultant's experience from other projects, this is expected to include the following which the current layout already meets:

- Minimum distances between wind turbines to be not less than 2.5 × rotor-diameter;
- Adhere to a buffer area of 7 × rotor-diameter between turbine rows;

(ii) Barrier Effect Study

It is recommended that RCREEE undertake at the cumulative level for all wind farms within the GoS region a barrier effect study. The study should assess potential impacts of wind farms as disruptive barriers to the migration route at the cumulative level within the GoS region and identify any additional mitigation measures to be considered. This could include for example spacing/buffer requirements between wind farms. The study should take into account the Project and all surrounding wind farms and the variations in the turbine heights of such projects. The study should be undertaken once all wind farms have confirmed their turbine specifications – please refer to "Section 8.16" for full list of wind farm projects within the GoS region.

(iii) Avi-Fauna Monitoring and On-Demand Turbine Shutdown

Good International Industry Practice standard shutdown on demand and bird monitoring study protocol will be designed and implemented by the Project informed by baseline bird data and the results of similar monitoring at GoS wind projects.

Monitoring during the operation of the wind farm must be completed in order to inform the actual impact caused by the wind farm on resident and migratory birds – known as Active Turbine Management Plan (ATMP). The monitoring must be undertaken with the primary objective of collision avoidance but also secondary for migration monitoring behaviour.

Monitoring will be undertaken during the migration seasons. The start and end of the monitoring period will be agreed with the ATMP Technical Committee[8] prior to commencement of each migration season. Based on current information, monitoring must take place during the spring migration season (from 20 February until 15

[8] This includes members from RCREEE, EEAA, and EETC

May) and autumn migration season (from 10 August till 15 November). Throughout these periods, monitoring must take place continuously on a daily basis.

RCREEE developed an ATMP protocol that describes the shutdown criteria and protocol, communications protocol, timing of operation (seasonal and daily), number of vantage points, equipment used (optical and communications), and other as applicable.

(iv) Avi-Fauna Carcass Search during Operation

A Good International Industry Practice standard post-construction fatality monitoring (PCFM) program (including bias correction trials) will be designed and implemented.

The PCFM program will assess the effectiveness of shutdown mitigation measures and allow the annual number of bird turbine collision fatalities to be estimated.

PCFM reporting, including fatality rate estimate analysis will be 6-monthy, Additionally, a comparative assessment between the fatality monitoring results and the outcomes of the pre-construction ESIA CRM will be provided annually.

8.7 Bats

This section identifies the anticipated impacts on bats from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

8.7.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the EPC Contractor for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, such activities would likely result in the alteration of the site's habitat and thus potentially impacts bats; particularly through loss of hunting habitats for bats as well as roosting sites.

However, such impacts on bats created during the construction phase would of a long-term duration as they would result in a permanent change in the natural biodiversity of the site. However, such impacts are expected to be of negative nature, low magnitude, and low sensitivity and therefore not significant due to the reasons provided below.

- Based on literature review all bat species that are expected within the Project area are considered of Least Concern according to IUCN Red List of Threatened Species.
- The Project site being a feeding ground for bats (which in turn relates to bat activity) is expected to be minimal and insignificant given that the very low nocturnal insect activity due to the arid nature of the Project site and very low vegetation coverage.
- Based on preliminary visits of the Project area it does not seem to support any roosting sites for bats.

Taking the above into account, no mitigation measures are expected to be required.

8.7.2 Potential Impacts during the Operation Phase

The potential impacts from the Project during operation are mainly related to risk of bat strikes and collisions with rotors of the operating wind turbines.

Many reports have corroborated the findings of bat collisions with wind turbines; this includes reports in Germany (Dürr 2001; Trapp *et al.* 2002; Dürr & Bach 2004), Sweden (Ahlén, 2002) and Spain (Alcalde, 2003). Evidences that turbines do not only kill bats from local populations but also from populations at far distance were established (Voigt *et al*., 2012).

In addition, in reference to EUROBATS Guidelines for Considerations on Bats in Wind Farm Projects (Rodrigues et al, 2014), some of the species that are listed to have their distribution range in the Project area and its vicinity are documented to be vulnerable to collisions with wind turbines. For instance, *Pipistrellus spp.* are known to be at high risk of collision from wind turbines. The literature shows that two species of the genus have their distribution range in the area; *Pipstrellus kuhlii* and *P. rueppellii*. Also, *Eptesicus spp.* of which *Eptesicus bottae* is documented to be recorded in the area, are known to be of medium risk to collision with wind turbines. None of the species listed in the literature review are known to have low risk of collision with wind turbines. In fact, all remaining seven species' vulnerability to collision with wind turbines is unknown.

Such impacts are anticipated to be of a long-term duration as negative nature, medium magnitude, and low sensitivity and therefore of minor significance due to the reasons provided below.

- Risk of collision of bats could potentially entail impacts on population on the species during specific periods of the year, mainly in spring season. However, based on literature review all bat species that are expected within the Project area are considered of Least Concern according to IUCN Red List of Threatened Species.
- The Project site being a feeding ground for bats (which in turn relates to bat activity) is expected to be minimal and insignificant given that the very low nocturnal insect activity due to the arid nature of the Project site and very low vegetation coverage.
- Based on visits of the Project area it does not seem to support any roosting sites for bats.

Mitigation and Monitoring Measures

- Developer will be required to undertake at height bat acoustic surveys for one (1) year during first or second year of operations to verify outcomes above. Such acoustic surveys will be done at the met masts and should be undertaken by a third-party entity with experience in bat assessments and studies.
- To verify the outcomes above, as part of the Carcass Search Surveys and program to be undertaken (refer to "Section 8.6" earlier), this should cover bats as well. Based on the outcomes of the program above, if the results present any key outcomes, then additional management measures should be determined as appropriate and based on the outcomes of the carcass search survey program.

8.8 Archaeology and Cultural Heritage

This section identifies the anticipated impacts on archaeology and cultural heritage from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

It is important to note that there are no anticipated impacts during the operational phase of the Project.

8.8.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the EPC Contractor for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Although such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal, if such activities are improperly managed, they could damage or disturb archaeological remains present on the surface of the Project site. However, the archaeological baseline assessment discussed earlier concludes that there are no archaeological sites or remains within the Project site. Therefore, there are no anticipated impacts from the Project on surface archaeological remains within the Project site.

In addition, there is a chance that throughout such construction activities, archaeological remains buried in the ground are discovered. Improper management (if such sites are discovered) could potentially disturb or damage such sites which could potentially be of importance. Such potential impacts are of a short-term duration as they are limited to the construction phase, and are irreversible as should sites be discovered then inappropriate management could result in disturbance and/or damage, in which such an impact would be of medium magnitude. The impacts will be of a negative nature and low sensitivity given that the likelihood of such impacts is considered low. Given all of the above, such an impact is considered to be of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the EPC Contractor during the construction phase and which include:

- As required by the, during excavation activities, SCA must be notified to check if they will provide any observers to oversee the process and ensure that no underground archaeological remains of importance are unearthed and/or disturbed.
- Throughout the construction phase, and as the case with any Project development that entails such construction activities, there is a chance that potential archaeological remains in the ground might be discovered. It is expected that appropriate measures for such chance find procedures are implemented. Those mainly require that construction activities be halted and the area fenced along with proper signage, while immediately notifying the Ministry of Tourism and Antiquities/Red Sea and Suez Antiquities Inspection Office. No additional work will be allowed before the Ministry/Inspection Office assesses the found potential archaeological site and grants a clearance to resume the work. Construction activities can continue at other parts of the site if no potential archaeological remains were found. If found, same procedures above apply.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm EPC Contractors during the construction phase and which include:

- Submission of formal letter of communication with SCA; and
- For chance find procedure, inspection of actions taken in case of new discoveries, including fencing, limiting access to site, and contacting the Ministry of Tourism and Antiquities/ Red Sea and Suez Antiquities Inspection Office. Report should be prepared and submitted to the Ministry in such a case which details the above.

8.9 Air Quality and Noise

This section identifies the anticipated impacts on air quality and noise from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

8.9.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the EPC Contractor for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Although such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, such activities will likely result in an increased level of dust and particulate matter emissions, which in turn will directly and temporarily impact ambient air quality. If improperly managed, there is a risk of nuisance and health effects to construction workers onsite and to a lesser extent to the nearby surrounding receptors from windblown dust (such as nearby petroleum activities). In addition, construction activities will likely entail the use of vehicles, machinery and equipment (such as generators, compressors, etc.) which are expected to be a source of other pollutant emissions (such as SO_2, NO_2, etc.) which would also have minimal direct impacts on ambient air quality.

In addition, all the above activities will likely include the use of machinery and equipment such as generators, hammers, compressors, etc. and which are expected to be a source of noise and vibration generation within the Project site and its surroundings. If improperly managed, there is risk of nuisance and health affects to construction workers onsite and to a lesser extent to the nearby surrounding receptors (such as nearby petroleum activities).

However, it is important to note that there are no key receptors that are anticipated to be impacted from dust, noise and emission given that the closest receptor / community settlement to the Project site is Ras Gharib city and which is located 18km to the east.

The above impacts are anticipated to be temporary and of short-term nature as they are limited to the construction period only. Such impacts are of a negative nature, and will be noticeable and therefore of medium magnitude. However, the impacts will be dispersed and are reversible as air quality would revert back to baseline conditions after construction works is completed and thus the receiving environment is considered of low sensitivity. Given the above such an impact is considered of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the EPC Contractor during the construction phase:

- If dust or pollutant emissions were found to be excessive due to construction activities, the source of such emissions should be identified and adequate control measures must be implemented;
- Comply with the Occupational Safety and Health Administration (OSHA) requirements and the Egyptian Codes to ensure that for activities associated with high dust and noise levels, workers are equipped with proper Personal Protective Equipment (e.g. masks, eye goggles, breathing masks, ear muffs, etc.);
- Apply basic dust control and suppression measures which could include:
  - Regular watering of roads for dust suppression;

- Proper planning of dust causing activities to take place simultaneously in order to reduce the dust incidents over the construction period.
- Proper management of stockpiles and excavated material (e.g. watering, containment, covering, bundling).
- Proper covering of trucks transporting aggregates and fine materials (e.g. through the use of tarpaulin).
- Adhering to a speed limit of 15km/h for trucks on the construction site.

- Develop a regular inspection and scheduled maintenance program for vehicles, machinery, and equipment to be used throughout the construction phase for early detection of issue to avoid unnecessary pollutant and noise emissions.
- Based on inspections and visual monitoring undertaken, if noise levels were found to be excessive from construction activities, the source of such excessive noise levels should be identified and adequate control measures must be implemented; and
- Apply adequate general noise suppressing measures. This could include the use of well-maintained mufflers and noise suppressants for high noise generating equipment and machinery, developing a regular maintenance schedule of all vehicles, machinery, and equipment for early detection of issues to avoid unnecessary elevated noise level, etc.

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the EPC Contractor during the construction phase and which include:

- Dust and noise monitoring should be undertaken on a quarterly basis during the construction phase at key points where active construction activities are undertaken. The monitoring should include TSP, PM10 and PM2.5 and noise levels.
- Periodic inspections should be conducted at nearby sites (e.g. such as nearby petroleum activities) to determine whether harmful levels of dust and noise from construction activities exist; and
- Reporting of any excessive levels of pollutants/dust or noise and the measures taken to minimize the impact and prevent it from occurring again.

8.9.2 Potential Impacts during the Operation Phase

The main foreseen impacts during the operation phase are that related to the noise generated from the operating wind turbines and its potential impact on the health and safety of the nearby surrounding receptors. Given that such impacts are directly related to public health and safety, such impacts have been discussed in details in “Section 8.13 Public Health and Safety” along with other relevant impacts such as shadow flicker.

8.10 Infrastructure and Utilities

This section identifies the anticipated impacts on infrastructure and utilities from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

8.10.1 Potential Impacts on Road Networks during the Planning and Construction Phase

Wind turbines are manufactured in factories and transported to the installation site where they are assembled. Wind turbine components have big dimensions and weight and their transport poses a challenge to the existing roads and infrastructure. The Project's wind turbine blades have a length of around 90m and are usually transported in one piece. Tower components can have a transport height of up to 5m. Nacelles are also usually transported in one piece and can have a weight of more than 70 tonnes.

Components for wind energy projects are usually transported by sea from the manufacturing country to the country of installation and are then loaded in existing ports to trucks which manoeuvre their way through existing roads to the installation site.

Given the increasing size, weight, and length of components of the wind turbines, proper transportation and logistical solutions could be required for managing the heavy-load long-haul requirements. If improperly planned and managed, the trucks hauling the various heavy Project components may damage the existing roads, highways and bridges, utility lines (e.g. electricity lines), and could also be a public safety concern for other vehicles on the road.

Taking all of the above into account, the anticipated impacts on road networks are considered of short-term duration during the Project construction phase. Such impacts are of a negative nature, and if such impacts are improperly managed, then they are expected to be of high magnitude and medium sensitivity. Given the above impact is considered of moderate significance.

Mitigation Measures

It is recommended that EPC Contractor develop a Traffic and Transport Plan before commencement of any transportation activities to ensure that the transportation process is properly and adequately managed and does not pose a risk of damage to the existing roads, highways, overpasses whilst ensuring public safety. The Plan must analyse and study the entire route for transportation of the Project components from the port till the Project site. The assessment must take into account worst case scenarios for transportation of Project components for blade lengths, tower sections, etc. The study must investigate any constraints which need to be considered along the highways leading to the Project site such as bridges, overhead utility cables, slants in roads, etc. and identify accommodations which need to be taken into account (bypasses, adjustments to roads, etc.)

The Plan must take into account the following:

- The Plan must be developed in accordance with relevant local traffic and transportation legislations related to traffic loads and weights, dimensions, speed limits, etc.
- The plan must consider, to the extent possible, the proper planning of generated trips of trucks to ensure they are spread over the course of a work day and hours of day, and which also take into account peak and non-peak commute hours on the highway;
- As part of the Plan, the EPC Contractor must establish coordination with relevant entity to take into account any specific requirements that should be considered and ensure they are aware of the transportation requirements and details related to the Project.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the EPC Contractor during the construction phase and which include:

- Submission of Traffic and Transport Plan with proof of coordination with the authorities discussed above

for works required as part of the Study.

- Submission of proof of coordination with relevant entities

8.10.2 Potential Impacts on Civil and Military Aviation during the Planning and Construction Phase

Any tall structure could impact aircraft safety if located near airports or known flight paths. In addition, such structures could potentially interfere with certain electromagnetic transmissions associated with air transport, for example primary radar and secondary surveillance radar. Wind turbines have the potential to impact the surveillance systems used to detect and identify aircraft approaching, overlying or leaving Egyptian airspace and for which a Recognized Air Picture (RAP) is produced.

Inappropriate management of planning activities and site locations (e.g. siting of turbines) and construction activities (e.g. excavations) could disturb such aviation practices.

Such issues are generally managed through appropriate setback distances (if applicable) and in addition, regulatory authorities generally include requirements for wind farm developments related to visibility of turbines to include navigational lights and blade paintings

Nevertheless, if such issues are improperly managed and not taken into account as part of the planning phase, they could affect aircraft safety. Therefore, such impacts are considered of long-term duration, of negative nature, and of low magnitude given impact is related to inappropriate management of activities, however given its importance it is considered if high sensitivity. Given all of the above, the impact is considered of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Developer during the planning phase and which include:

- Establish coordination with NREA to ensure that the clearance that has been provided by the Ministry of Defence for the area includes in particular approvals from civil and military aviation entities. In addition, based on the that adhere to any specific navigational safety requirements (e.g. navigational lights, blade paintings, etc.)

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Developer during the construction phase and which include:

- Submission of formal non-objection letters from relevant entities

8.10.3 Potential Impacts on the Petroleum Facilities during Construction

As noted earlier, there is one (1) petroleum facility unit located within the Project area along with road networks connecting such unit. In addition, based on the requirements of the Coordination Agreement between NREA and General Petroleum Company, there are specific requirements to be considered for the detailed design of the Project.

Inappropriate management of planning activities (e.g. siting of turbines) and construction activities (e.g. excavations) could damage and/or disturb such facility.

Taking all of the above into account, the anticipated impacts are considered of short-term duration during the Project construction phase. Such impacts are of a negative nature, and if such impacts are improperly managed, then they are expected to be of medium magnitude and medium sensitivity due to their distance from the Project site. Given the above impact is considered of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Developer during the planning phase:

- Establish coordination via NREA with the General Petroleum Company's head office in Cairo to discuss and determine any specific requirements to be taken into account for the detailed design of the Project as well as coordination agreement requirement during the construction and operation phase (e.g. avoidance of such areas, buffer distances to be considered, etc.)

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Developer during the planning phase and which include:

- Submission of proof of coordination with relevant entities

8.10.4 Potential Impacts on Water Resources during Construction and Operation

It is expected that the Project throughout the construction and operation phase will require water for potable usage (drinking, showering, etc.) and non-potable usage (e.g. cleaning of machinery and vehicles).

The Project is expected to require around 27,000m^3 throughout the construction phase (for a total duration of 18 months) – equivalent to around 50m^3/day. This will include around 19,000m^3 for construction requirements (concrete works, minimize dust, cleaning of requirements, etc.) as well as 9,000m^3 as potable water requirements (drinking, washing, etc.).

Similarly, during the operation phase, water will mainly be required for potable use of onsite staff at the Wind farm. Nevertheless, such requirements are expected to be minimal and insignificant.

As discussed earlier, based on consultations with Ras Gharib Water Company there are no existing or planned water connections to the Project area. Water will be supplied through water trucks and tankers from Ras Gharib and stored onsite through water tanks.

Based on the above it is clear that the water requirements for the Project during construction and operation are unlikely to entail any constraints on the existing users. However, the involved entities are required to coordinate with Ras Gharib Water Company to secure water requirements for the Project most likely through tankers.

Taking all of the above into account, the anticipated impacts on the local water resources and utilities are considered of short-term duration during the Project construction phase and of long-term duration during the operation phase. Such impacts are of a negative nature, and are expected to be of low magnitude and of low sensitivity given the temporary nature of such impacts during construction and minimal water requirements of the Project during operation. To this extent, the impact is considered not significant.

Additional Requirements

The following identifies additional requirements to be applied by the EPC Contractor during the construction phase and Project Operator during the operation phase respectively and which include:

- Coordinate with the Ras Gharib Water Company to sector the water requirements of the Project.

8.10.5 Potential Impacts on Waste Utilities during Construction and Operation

The Project is expected to generate the following waste streams during the construction and operation phases:

- Wastewater during construction and operation to include black water (sewage water from toilets and sanitation facilities) and grey water (from sinks, showers, etc.) and industrial effluents (e.g. batching plants onsite). Wastewater during the construction phase from the Project can be assumed by taking into account an 80% wastewater generation factor for potable water requirements which will amount to around 8,000m3 throughout the construction phase. Wastewater generated from the Wind Farm during operation is expected to be minimal and insignificant. Wastewater will be stored onsite though enclosed septic tanks and collected by tankers from the Project to the closest WWTP.

- Solid waste during construction and operation from the Wind Farm will include construction waste (mainly during construction to include dirt, rocks, debris, etc.) as well as general municipal waste (such as food, paper, glass, bottles, plastic, etc.). Solid waste quantities generated are not expected to be significant and are likely to be easily handled by closest landfill facility.

  Solid waste quantities expected are around 0.5-1 tonnes daily for construction waste on average , while municipal waste is expected to be around 300kg per day at peak taking into account the daily per capita waste generation factor in Egypt (*1.25kg/capita/day*[9]) and number of 250 workers. During operation, this is only likely to include municipal waste at around 30kg per day for 24 workers.

- Hazardous waste during construction and operation from the Wind Farm will include routine waste generated from such activities to include spent oil, lubricants, paint cans, solvents, etc. Hazardous waste quantities generated are not expected to be significant and are likely to be easily handled by closest authorized facility.

  Hazardous waste quantities are expected to be around 10km per day only.

Taking all of the above into account, the anticipated impacts on waste utilities are considered of short-term duration during the Project construction phase and of long-term duration during the operation phase. Such impacts are of a negative nature, and are expected to be of low magnitude and of low sensitivity given the relatively minimal quantities generated and easy of management by relevant authorities. Given the above impact is considered not significant.

Additional Requirements

The following identifies the additional requirements to be applied by the EPC Contractor during the construction phase and Project Operator during the operation phase respectively and which include:

- Coordinate with the Ras Gharib Water Company and obtain list of authorized contractors for collection of wastewaters from the site to the Ras Gharib WWTP.

- Coordinate with the Ras Gharib City Council to hire a competent private contractor for the collection of solid waste from the site to the Ras Gharib Public Dumpsite.

- Coordinate with Environmental Management at Ras Gharib City Council to obtain list of authorized contractors for collection of hazardous waste from the site to the closest approved facility for final disposal.

[9] A smart framework for municipal solid waste collection management: A case study in Greater Cairo Region - ScienceDirect

8.10.6 Potential Impacts on Telecommunication and Television & Radio Links during the Planning and Construction Phase

Wind turbines during the construction and operation phase could impact telecommunication, TV and Radio infrastructure. For example, construction activities could damage/disturb underground communication cables (if present within the area), while rotating turbines during operation could disrupt Line of Sight (LoS) connections between telecommunication transmission towers.

Such issues are generally managed through appropriate setback distances (if applicable) from such infrastructure elements. Nevertheless, if such issues are improperly managed and not taken into account as part of the planning phase, they could affect such elements. Therefore, such impacts are considered of long-term duration, of negative nature, and of low magnitude given impact is related to inappropriate management of activities, however given its importance it is considered if high sensitivity. Given all of the above, the impact is considered of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Developer during the planning phase and which include:

- Establish coordination via NREA with NTRC to provide information on the Project (to include location and specifications of turbines in specific) and include any specific requirements to be considered as part of the detailed design to include setback distances if required for telecommunication, infrastructure (e.g. from LoS connections)

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Developer during the planning phase and which include:

- Submission of formal non-objection letter from NTRC

8.10.7 Potential Impacts on Nearby Wind Farms

As noted earlier, there are several operating and planned wind farm development Projects within the GoS area. Within the Project area, there is another existing and operational wind farm known as the RGWE Wind Energy (250MW). The Wind Farm is located around 3km to the south of the Project site.

Consultations were undertaken with the O&M Manager from RGWE whom indicated that there is an agreement with NREA that should be informed of any wind farm project to be developed in the area to agree on proper setback distance so that RGWE project is noted affected from a technical stand point of view.

Inappropriate management of planning activities (e.g. siting of turbines and proper buffer distance) could affect such nearby wind farms.

Taking all of the above into account, the anticipated impacts are considered of long-term duration during the operation phase. Such impacts are of a negative nature, and if such impacts are improperly managed, then they are expected to be of medium magnitude and medium sensitivity due to their distance from the Project site. Given the above impact is considered of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Developer / EPC Contractor during the planning phase:

- Further follow/communication with NREA to ensure if buffer distance of the Project from other nearby wind farm projects is considered sufficient and appropriate from a technical perspective

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Developer / EPC Contractor during the planning phase and which include:

- Submission of proof of coordination with relevant entities.

8.11 Occupational Health and Safety and Worker Accommodation

This section identifies the anticipated impacts from the Project throughout its various phases on occupational health and safety. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

This section presents the assessment of potential impacts on occupational health and safety collectively during the construction and operation phase for the wind farm, given that they are similar in nature during both phases.

Throughout the construction and operation phase there will be generic occupational health and safety risks to workers, as working onsite increases the risk of injury or death due to accidents. The following risks are generally associated with wind farm development projects:

- Slips and falls;
- Working at heights;
- Working with powered and hand-held tools;
- Struck-by objects;
- Moving machineries;
- Working in confined spaces and excavations;
- Exposure to chemicals, hazardous or flammable materials;
- Working in sunny conditions and high temperatures;
- Exposure to electric shocks and burns when touching live components;
- OHS risks from work with nearby operations to include in specific the oil rigs and petroleum storage facilities

Such impacts are considered of short-term duration during the construction phase and of long-term duration throughout the Project operation phase, of a negative nature, and are expected to be of medium magnitude and high sensitivity as in extreme cases they could entail permanent impacts (e.g. permanent disability). Nevertheless, such impacts are generally controlled through the implementation of general best practice. Given the above such an impact is considered of moderate significance.

Mitigation Measures

Occupational Health and Safety

It is expected that the EPC Contractor will prepare an Occupational Health and Safety Plan (OHSP) regarding the Project's construction, installation and commissioning works as well as the general construction site operations. In addition, the Project Operator is expected to develop an OHSP tailored to the Project's operation phase.

The objective of the OHSP is to ensure the health and safety of all personnel in order to concur and maintain a smooth and proper progress of work at the site and prevent accident which may injure personnel or damage property of the EPC Contractor and all involved sub-contractors, as well as the Project Operator.

The OHSP for the construction and operation phase should be Project and site specific and must take into account the national requirements mainly the Law 4/1994 and Law 12/2003 on Labour and Workforce Safety and Book V on Occupational Safety and Health (OSH) and Ministerial Decree 211/2003. In addition, it must also be compliant with the IFC PS2, EBRD PR 2 and World Bank's ESS 2 (Labour and Working Conditions) which recognize the importance of avoiding or mitigating adverse health and safety impacts on workers and require the development of a project-specific health and safety plan that is in accordance with Good International Industry Practice (GIIP).

In general, the OHSP should address the following components:

- Identify roles and responsibilities of the personnel involved within the Project to include the EHS manager, construction manager, supervisor, and other subcontractors' responsibilities;
- Identify in details information in relation to formulation of safety committees, communication protocols, first aid personnel and facilities, first aid training programs, occupational health and safety culture, quality system, reporting requirements, competence and job safety training, safety inspections, recruitment procedures, safety audits, risk assessment, etc.;
- Risk assessment, method statement, and job safety analysis procedure;
- permit to work procedure;
- Lock Out Tag Out Procedure;
- Identification of measures to be implemented onsite that ensure hazard elimination or substitution, followed by engineering control requirements.
- Identify in details the hazards which may be associated with various activities to take place and the various measures to be implemented to reduce such risks including the requirements for Personal Protective Equipment (PPE). This includes for example hand tools, access equipment, lifting equipment, mobile working equipment, etc.; and
- Establish training requirements for workers to comply with health and safety procedures and protective equipment.
- Include specific procedures and protocols related to COVID-19 risk to include but not limited to: (i) complying with the World Health Organization (WHO) requirements as well as local Ministry of Health requirements at that time; (ii) identification of requirements for daily temperature checks, provision of relevant PPE equipment (sanitizers, facemask, etc.) and undertaking COVID-19 testing at accredited institutions; (iii) undertake regular sanitization and disinfection arrangements of shared facilities; (iv) identification of requirements for self-isolation in case of suspected COVID-19 symptoms or direct contact with a person with a confirmed COVID-19 infection; (v) continues training and education on COVID-19 issues such as symptoms, procedures to be implemented, etc.
- Include specific procedures and protocols related to venomous species onsite to include but not limited to undertaking awareness sessions on potential presence of key species, measures to be undertaken in case they are found, ensuring medical resources are available to handle incident.
- Incident and investigation procedure.

The EPC Contractor and Project Operator are expected to adopt and implement the provisions of the OHSP throughout the Project construction and operation phase.

Emergency Preparedness and Response

The EPC Contract and Project Operator are also expected to prepare and implement an Emergency Preparedness and Response Plan for the Project construction and operation phase.

The objective is to establish a series of organizational, operational and preventive measures in the event of an emergency that are adapted to the circumstance of such situations, which in turn will ensure the safety of workers and property within the specific Project site. The plan should take into account the following:

- Inclusion of requirements for an emergency responder team that includes at a minimum first aiders and firefighters that receive appropriate and certified training
- Inclusion of requirements to undertake emergency drills in coordination with external emergency response services if required (e.g. civil defence, nearest hospital, etc.)
- Identify in detail of emergency procedures to be implemented to include first actions, alerting emergency contacts, site evacuation, communicating with external emergency services
- Identification in details of emergency control measures to include but not limited to: (i) fire (including fit for purpose firefighting equipment and PPE given potential electrical fires), (ii) personnel accidents, (iii) spillage, (iv) sandstorms, (iv) heats strokes, (v) war conflicts/security deterioration and other.
- Consider real time emergency communication using radios
- Identification of location of assembly points onsite
- Identification of emergency signs to be implemented onsite
- Identify roles and responsibilities for implementation of plan to include establishment of an emergency committee and assigning roles to an emergency manager

Worker Grievance Mechanism

The EPC Contract and Project Operator are also expected to prepare and implement a worker grievance mechanism for the Project construction and operation phase. The objective is to ensure a robust and comprehensive procedure to capture, document, resolve and close out any worker complaint, whether classified as grievances or not. The plan should take into account the following:

- Identification of a step-by-step process and guideline to ensure that every complaint/grievance made by workers are registered, documented and fully addressed
- The overall outline/structure of the grievance mechanism will be as follows:
  - Workers will be allowed to lodge grievances through various platforms and channels to include grievance boxes distributed onsite, telephone, face to face meetings with responsible personnel, workers representatives and unions. Contact details for all such channels will be identified and provided in detail.
  - Anonymous lodging of grievances will be allowed.
  - All grievances will be recorded and a case handler will be assigned and who will be determined at a later stage.

- All grievances will be handled in the shortest possible period. The first approach will be to inform the worker within the first 24 hours after receiving the grievance. The worker will be informed within 7 working days on whether or not the grievance proceeds and what the next steps will be.
- Once a resolution has been agreed or a decision made, the case handler will monitor the implementation of the response.
- After the implementation of an agreed resolution has been verified the grievance close-out will take place. It will entail reaching a unanimous agreement, clearly communicated to avoid misunderstandings.
- A close-out report will be prepared with evidence to support closure (e.g. photos).

Worker Accommodation

It is not clear at this point whether there will be any onsite accommodation for workers. Nevertheless, should the EPC Contractor opt for onsite accommodation unit for workers, it must conform to the national requirements. In addition, it should also confirm to international best practice requirements – this includes mainly the "Workers' accommodation: process and standards" (EBRD/IFC Guidance Note, 2009). The document provides guidance notes on general living facilities, room facilities, medical facilities, management of accommodation units, etc.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the EPC Contractor and Project Operator during the construction and operation phase:

- Inspection to ensure the implementation of the provisions of the Occupational Health and Safety Plan and assess compliance with its requirements;
- Regular Reporting on the health and safety performance onsite in addition to reporting of any accidents, incidents and/or emergencies and the measures undertaken in such cases to control the situation and prevent it from occurring again; and
- If applicable, inspection on workers accommodation to ensure its compliance with the requirements of "Instructions for Prevention of Health Nuisances from Workers Accommodation No. (1) For the year 2013" and "Workers' accommodation: process and standards" (EBRD/IFC Guidance Note, 2009).
- Submission of an Emergency Preparedness and Response plan
- Submission of a Worker Grievance Mechanism.

8.12 Human Rights

Inappropriate management of the workforce during both the construction and operation phase could entail several human right risks and violations by employing entities such as the EPC Contractor and Project Operator. This could include but not limited to engaging child workers, confiscation of passports of foreign workers, unsuitable working hours, and other.

The above impacts are anticipated to be of short-term nature during the construction period and long-term nature during the operation phase. Such impacts are of a negative nature, and inappropriate management of workforce could result in impacts that are of medium sensitivity and medium magnitude. Given the above such an impact is considered of minor significance.

Mitigation Measures

The EPC Contractor and Project Operator are required to develop and implement a Human Resources (HR) procedure for workers that should be guided by the Local Labour Law as well as the IFC PS 2 / EBRD PR 2 and ILO Fundamental Labour Conventions covering the following in particular:

- Providing reasonable working conditions and terms of employment to include but not limited to contract management, working hours, salaries/wages, annual and medical leaves, bereavement leaves, accommodation, etc.
- Recognizing workers' rights to form and to join workers' organizations and to bargain collectively
- Prohibition of child labour within the workforce
- Overall management of young workers within the labour force
- Prohibition of forced labour
- Non-discrimination throughout the entire work cycle in all its forms
- Providing equal opportunities for all throughout procurement and employment opportunities including women groups
- Overall management of daily workers, migrant workers and third-party workers

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the EPC Contractor and Project Operator:

- Undertake monthly inspections during construction and quarterly during operation against the developed HR procedure
- Submission of HR inspection report that identifies any corrective measures undertaken

Note

Other potential impacts on human rights includes potential for risks, particularly labor risks, in project supply chains. An assessment into the Project's supply chain risks is currently in progress and EBRD will disclose the outcomes (summary) when complete.

8.13 Public Health and Safety

This section identifies and assesses the anticipated impacts from the Project activities on public health and safety during the various phases to include planning and construction phase and operation phase. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

8.13.1 Potential Impacts from Noise from Wind Turbines during Operation

Wind turbines produce noise during operation from mechanical and aerodynamic sources. Mechanical noises are mainly limited from the machinery in the nacelle of the turbine (gearbox, generator, auxiliary equipment, etc.) while aerodynamic noise is generated from the movement of air around the turbine blades and tower.

Propagation of the sound from a turbine is primarily a function of distance, but it can also be affected by the placement of the turbine, surrounding terrain, and atmospheric conditions. In addition, noise levels depend greatly on the level of operation of the turbines (percentage of rated power). Nevertheless, in some cases, background/ambient sound already exceeds the sound produced by any wind turbine (e.g. high wind speeds, surrounding activities, etc.). In this case, the sound from the wind turbine blends into the background sound, simply becoming part of the present soundscape without the notice of residences.

As required by the IFC EHS Guideline for Wind Energy, the following is noted in relation to noise assessment for wind farms:

- Receptors should be chosen according to their environmental sensitivity (human, livestock, or wildlife).
- Preliminary modelling should be carried out to determine whether more detailed investigation is warranted. The preliminary modelling can be as simple as assuming hemispherical propagation (i.e., the radiation of sound, in all directions, from a source point). Preliminary modelling should focus on sensitive receptors within 2,000 meters (m) of any of the turbines in a wind energy facility.
- If the preliminary model suggests that turbine noise at all sensitive receptors is likely to be below an LA90 of 35 decibels (dB) (A) at a wind speed of 10 meters/second (m/s) at 10 m height during day and night times, then this preliminary modelling is likely to be sufficient to assess noise impact; otherwise, it is recommended that more detailed modelling be carried out, which may include background ambient noise measurements.

The IFC EHS Guideline for Wind Energy is based on the on "the Assessment and Rating of Noise from Wind Farms" (ETSU-R-97). ETSU can be regarded as relevant guidance on good practice, it contains a methodology for generating noise limits for a wind turbine and wind farms. ETSU-R-97 is referenced by the United Kingdom (UK) Government as a best practice guide for UK Legislation. The assessment procedure of ETSU-R-97 consists of the following steps for the screening assessment:

- Determine a study area;
- Identify potentially affected properties;
- Predict noise levels from all turbines (existing and proposed) and determine a noise contour boundary of 35dB(A);
- Identify if any noise sensitive receptors are within this boundary.

Taking the above requirements into account, a screening assessment was undertaken for the Project based on the following:

- Noise prediction calculations using SoundPLAN 8.2 software according to the International Organization for Standardization (ISO) 9613 'Acoustics – Attenuation of Sound During Propagation Outdoors' (International Organization for Standardization -ISO, 1996). ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources
- ISO 9613-2 calculates predicted noise levels with the major assumption that the sources are located upwind from the Noise Sensitive Receiver locations (NSR) as this is the worst-case scenario. Therefore, directivity and attenuation due to metrological factors such as wind speed and wind direction upwind from a source

are not taken into account

- Screening was based on a worst-case noise scenario (W10 = 10m/s) as required by the guidelines. As discussed in "Section 2.3" earlier, two (2) potential turbines are being considered at this point which include the following:

Table 67: Turbine and Noise Specifications

Manufacturer	Goldwind	Envision
Model type	GWH182 7.2 MW	EN182 7.8 MW
Rated Power	7,200 kW	7,800 kW
Rotor Diameter	182 m	182 m
Hub Height	110 m	110 m
Number of Turbines	228	26
Maximum Sound Power Level	111.9 dB(A)	111.2 dB(A)
Sound Power Level Uncertainty	± 1 dB(A)	± 2 dB(A)

- The Goldwind layout was selected for the assessment because it features a greater number of turbines and a higher maximum sound power level compared to the Envision layout. To ensure a comprehensive analysis, the uncertainty value of the Envision layout (+2) was incorporated into the assessment to account for a maximum worst case scenario.
- Determining the extent of the 35 dB(A) contour boundary emitted from the wind turbine generators (WTG)
- Determining if there are any noise sensitive receptors within the calculated contour boundary;
- Model calculation and parameter setting to include the following:

Table 68: Model Calculation and Parameter Setting

Model Parameter	Parameter Setting / Standard
Calculation Standard	(ISO) 9613 'Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Calculation Method' (ISO, 1996) Application as per IOA GPG
Wind Speed	10 m/s
Ground Absorption Coefficient	0.5
Receiver Height	10 m
Meteorological Data	Humidity 70% Air Pressure 1013.3 mbar T = 10ºC
Atmospheric Attenuation Coefficients (dB / km)	63Hz 125Hz 250Hz 500Hz 1kHz 2kHz 4kHz 8kHz 0.1 0.3 1.1 2.8 5.0 9.0 22.9 76.6

The study is based on the following information:

- General arrangement and layout drawings of the wind farm, including topography.
- Wind turbine supplier data (vendor noise data) as provided by the Developer
- Noise Sensitive Receiver locations (NSR) as identified in "Section 7.10" earlier. Review of identified receptors indicate that the nearest NSR is Ras Gharib City located 18km to the southeast. As discussed within the land use section (refer to "Section 7.2") it was concluded that the Project site in particular is uninhabited and vacant with no indication or evidence of any physical or economical land use activities. There are several ongoing activities related to infrastructure and utilities such petroleum activities within the surrounding areas (to include 4-5km radius from the site in particular) as well as empty/abandoned army units. *Therefore, such receptors are not considered key sensitive receptors*.

A noise contour map for the worst-case noise scenario has been calculated and is presented in the figure below. The map shows both contour lines and noise propagation level areas or 'zones'. The significance of the noise

contour map is to allow for an overview of noise levels over a geographic area and therefore allows a quick basic analysis of the noise propagation for identification of the specific NSR.

Table 69: Noise Contour Map Setup Specification

Parameter Description	Noise Map Parameter
Wind Speed (W10)	10 m/s
WTG Operation	Worst Case – All WTGs operating
Mapping Grid Resolution	25 x 25 m
Mapping Result Range	30 - 70 dB(A)

As noted in the figure below, according to the results of the preliminary model undertaken, the nearest NSR (Ras Gharib City) is outside of the LA90 of 35 decibels (dB) (A) at a wind speed of 10 meters/second (m/s) at 10 m as required by the Guidelines. Based on the results of the noise contour map the predicted contribution noise level at 10 m/s has been estimated at 20 dB(A).

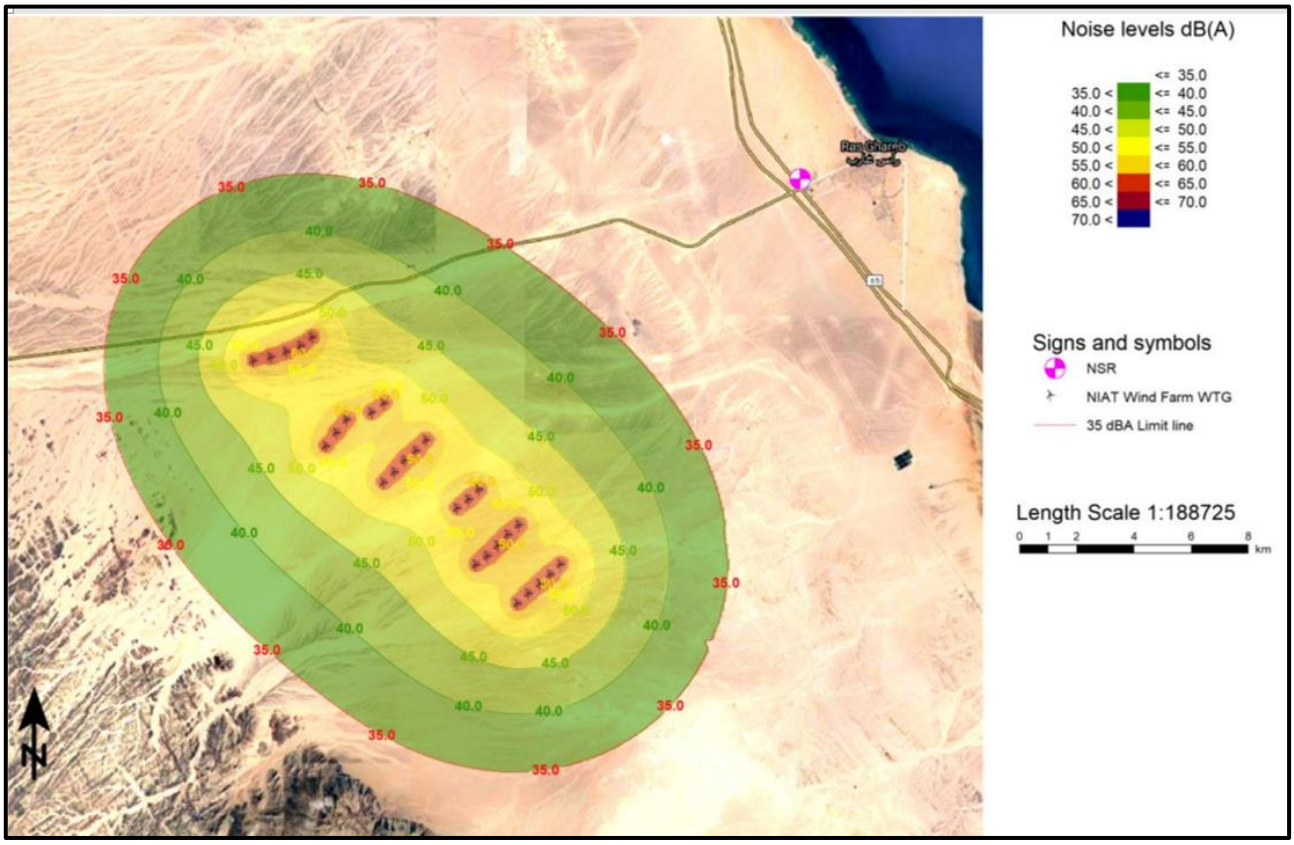

Figure 100: Noise Screening Assessment Results

Taking the above into account, such impacts are considered irrelevant and no detailed noise assessment is required.

8.13.2 Potential Impacts from Shadow Flicker from Wind Turbines during Operation

Shadow flicker occurs when the sun passes behind the wind turbine and casts a shadow several hundred meters away from the turbine's location. As the rotor blades rotate, shadows pass over the same point causing an effect known as 'shadow flicker'. Shadow flicker only occurs under specific environmental conditions which must also align for flicker to occur which include position and height of the sun, wind speed, direction, cloudiness, and position of the turbine to a sensitive receptor.

Excessive shadow flicker can be a source of nuisance and could create a disturbing indoor environment to the occupants of those buildings especially when casted through windows of buildings that directly face the turbine with no obstructions in sight (trees, hills, etc.).

A companion guide to Planning Policy Statement 22 (PPS22) (2004) and BERR (2007) indicates that shadow flicker is typically limited to occurring within approximately 10 rotor diameters of a wind turbine; at distances beyond 10 rotor diameters shadow flicker effects are essentially undetectable. Beyond this distance, the shadow is diffused such that the variation in light levels is not likely to be sufficient to cause annoyance. This is also acknowledged in the Queensland Wind Farm Planning Guidelines, which state that the first step in performing a shadow flicker assessment is to determine the extent of shadows from turbines and suggest a distance equivalent to 265 maximum blade chords (the thickest part of the blade) as an appropriate limit. This limit corresponds to around 800 m to 1,325 m for modern wind turbines, which typically have maximum blade chord lengths of 3 m to 5 m (AECOM, 2016). The maximum shadow flicker expected are likely to occur within 1,800m radius.

The IFC EHS Guideline for Wind Energy states that *where there are nearby receptors*, commercially available software can be used to model shadow flicker in order to identify the distance to which potential shadow flicker effects may extend.

Based on the above and the fact that the closest proposed sensitive receptor is located 18km from the Project; such impacts are considered irrelevant and no detailed shadow flicker modelling is required.

8.13.3 Potential Impacts from Trespassing of Unauthorised Personnel

Such impact is mainly related to public access of unauthorized personnel to the various Project components. Such access could result in safety issues such as unauthorized climbing of the turbine, safety hazards from substations (electric shock, thermal burn hazards, exposure to chemicals and hazardous materials, etc.), unauthorized climbing of the transmission tower and others.

Such impacts are considered of long-term duration throughout the Project operation phase, of a negative nature, and are expected to be of medium magnitude and high sensitivity given that it entails potential public safety concerns which in extreme cases they could entail permanent impacts (e.g. death or permanent disability). Given the above such an impact is considered of moderate significance.

Mitigation Measures

The following presents the mitigation measures that are to be implemented by the Project Operator during the operation phase of the Project and which include:

- A Security Risk Assessment should be developed for the Wind Farm Project and which takes into account the following:
  - Each turbine to be fitted with locked doors to prevent unauthorized access to the turbines;
  - Substation area to be completely fenced with concrete walls to prevent unauthorized access;
  - Onsite guards within the entire Project site at all times to ensure the safety and security of the Project as well as preventing unauthorized access to any of the Project components. However, it must be ensured that all onsite guards are adequately trained to deal with unauthorized trespassing incidents.
  - Post informative signs on the turbines and substation about public safety hazards and emergency contact information. Signs, especially warnings need to be pictorial as well as written to ensure they are understood by those unable to read

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to *not significant.*

Monitoring and Reporting Requirements

The following presents the mitigation measures that are to be implemented by the Project Operator during the operation phase of the Project and which include:

- Submission of Security Risk Assessment

8.13.4 Potential Impacts from Worker Influx during Construction

During construction the Project a relatively significant number of workers will be expected onsite (around 250 workers) for duration of approximately 18 months. However, as discussed earlier, at this point it is still unclear how many of these workers will be expatriates, Egyptians and/or from local communities and it is still unclear where accommodation of these works will take place.

Nevertheless, the influx of workforce to the area could result in certain community health, safety and security impacts which are discussed below.

Risk of Diseases

Influx of workers may introduce new reservoirs of diseases such as vector-related diseases, water-borne diseases, etc. In addition, there is also a risk of spreading communicable diseases, included sexually transmitted ones. The risk of catching or exchanging communicable diseases (e.g., Virus B, Virus C, and HIV/AIDS) and the lack of awareness on transmission disease can represent a high risk to workers and community health and safety. This could also include in particular risk from COVID-19.

Inappropriate Code of Conduct

Other risks from worker influx include inappropriate code of conduct by workers towards local communities which might result in hostilities and resentment. Such inappropriate conduct could include also disrespecting the traditional culture and social norms of the area and local communities.

Increase in Social Vices

Population influx could result in an increase of social vices including alcoholism, drug abuse, and other.

Such impacts are considered of short-term duration during the construction phase, of a negative nature, and are expected to be of medium magnitude and medium sensitivity. Given the above such an impact is considered of minor significance.

Mitigation Measures

The EPC Contractor is expected to prepare a worker influx plan to be implemented for the construction phase of the Project. The plan must take into account the following:

- Medical examination program. All workers must be subject to a preliminary medical examination before commencement of any job tasks in accordance with local applicable requirements. In addition, routine medical examination for workers (bi-annually) must be undertaken. Such medical examinations must be undertaken at certified centres. Copies of medical examination results of all workers must be retained onsite.

- Details and procedures for ensuring and maintaining hygienic conditions onsite at all times specifically related to toilet and washing facilities, eating areas, etc.

- Development of a code of conduct for workers which takes into account appropriate behaviour by workers at all times, religious customs, traditional cultures and social norms in the area. In addition, it must include

specifically requirements for social vices including gender-based violence, sexual harassment, alcoholism, drug abuse, etc.

- Induction training and awareness raising sessions on risks associated to the most common contagious diseases (e.g. influenza virus), communicable diseases, general measures for hygiene, code of conduct expected to be implemented and other as appropriate.
- COVID-19 procedures to be implemented onsite for the workforce (e.g. masks, disinfectants, etc.)

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the EPC Contractor:

- Submission of the Worker Influx Plan

8.13.5 Potential Impacts from Security Personnel

Inappropriate management of security issues and incidents by security personnel towards local communities could result in resentment, distrust and escalation of events. Such impacts are considered of short-term duration during the construction phase and long-term duration during the Project operation phase, of a negative nature, and are expected to be of medium magnitude and medium sensitivity. Given the above such an impact is considered of minor significance.

Mitigation Measures

The EPC Contractor and Project Operator are expected to prepare a Security Management Plan to be implemented for the construction and operation phase of the Project.

The plan must identify appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues. The plan must adhere to: (i) IFC PS 4 (Community Health, Safety and Security); and (ii) EBRD PR 2 (Labour and Working Conditions), all of which identify requirements for security personnel. This includes in specific requirements to ensure security personnel are guided by the Voluntary Principles on Security and Human Rights in terms of hiring, rules of conduct, training, equipping and monitoring of such personnel. They also require reasonable inquiries that those providing security measures are not implicated in past abuses, will ensure they are trained adequately in the use of force (and firearms if applicable) and appropriate conduct towards the workers and the local community. Force should only be used when strictly necessary, and to an extent proportional to the threat.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the EPC Contractor and Project Operator:

- Submission of the Security Management Plan

8.13.6 Potential Impacts from Blade and Tower Glint of Wind Turbines during Operation

Blade or tower glint occurs when the sun strikes a rotor blade or the tower at a particular orientation. This can impact a community, as the reflection of sunlight off the rotor blade may be angled toward nearby residences.

However, as discussed previously, there are no key sensitive receptors located within the surrounding area of the wind farm which could potentially be impacted by blade and tower glint. In addition, according to the IFC EHS Guidelines on Wind Energy (IFC, 2007), blade glint is a temporary phenomenon for new turbines only, and typically disappears when blades have been soiled after a few months of operation.

Taking all of the above into account, such impacts are considered of short-term duration as they will occur only temporary throughout the operation phase of the Project and of a negative nature. However, given that there are no sensitive receptors located within the surrounding areas and the only temporary occurrence (if occurring at all) such an impact is considered of low magnitude and low sensitivity. Given the above, such an impact is considered of not significant.

Mitigation Measures

The following presents the mitigation measures that are to be implemented by the Project Operator during the operation phase of the Project and which include:

- Consideration should be given to the use of non-reflective finishes to ensure potential impacts are not significant.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to *not significant*

Monitoring and Reporting Requirements

The following presents the mitigation measures that are to be implemented by the Project Operator during the construction phase of the Project and which include:

- Inspections and visual monitoring to ensure that non-reflective finishes have been used.

8.13.7 Potential Impacts from Blade/Ice Throws from Turbines during Operation

There are potential impacts from blade throws and ice throws from the wind turbines, where if such incidents occur, they could affect the public safety of nearby receptors.

According to the IFC EHS Guidelines on Wind Energy (IFC, 2015), a failure in the rotor blade can result in the 'throwing' of a rotor blade – however the overall risk of such an event is extremely low. In addition, if ice accretion occurs in blades, which can happen in certain weather conditions in cold climates, then pieces of ice can be thrown from the rotor during operation, or dropped if the turbine is idling. Ice throws are considered irrelevant given that in general the area does not experience any snow events.

The IFC EHS Guidelines on Wind Energy (IFC, 2015) states a setback distance should be applied between turbines and *populated locations*. The minimum setback distance is 1.5 x turbine height (tower + rotor radius), although modelling suggests that the theoretical blade throw distance can vary with the size, shape, weight, and speed of the blades, and the height of the turbine.

However, as discussed under "Section 7.1" earlier, there are no populated locations within the Project site and surrounding areas.

Taking all of the above into account, such impacts are considered of long-term duration as they will occur throughout the operation phase of the Project and of a negative nature. However, given that there are no sensitive receptors located within the surrounding areas and given that the risk is extremely low such an impact is considered of low magnitude and low sensitivity. Given the above, such an impact is considered of not significant.

Taking the above into account, there are no applicable mitigation or monitoring measures to be considered.

8.14 Socio-economics

This Section identifies the potential impacts in relation to socio-economic during the various Project phases. For each impact, a set of mitigation measures and monitoring requirements are identified.

Given the generic nature of the impacts on socio-economic development for both phases of the Wind Farm Project (construction and operation) those have been identified collectively throughout this section.

During the construction and operation phases of the Wind Farm, the Project is expected to create the following job opportunities:

- Around 250 job opportunities at peak during the construction phase for a duration of approximately 18 months. This will mainly include skilled job opportunities (to include engineers, technicians, consultants, surveyors, etc.) and unskilled job opportunities (mainly labourers but will also include a number of security personnel).
- Around 24 job opportunities during the operation phase for a duration of 20 years. This will include skilled job opportunities (such as engineers, technicians, administrative employees, etc.) and unskilled job opportunities (such as security personnel, drivers, etc.).

However, the contractors and operators have not been selected at this stage, and therefore there are no details available on the number of job opportunities targeted to local communities, type of jobs, duration, etc. In addition to the above, the local communities could also be engaged in procurement opportunities along different segments of the value chain such as local contractors, local supply of equipment and machinery, cleaning services, etc.

Taking the above into account, the Developer is committed to ensuring that priority for job opportunities and procurement activities where relevant are targeted to the local communities. The above could also entail other indirect positive benefits to the local community from increase in demand for local services, supplies, and businesses. This could include for example possible engagements for supplies and service providers (accommodation services, food, etc.). Such demands could improve the existing local economic activities and impact certain sectors, such as wholesale/retail trade.

Taking all of the above into account, this to some extent could contribute to enhancing the living environment for its inhabitants. The creation of job and procurement opportunities in specific is of crucial importance. However, it is understood that the socio-economic development of the area is not hinged on a single project but rather on implementing collective and coordinated actions, including other development projects and investment within the area.

Nevertheless, proper planning and local community engagement from the start is crucial to understand issues and opportunities which in turn would enable the Project build true sustainable links which will bring maximum benefits to the local communities. Given the above, such impacts are anticipated to be *positive*.

Recommendations and Required Action

As the impacts discussed are mainly positive, no mitigation measures have been identified. This section provides recommendations which aim to enhance such positive impacts anticipated from the Project throughout the construction and operation phases to the greatest extent possible.

- Local Recruitment Procedure: the EPC Contractor under supervision from the Developer should develop a Local Recruitment Procedure that must identify the number of job opportunities targeted for local communities to include skilled and unskilled workers, including Bedouin groups. Such job opportunities shall also take into account employment of local communities in the area around the project to include fresh graduate engineers, technicians, labourers, etc. In addition, the procedure must include details on how job

opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all including females. The Procedure should investigate the potential for implementation through a joint collaboration between the Developer/EPC Contractors and the other wind farm developers in the area. Prioritising employment from the community is considered a key issue and this should be reflected in the EPC Contract and subsequent subcontracts.

- Local Procurement Procedure: the EPC Contractor under supervision from the Developer should develop a Local Procurement Procedure that must identify the procurement opportunities targeted for local communities (including Bedouin groups) to include for example local subcontractors, local supplies and services, cleaning services, etc. In addition, the procedure must include details on how procurement opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all. The Procedure should investigate the potential for implementation through a joint collaboration between the Developer/EPC Contractors and the other wind farm developers in the area. Prioritising procurement opportunities from the community is considered a key issue and this should be reflected in the EPC Contract and subsequent subcontracts.
- Social Responsibility Program: it is recommended that the Developer implement a social responsibility program which aims to benefit the local communities to the greatest extent possible. In this case, a structured approach must be developed which must identify priority development projects which could benefit local communities (e.g. based on a needs assessment if available). Based on that the social responsibility program can prioritise projects for local communities based on available budget, vision, timeline for implementation and other factors.

8.15 Summary of Anticipated Impacts

The tables below present a summary of the anticipated impacts during the planning and construction and operation phase of the Project. The information in the tables includes:

- Key and generic environmental attributes (e.g. air quality, noise);
- Impact (textual description);
- Nature of impact (negative or positive);
- Duration (long-term or short-term);
- Reversibility (reversible or irreversible);
- Magnitude (high, medium, or low);
- Sensitivity (high, medium, or low);
- Significance (major, moderate, minor, or not significant);
- Management action – generally management actions describe whether an impact can be mitigated or not. Management actions include: (i) mitigation measures; (ii) compensation measures; (iii) additional requirements which must be implemented at a later stage and which could be required by a governmental entity; (iv) for positive impacts recommendations have been provided which aim to enhance the impact; and
- Residual significance after management actions is implemented (major, moderate, minor, or not significant)

Table 70: Summary of Anticipated Impacts during Planning and Construction

Attribute / Issue	Likely Impact – Planning and Construction Phase	Impact Assessment							
		Nature	Duration	Reversibility	Magnitude	Sensitivity	Significance	Management Action	Residual Significance
Landscape and Visual	Visual and landscape impacts due to presence of elements typical of a construction site such as equipment and machinery.	Negative	Short – Term	Reversible	Medium	Low	Minor	Mitigation Available	Not Significant
Land Use	Project could conflict the formal assigned land uses set by the various governmental entities.	There are no anticipated impacts.						No additional requirements	Not relevant
	There are several land uses onsite which if improperly managed could result in potential conflicts and disputes. This includes the Ghafra system of the Bedouin groups and existing nearby petroleum facilities.	Negative	Long – Term	Reversible	Medium	High	Moderate	Mitigation Available	Not Significant
Geology, Hydrology and hydrogeology	Potential for flood risks on the Project area.	Negative	Long – Term	Irreversible	Medium	High	Moderate	Mitigation Available	Minor
	Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater.	Negative	Long – Term	Could be irreversible	Medium	Low	Minor	Mitigation available	Not Significant
Biodiversity	Improper management of construction activities could disturb/damage habitats and fauna	Negative	Short – Term	Could be irreversible	Medium	Medium	Moderate	Mitigation available	Not Significant
Avi-Fauna (Birds)	Improper management of construction activities could disturb breeding birds and damage relevant habitats	Negative	Short – Term	Could be irreversible	Low	Medium	Minor	Mitigation Available	Not Significant
Bats	Improper management of construction activities could damage habitats and disturb species.	Negative	Long – Term	Could be irreversible	Low	Low	Not Significant	No Mitigation Required	Not Significant
Archaeology	Improper management of construction activities could disturb/damage archaeological remains which could be buried in the ground (if any).	Negative	Short – Term	Could be irreversible	Medium	Low	Minor	Mitigation Available	Not Significant
Air Quality and Noise	Construction activities will likely result in an increased level of dust, particulate matter and pollutant emissions which in turn will directly impact ambient air quality.	Negative	Short - Term	Reversible	Medium	Low	Minor	Mitigation Available	Not Significant
	Possible noise emissions to the environment from the construction activities which will likely include the use of machinery and equipment such as generators, hammers, and compressors and other activities	Negative	Short - Term	Reversible	Medium	Low	Minor	Mitigation Available	Not Significant
Infrastructure and Utilities	Road Networks – if transportation activities of the various project components to the site are not properly managed beforehand, they could entail risk of damage to the existing roads and could be of public safety concerns to other users on the road. In addition, if planning activities are not well managed it could damage/disturb existing onsite road networks.	Negative	Short - Term	Reversible	High	Medium	Moderate	Mitigation Available	Not Significant
	Civil and Military Aviation – Improper planning and site selection of the Project could impact aircraft safety and/or could potentially interfere with certain electromagnetic transmissions associated with air transport	Negative	Long – Term	Reversible	Low	High	Minor	Mitigation Available	Not Significant
	Petroleum Facilities – if planning activities are not well managed onsite it could damage/disturb existing the infrastructure of such facilities	Negative	Short – Term	Reversible	Medium	Medium	Minor	Mitigation Available	Not Significant
	Water Resources – water requirements of the Project could entail constraints on the existing resources and users.	Negative	Short - Term	Reversible	Low	Low	Not significant	Additional Requirements	Not Significant
	Waste Utilities – it is important to ensure that existing utilities would be able to handle the amount of waste, wastewater and hazardous generated from the Project during the construction phase.	Negative	Short - Term	Reversible	Low	Low	Not significant	Additional Requirements	Not Significant
	Telecommunication, and TV & Radio Links – Improper planning and site selection of the Project could potentially interfere with certain electromagnetic transmissions associated with telecommunications, and radio/television systems in the area.	Negative	Long- Term	Reversible	Low	High	Minor	Additional Requirements	Not Significant
Occupational Health and Safety	There will be some generic risks to workers health and safety from working on construction sites, as it increases the risk of injury or death due to accidents.	Negative	Short – Term	Could be Irreversible	Medium	Medium	Minor	Mitigation Available	Not Significant
Public Health and Safety	Public access of unauthorized personnel to the various Project components (turbines, substation) could result in various public safety hazards.	Negative	Long – term	Could be Irreversible	Medium	High	Moderate	Mitigation Available	Not Significant
	Worker influx could result in certain community health, safety and security impacts to include risk of diseases, inappropriate code of conduct by workers towards locals, increase in social vices, etc.	Negative	Short – Term	Reversible	Medium	Medium	Minor	Mitigation Available	Not Significant
	Inappropriate conduct of security personnel towards local communities could result in resentment, distrust and escalation of events	Negative	Short – Term	Reversible	Medium	Medium	Minor	Mitigation Available	Not Significant
Human Rights	Inappropriate management of the workforce could entail several human right risks and violations.	Negative	Short – Term	Reversible	Medium	Medium	Minor	Mitigation Available	Not Significant
Socio-economic Development	The Project is expected at a minimum to provide job opportunities for local communities. This, to some extent, could contribute to enhancing the living environment for its inhabitants, elevate their standards of living, and bring social and economic prosperity to local communities.	Positive	Not applicable.						

Table 71: Summary of Anticipated Impacts during Operation

Attribute / Issue	Likely Impact – Operation Phase	Impact Assessment							
		Nature	Duration	Reversibility	Magnitude	Sensitivity	Significance	Management Action	Residual Significance
Landscape and Visual	Visual impacts concern the turbines themselves (e.g. colour, height, and number of turbines) relating to their interaction with the character of the surrounding landscape.	Could be Negative or Positive	Long – Term	Reversible	Medium	Low	Minor	No mitigation required	Minor
Geology, Hydrology and Hydrogeology	Risk of soil and groundwater contamination during the various operational activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater.	Negative	Long – Term	Could be irreversible	Medium	Low	Minor	Mitigation available	Not significant
Biodiversity	Improper management of operation activities could disturb/damage habitats and fauna.	Negative	Long – Term	Could be irreversible	Medium	Low	Minor	Mitigation Available	Not Significant
Avi-Fauna (Birds)	Wind turbines are associated with impacts on birds from risks of strikes and collision on both migratory and resident soaring birds. Such impacts depend on several factors but could affect the population levels of certain species especially those with international/national critical conservation status.	Negative	Long – Term	Could be irreversible	Low – High	Medium	Moderate	Mitigation Available	Not Significant
Bats	The potential impacts from the Project during operation are mainly related to risk of bat strikes and collisions with rotors of the operating wind turbines.	Negative	Long – Term	Could be irreversible	Medium	Low	Minor	Mitigation Available / Additional Studies	Not Significant
Infrastructure and Utilities	Water Resources – water requirements of the Project could entail constraints on the existing resources and users.	Negative	Long - Term	Reversible	Low	Low	Not significant	Additional Requirements	Not Significant
	Waste Utilities – it is important to ensure that existing utilities would be able to handle the amount of waste, wastewater and hazardous generated from the Project during the construction phase.	Negative	Long – Term	Reversible	Low	Low	Not significant	Additional Requirements	Not Significant
Occupational Health and Safety	There will be some risks to workers health and safety during the operation and maintenance activities of the Project.	Negative	Long – Term	Could be irreversible	Medium	Medium	Minor	Mitigation Available	Not Significant
Public Health and Safety	Operating wind turbines will produce shadow flicker which could be a source of disturbance and nuisance to the receptors and could create a disturbing indoor environment.	There are no anticipated impacts.						No additional requirements.	Not relevant
	Public access of unauthorized personnel to the various Project components (turbines, substation) could result in various public safety hazards.	Negative	Long – term	Could be Irreversible	Medium	High	Moderate	Mitigation Available	Not Significant
	Inappropriate conduct of security personnel towards local communities could result in resentment, distrust and escalation of events	Negative	Short-term	Reversible	Medium	Medium	Minor	Mitigation Available	Not Significant
	Blade or tower glint can impact sensitive receptors as the reflection of sunlight off the rotor blade may be angled toward nearby receptors.	Negative	Short – Term	Reversible	Low	Low	Not Significant	Mitigation available	Not Significant
	Failure in rotor blade can result in the 'throwing' of the blade. Although overall risk of such events is extremely low, it could affect the public safety of nearby receptors.	Negative	Long – term	Could be Irreversible	Low	Low	Not Significant	Mitigation Available	Not Significant
Human Rights	Inappropriate management of the workforce could entail several human right risks and violations.	Negative	Long – Term	Reversible	Medium	Medium	Minor	Mitigation Available	Not Significant
Socio-economic Development	The Project is expected at a minimum to provide job opportunities for local communities. This, to some extent, could contribute to enhancing the living environment for its inhabitants, elevate their standards of living, and bring social and economic prosperity to local communities.	Positive	Not applicable						

8.16 Assessment of Cumulative Impact

As discussed earlier, currently an area of around 300km^2 in the GoS is being developed for multiple wind farm projects (in which the Project site is located). An Environmental and Social Impact Assessment for an Area of 300km^2 at the Gulf of Suez (Strategic ESIA) was undertaken. One of the objectives of the Strategic ESIA was to investigate the cumulative impacts of the wind farm developments and identify constraints to be taken into account by the various developers.

This section provides an assessment of cumulative impacts mainly based on the outcomes of the Strategic ESIA. The table below provides the key outcomes of the Strategic ESIA for each attribute, key outcomes of the project-specific ESIA and key additional requirements to be considered.

Table 72: Assessment of Cumulative Impacts

E&S Attributes	Outcomes of Strategic ESIA	Outcomes of Project Specific ESIA	Additional Requirements
Landscape and Visual	Key outcome of the Strategic ESIA is related to visibility of the turbines during operation. The Strategic ESIA concludes that due to absence of people living in the area and very few passengers passing through the area, such issues are not considered to be important. No additional requirements have been identified in the Strategic ESIA.	Key impact is related to visibility of the turbines during operation. No key issues of concern given that no key sensitive visual receptors which are anticipated to be impacted from the Project during operation were identified.	No additional requirements to be considered
Land Use	Key outcome is that the Strategic ESIA area is uninhabited and unutilized; therefore, there are no land use impacts related to physical or economical displacement. No additional requirements have been identified in the Strategic ESIA.	Key outcome is that Project site is uninhabited and vacant. However, Bedouin Bedouins apply a type of customary ownership on the area known as Urfi Contracts and Ghafra System – however, this is not an official process that is acknowledged by the Government.	Site-specific mitigation and monitoring requirement. Refer to "Section 8.3".
Geology, Hydrology, Hydrogeology	Key outcome of the Strategic ESIA is recommendation to avoid placing turbines within the beds of major wadi systems where there could be flood risks. In addition, the Strategic ESIA calls for earth roads crossing wadi beds to be built at the same level as the wadi bed to minimize serious damage in the event of flash floods and to avoid creating a bottleneck for discharge. In addition, the Strategic ESIA requires routine measures for waste management during construction and operation.	Flood risk assessment was undertaken for the Project site which identifies recommendation to be considered for the detailed design of the Project. There are routine impacts during construction and operation from improper waste management.	Site-specific mitigation and monitoring requirement for flood risks (refer to Section 8.4). Site-specific mitigation and monitoring requirement for waste management (refer to Section 8.4).

E&S Attributes	Outcomes of Strategic ESIA	Outcomes of Project Specific ESIA	Additional Requirements
Biodiversity	No major issues identified by the Strategic ESIA since the habitats of the area are considered to be of low or no importance. However, special consideration should be given to the globally threatened to the Egyptian Dabb Lizard Uromastyx aegyptia.	Site specific survey concludes that habitats of the area are considered to be of low or no importance. The Egyptian Dabb Lizard *Uromastyx aegyptia* burrows have been confirmed within the Project site. In addition, please refer to standalone Critical Habitat Assessment (CHA) and Cumulative Effects Assessment (CEA).	Site-specific mitigation and monitoring requirement. Refer to "Section 8.5".
Birds (avi-fauna)	Significant considerations were provided with the Strategic ESIA regarding impacts on avifauna, specifically during spring migration season while autumn migration was considered to be of low significance since species recorded were of least concern and were relatively low. Furthermore, the Strategic ESIA requires the implementation of a post-construction monitoring program for wind farms, which is critical for ensuring that the shutdown program achieves its objectives and determining whether additional measures are required to reduce or eliminate negative impacts.	Outcomes in general are similar to Strategic ESIA as the numbers of birds recorded were moderate during autumn and high during spring with the highest numbers being for species of low concern. In addition, please refer to standalone Critical Habitat Assessment (CHA) and Cumulative Effects Assessment (CEA).	Site-specific mitigation and monitoring requirements. Refer to "Section 8.6".
Bats	Bats were not considered specifically by the Strategic ESIA.	The literature review has shown that there are some species that could be of high vulnerability to collision with wind power infrastructures	Site-specific mitigation and monitoring requirements. Refer to "Section 8.7".
Archaeology and Cultural Heritage	There are no archaeological and cultural heritage sites within the Strategic ESIA studied area. No additional requirements have been identified for site-specific ESIA's or for developers.	There are no site-specific archaeology or cultural heritage remains. Therefore, there are no anticipated impacts during construction. There is routine chance find impacts related to the construction phase.	Site-specific mitigation and monitoring requirement. Refer to "Section 8.8".
Air Quality and Noise	Key outcome is that there are no key issues of concern identified within Strategic ESIA studied area due to absence of sensitive receptors which could be affected by air quality and dust during construction phase.	Site specific survey did not identify any key issues of concern.	Site-specific mitigation and monitoring requirement. Refer to "Section 8.9".

E&S Attributes	Outcomes of Strategic ESIA	Outcomes of Project Specific ESIA	Additional Requirements
Infrastructure and Utilities	Several infrastructure and utility elements were noted within the Strategic ESIA to include roads, electricity lines, oil exploitation facilities, military posts and other (no key issues of concern identified). Additionally, a waste dumpsite is identified to be within the Strategic ESIA area which requires removal.	Several infrastructure and utility elements have been identified to include roads, petroleum facilities, and other which require proper management measures.	Site-specific mitigation and monitoring requirement. Refer to "Section 8.10".
Occupational Health and Safety	No key issues of concern are noted. There are routine impacts during construction and operation on occupational health and safety and the Strategic ESIA identifies additional relevant measures to control such impacts.	No key issues of concern are noted. There are routine impacts during construction and operation on occupational health and safety.	Site-specific mitigation and monitoring requirement. Refer to "Section 8.10".
Public Health and Safety	Key issues include noise and shadow flicker. The Strategic ESIA concludes that due to large distance from any nearby settlement, there are no impacts related to noise and shadow flicker during operation of turbines. No additional requirements are identified in the Strategic ESIA.	ESIA does not identify any key issues related to shadow flicker. However, preliminary noise assessment indicates exceedance of noise levels at Ras Gharib. Additional study is required that considers cumulative impacts from other nearby wind farms as well.	Site-specific mitigation and monitoring requirement for other public health and safety concerns. Refer to "Section 8.13".
Socio-economics	Impacts anticipated are positive in nature.	Impacts anticipated are positive in nature.	Project specific recommendations to enhance positive impacts have been provided. Refer to "Section 8.14".

8.16.1 Cumulative Noise Effect from All Wind Farms in the Region

There are four existing wind farms and one additional proposed wind farm present in the surrounding area of the proposed Project location. Therefore, even during the screening assessment as undertaken in "Section 8.13", the assessment should consider all wind turbine noise emissions that have the potential to increase noise levels at noise sensitive receptors.

The key wind farms that could result in cumulative impacts are summarized below.

Amunet Wind Farm

Two potential wind farm designs were considered for this Project. One design consisting of 173 Siemens Gamesa wind turbines and one design consisting of 117 Vestas wind turbines. For the purpose of the cumulative assessment, the worst-case scenario design (Siemens Gamesa) shall be used in the model. The table below details the basic specifications.

Table 73: Amunet Wind Farm - Gamesa SG 2.9-114 CS Wind Turbine Generator Specification

Manufacturer	GAMESA
Model Type	2.9-114

Rated Power	2,900 kW
Rotor Diameter	114 m
Hub Height	63 m

Lekela Wind Farm

This project consists of 96 wind turbine generators, each of which also houses a Gamesa SG 2.6-114 IA wind turbine. The table below details the basic specifications.

Table 74: Lekela Wind Farm - Gamesa SG 2.6-114 CS Wind Turbine Generator Specification

Manufacturer	GAMESA
Model Type	2.6-114
Rated Power	2,625 kW
Rotor Diameter	114 m
Hub Height	63 m

RGWE 250MW Wind Farm

This project consists of 125 wind turbine generators, each of which houses a G97- 2.1 MW max power wind turbine. The table below details the basic specifications.

Table 75: RGWE 250MW Wind Farm - G97- 2.1MW MaxPower Wind Turbine Generator Specification

Manufacturer	GAMESA
Model Type	G97-2.1
Rated Power	2,100 kW
Rotor Diameter	97 m
Hub Height	71.5 m

RSWE 500MW Wind Farm

This project consists of 191 wind turbine generators, each of which houses a Gamesa SG 2.6-114 IA wind turbine. The table below details the basic specifications.

Table 76: RSWE 500MW Wind Farm - Gamesa SG 2.6-114 Wind Turbine Generator Specification

Manufacturer	GAMESA
Model Type	2.6-114
Rated Power	2,625 kW
Rotor Diameter	114 m
Hub Height	63 m

NIAT Wind Farm

This proposed project consists of 173 wind turbine generators, each of which will house one 3.05 MW Wind Turbine. The table below details the basic specifications.

Table 77: NIAT Wind Farm - Gamesa SG 2.6-114 Wind Turbine Generator Specification

Manufacturer	GAMESA
Model Type	2.6-114 (AM+4, 3.05MW)
Rated Power	3,050 kW

Rotor Diameter	114 m
Hub Height	63 m

8.16.2 Results of Cumulative Noise Effect from All Wind Farms in the Region

Noise contour maps for the worst-case noise scenario have been calculated for the cumulative assessments and is presented in the figure below. The map shows noise contour lines as well as the noise contour limit line of 35 dB(A).

As noted in the figure below, cumulatively the results of the preliminary model undertaken indicate that the nearest NSR (Ras Ghareb City) exceeds the limit of LA90 of 35 decibels (dB) (A) at a wind speed of 10 meters/second (m/s) at 10 m. Based on the results of the noise contour map the predicted contribution noise level cumulatively at 10 m/s has been estimated at 36.2 dB(A).

However, as discussed earlier, the IFC EHS Guidelines on Wind Energy recommends that modelling should focus on sensitive receptors within 2 km of the nearest wind turbine. The nearest NSR is located 6 km from nearest wind farm (that being NIAT wind farm). The NSR is located in the suburbs of Ras Ghareb, located within a junction of two main highways (Highway 65 and El-Shaikh Fadel).

Taking the above into account, noise from the wind turbines cumulatively is unlikely to be audible above the background noise level at this location. In addition, as discussed in “Section 8.13” it was concluded that noise levels from the Infinity Wind Farm are not contributing to the cumulative noise levels at the NSR. Therefore, there are no additional requirements for the Infinity Wind Farm Project.

However, other wind farms that are contributing to the noise exceedance will be required to undertake a 24-hour baseline noise survey to verify that background noise levels at this NSR are high enough to screen potential wind turbine noise.

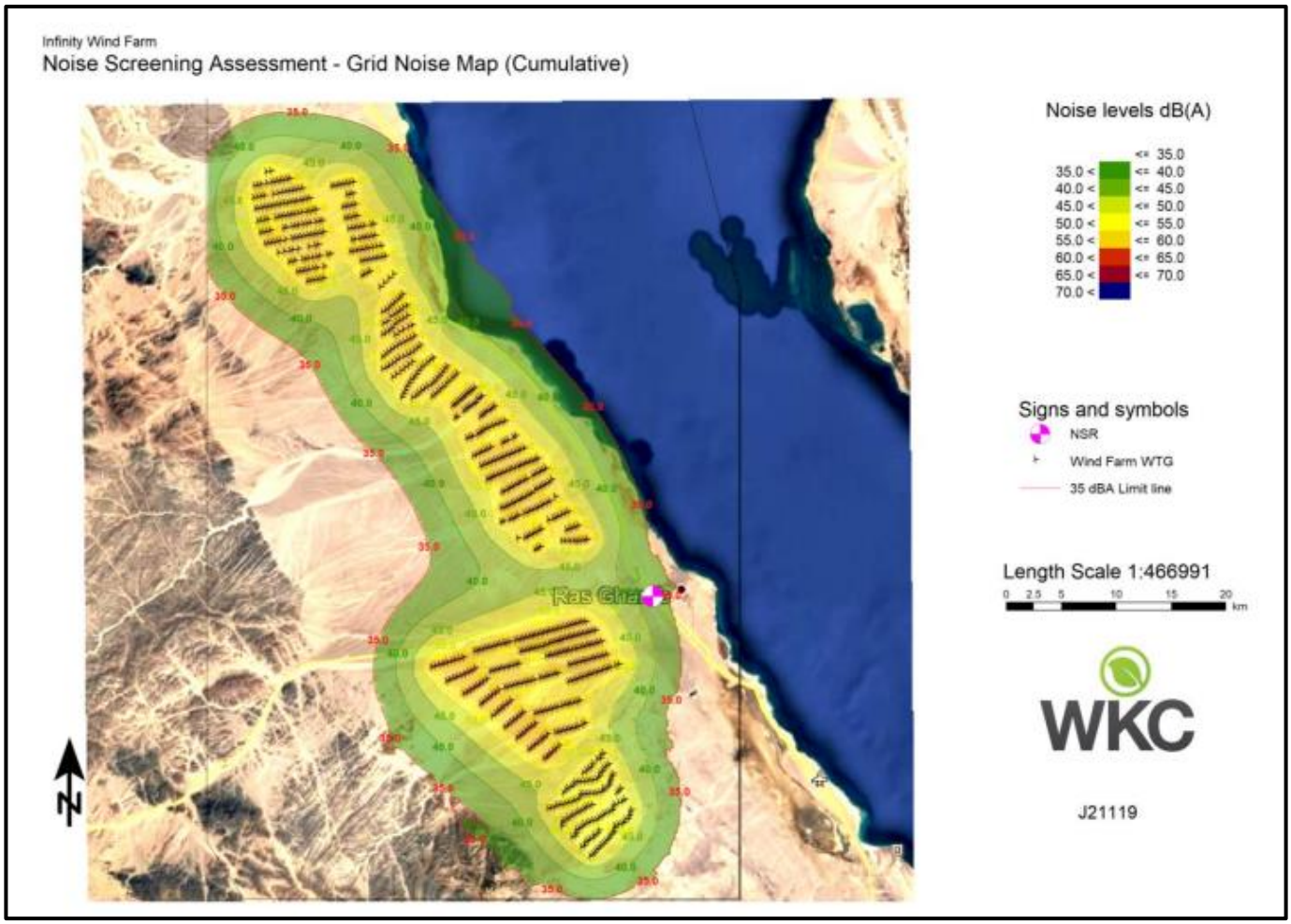

Figure 101: Noise Contour Map for Infinity Wind Farm Layout

9 FRAMEWORK ENIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

9.1 Institutional Framework and Procedure Arrangements for ESMP Implementation

Generally, two main pillars govern the successful implementation of any Environmental and Social Management Plan (ESMP) as well as the Environmental, Social, Health and Safety Management System (ESHS-MS) for the project that will be developed at a later stage (as discussed in further details in below). These pillars include:

- Proper identification of roles and responsibilities for the entities involved; and
- Effective control of the process.

All management practices are interlinked, and this section describes how these two pillar criteria could be fulfilled, which in turn helps ensure that the overall objectives are met.

Staffing Requirements

Defining roles and responsibilities of the involved entities identifies where and when each entity should be engaged, their degree of involvement, and the tasks expected of the entity. This in turn eliminates any overlap of jurisdiction or authority and ensures proper communication and effective management of ESMP and ESHS-MS components.

The table below identifies the staffing requirements that are expected for the Project. This should be expanded further in the Environment, Health, and safety (EHS) Manual that is required as part of the ESHS-MS (as discussed in further details below). This should include an organisational structure that identifies the lines of authority and roles and responsibilities of all involved entities.

Table 78: Roles and Responsibilities of Entities Involved in ESMP

Project Role	Entity	Responsibilities	Staffing Requirements
Project Owner and Developer	IPH	▪ Selection of EPC Contractor and Project Operator; ▪ Implement mitigation and monitoring requirements as applicable for such entity as detailed in the ESMP; and ▪ Ensure overall compliance of EPC Contractor and Project Operator with the requirements of the ESMP and ESHS MS.	Appoint competent HSSE Manager or as part of Third-Party Employer representative (e.g. Owner's Engineer) Appoint a Community Liaison Officer (CLO)
EPC Contractor	TBD	▪ Appoint a competent HSE team. ▪ Implement mitigation and monitoring requirements as detailed in the ESMP and ESHS MS requirements;	For Project nature and duration, this is expected to include at a minimum full-time and onsite HSE Manager and one HSE officer is to be deployed for 50 workers.
Project Operator	TBD	▪ Appoint a competent HSE team. ▪ Implement mitigation and monitoring requirements as detailed in the ESMP and ESHS MS requirements;	For Project nature and duration, this is expected to include HSE Manager (which is required to be full-time onsite at all times).
EEAA	Granting environmental clearance to the Project	▪ Undertake compliance monitoring	N/A
IESC	TBD	▪ Monitoring on Developer and EPC Contractor to ensure compliance with IFI E&S requirements.	N/A

OE	TBD	▪ Support Developer in implantation of mitigation and monitoring requirements and compliance of EPC Contractor with E&S requirements	Appoint competent HSSE Manager

Training and Awareness

An EHS training plan must be developed and maintained onsite which identifies the type of training that is required for each worker onsite. The plan will ensure that each worker is competent in relation to the tasks to be performed. In addition, signed attendance sheets and training material must be maintained onsite at all times. This should be completed by the EPC Contractor and Project Operator as applicable.

Training should include the following as applicable and as highlighted in the table that follows.

- Basic visitor HSE induction training
- Worker HSE induction training for all workers onsite to include for example EPC Contractor and subcontractor crew
- Emergency response training for all workers onsite to include for example EPC Contractor and subcontractor crew
- Specialized training: there are other specific training requirements that must be adhered to and which are related to specific topics as applicable. This includes for example specific training for Occupational Health and Safety (OHS) issues such as working at height, electrical works, etc.
- Tool Box Talks (TBT): regular TBT meetings must be undertaken with for example EPC Contractors respective crews and subcontractor crew. Topics and frequency are developed and distributed regularly.

Table 79: Training Elements

Training	EPC Contractor	Project Operator
Basic visitor HSE induction training	✓	✓
Worker HSE induction training	✓	✓
Emergency response training	✓	✓
Specialized training	✓	✓
Tool Box Talks (TBT)	✓	✓

Inspection and Monitoring

EHS inspection and monitoring must be undertaken to ensure compliance of involved entities with the mitigation and monitoring requirements as detailed in the ESMP and ESHS-MS requirements. This should be completed by the Developer, EPC Contractor, and Project Operator as applicable.

Inspection and monitoring should include the following as applicable and as highlighted in the table that follows.

- Daily HSE inspection and monitoring at the site and preparation of a daily observation report stating therein the corrective measures on observed safety deficiencies, unsafe acts and conditions.
- Weekly site inspections to be carried out using the weekly site inspection checklists template based on requirements of the ESMP and EHSS-MS

- HSE Audits to be undertaken by Developer on EPC Contractor to ensure compliance with ESMP requirement and EHSS-MS. HSE audits should be undertaken monthly during the construction phase and quarterly during the operation phase

Table 80: Inspection and Monitoring Elements

Inspection and Monitoring	Developer	EPC Contractor	Project Operator
Daily HSE Inspection and Monitoring		✓	
Weekly Site Inspections		✓	✓
HSE Audits	✓		

Meetings

Regular EHS meeting must be undertaken to discuss EHS performance onsite, outstanding issues, key issues of concern and other as applicable. Signed attendance sheets and Minutes of Meeting (MoM) must be maintained onsite at all times. This should be completed by the Developer, EPC Contractor, and Project Operator as applicable.

Meetings should include the following as applicable and as highlighted in the table that follows.

- Weekly HSE meetings
- Monthly HSE meeting
- Quarterly management HSE reviews

Table 81: Required Meetings

Meetings	Developer	EPC Contractor	Project Operator
Weekly HSE Meetings		✓	✓
Monthly HSE Meeting	✓	✓	✓
Quarterly Management HSE reviews	✓	✓	✓

Reporting

HSE reporting will be required to summarize the following:

- Progress in implementing the ESMP and EHSS MS plans as required
- Findings of the monitoring programs, with emphasis on any breaches of the control standards, action levels or standards of general site management
- Outstanding incident report forms
- Relevant changes or possible changes in legislation, regulations and international practices
- Reporting on Key Performance Indicators (KPI).
- Grievances
- Security incidents

Reporting should be submitted to the Developer as applicable by the relevant entities as identified below.

Table 82: Reports

Reporting	EPC Contractor	Project Operator

Reporting	Monthly	Monthly

9.2 Environmental, Health, Safety and Social Management System (EHSS-MS)

The ESIA is considered a key document in assessing and managing environmental and social risks related to the Project. The key output of the ESIA is the framework ESMP which aims to provide high level mitigations and requirements for managing the environmental and social risks anticipated from the Project.

Throughout the Project's construction and operation phase an Environmental, Health, Safety and Social Management System (EHSS-MS) must be implemented by all relevant parties (i.e. Developer, EPC Contractor and Project Operator). The EHSS-MS must be project and site specific and must build on and take into account the requirements of the framework ESMP presented throughout this document. The development and implementation of an EHSS-MS is considered a key requirement under IFC PS1, in addition the EHSS-MS must also be in line with the IFC PSs.

Summarised below is the overall framework, structure and key requirements for the EHSS-MS for the key entities involved in the Project.

Developer

- HSE Manual that should include: (i) HSE Policy; (ii) Human Resources Policy and Procedures; (iii) HSE Organisational Structure and Responsibilities; and (iv) HSE Training, Monitoring and Reporting Plan
- Stakeholder Engagement Plan;
- Community Grievance Mechanism
- Active Turbine Management Plan (ATMP)

EPC Contractor

- HSE Manual (in line with Developer) that should include: (i) HSE Policy; (ii) Human Resources Policy and Procedures; (iii) HSE Organizational Structure and Responsibilities; (iv) HSE Training, Monitoring and Reporting Plan
- Water Management Plan
- Waste Management Plan
- Air Quality and Noise Management Plan
- Traffic and Transport Management Plan
- Occupational Health and Safety Plan
- Emergency Preparedness and Response Plan
- Security Management Plan
- Chance Find Procedures
- Worker Grievance Mechanism
- Employment and Procurement Management Plan

- Worker Influx and Accommodation Plan
- Labour and Working Conditions Management Plan

Project Operator

- HSE Manual (in line with Developer) that should include: (i) HSE Policy; (ii) Human Resources Policy and Procedures; (iii) HSE Organizational Structure and Responsibilities; (iv) HSE Training, Monitoring and Reporting Plan
- Water Management Plan
- Waste Management Plan
- Occupational Health and Safety Plan
- Emergency Preparedness and Response Plan
- Security Management Plan
- Employment and Procurement Management Plan
- Labour and Working Conditions Management Plan

9.3 Compilation of the Framework Environmental and Social Management Plan (ESMP)

The tables below present the framework ESMP for the: (i) planning and construction, and (ii) operation phase respectively and which include the following:

- The environmental attribute (e.g. air quality) that is likely to be impacted;
- A summary of the potential impact and/or likely issue;
- The identified management measures that aim to eliminate and/or reduce the potential impact to acceptable levels. Management measures include mitigation actions, further requirements, additional studies, etc.;
- Monitoring actions to ensure that the identified mitigation measures are implemented. Monitoring actions include: inspections, review of reports/plans, reporting, etc.;
- The frequency for implementing the monitoring actions, which include: once, continuously throughout the construction/operation period (depending on the mitigation measure identified this could include daily, weekly, or monthly), or upon occurrence of a certain issue;
- Parameters and location of monitoring actions as identified and applicable; and
- Responsible entity for implementing the mitigation measures and monitoring actions identified.

Table 83: Framework ESMP for the Planning and Construction Phase

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
Landscape and Visual	Visual and landscape impacts due to presence of elements typical of a construction site such as equipment and machinery.	Ensure proper general housekeeping and personnel management measures are implemented which could include: (i) ensure the construction site is left in an orderly state at the end of each work day; (ii) to the greatest extent possible construction machinery, equipment, and vehicles that are not in use should be removed in a timely manner and kept in locations to reduce visual impacts to the area. (iii) Ensure proper storage, collection, and disposal of waste streams generated as discussed in detail in "Section 8.4.2".	Mitigation	Visual inspections	At construction active areas	Daily / Weekly	EPC Contractor
Land Use	There are several informal land uses onsite which if improperly managed could result in potential conflicts and disputes. This includes the Ghafra system of the Bedouin groups and existing petroleum facilities within the area.	(i) Establish coordination with the Bedouin Groups for inclusion and engagement in employment and procurement opportunities. (ii) Implementation of SEP that includes specific references for engagement and coordination with Bedouin groups. Please refer to SEP for additional details.	Additional requirement	Submit agreement with Bedouin groups	Not applicable	Once before commencement of construction	Developer
Geology, Hydrology and hydrogeology	Solid waste management	Coordinate with Ras Gharib City Council for the collection of solid waste from the site to the municipal approved dumpsite (the closest dumpsite being Ras Gharib Public Dumpsite)	Mitigation	Submit contract	Not applicable	Once before commencement of construction	EPC Contractor
		Prohibit fly-dumping of any solid waste to the land	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Commitment to adherence to the waste hierarchy principle	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Distribute appropriate number of properly contained litter bins and containers properly marked as "Municipal Waste	Mitigation	Visual inspections	At construction active areas	Once before commencement of construction	
		Distribute a sufficient number of properly contained containers clearly marked as "Construction Waste" for the dumping and disposal of construction waste	Mitigation	Visual inspections	At construction active areas	Once before commencement of construction	
		Implement proper housekeeping practices on the construction site at all times	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Maintain records and manifests that indicate volume of waste generated onsite, collected by contractor, and disposed of at the landfill	Mitigation	Submit manifests	Not applicable	Throughout construction period	
	Wastewater management	Coordinate with Ras Gharib Water Company to hire a private contractor for the collection of wastewater from the site to the closest WWTP	Mitigation	Submit contract	Not applicable	Once before commencement of construction	EPC Contractor
		Prohibit illegal disposal of wastewater to the land	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Ensure that constructed septic tanks during construction and those to be used during operation are well contained and impermeable to prevent leakage of wastewater into soil	Mitigation	Visual inspections	At applicable area	Once before commencement of construction	
		Ensure that septic tanks are emptied and collected by wastewater contractor at appropriate intervals to avoid overflowing	Mitigation	Visual inspection	At applicable area	Daily/weekly	
		Maintain records and manifests that indicate volume of wastewater generated onsite, collected by contractor, and disposed of at the WWTP	Mitigation	Submit manifests	Not applicable	Throughout construction period	
	Hazardous Waste Management	Hire approved private contractor for the collection of hazardous waste from the site to the approved hazardous waste disposal facilities	Mitigation	Submit contract	Not applicable	Once before commencement of construction	EPC Contractor
		Ensure that hazardous waste is disposed in a dedicated area that is enclosed, of hard surface, with proper signage and suitable containers as per hazardous waste classifications and that they are labelled for each type of hazardous waste	Mitigation	Visual inspections	At applicable area	Once before commencement of construction	

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
		Ensure hazardous waste storage area is equipped with spill kit, fire extinguisher and anti-spillage trays and a hazardous waste inventory is available	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		Prohibit illegal disposal of hazardous waste to the land	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Possibly contaminated water (e.g. runoff from paved areas) must be drained into appropriate facilities (such as sumps and pits). Contaminated drainage must be orderly disposed of as hazardous waste	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Ensure that containers are emptied and collected by the contractor at appropriate intervals to prevent overflowing	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Maintain records and manifests that indicate volume of hazardous waste generated onsite, collected by contractor, and disposed of at the hazardous waste disposal facilities	Mitigation	Submit manifests	Not applicable	Throughout construction period	
	Hazardous material management	Ensure that hazardous materials are stored in an area that is of hard impermeable surface, flame-proof, accessible to authorized personnel only, locked when not in use, and prevents incompatible materials from coming in contact with one another, and includes secondary containment systems	Mitigation	Visual inspections	At applicable area	Once before commencement of construction	EPC Contractor
		Maintain a register of all hazardous materials used and accompanying MSDS must present at all times. Spilled material should be tracked and accounted for	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		Incorporate dripping pans at machinery, equipment, and areas that are prone to contamination by leakage of hazardous materials (such as oil, fuel, etc.)	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Maintenance activities and other activities that pose a risk for hazardous material spillage (such as refuelling) must take place at a suitable location (hard surface) with appropriate measures for trapping spilled material	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Ensure that a minimum of 1,000 litters of general-purpose spill absorbent is available at hazardous material storage facility.	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		If spillage on soil occurs, spill must be immediately contained, cleaned-up, and contaminated soil disposed as hazardous waste	Mitigation	Visual inspection	At applicable area	Upon occurrence	
	Erosion and runoff management	Avoid executing excavation works under aggressive weather conditions	Mitigation	Visual inspections	At construction active areas	Upon occurrence	EPC Contractor
		Place clear markers indicating stockpiling area of excavated materials to restrict equipment and personnel movement, thus limiting the physical disturbance to land and soils in adjacent areas	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Erect erosion control barriers around work site during site preparation and construction to prevent silt runoff where applicable such as silt fences, gravel bas berms, fiber rolls, and other.	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Return surfaces disturbed during construction to their original (or better) condition to the greatest extent possible	Mitigation	Visual inspections	At construction active areas	Upon occurrence	
Biodiversity	Construction activities would disturb existing habitats (flora and fauna). In addition, other impacts could be from improper management of the site (e.g. improper conduct and housekeeping practices).	Implement Biodiversity Management Plan (BMP) which is provided as a standalone document.	Mitigation	Refer to BMP	At applicable area	Refer to BMP	EPC Contractor

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
		Undertake a detailed Egyptian Dabb Lizard survey through a biodiversity expert. The survey should focus on all construction activities areas and in particular the Wadi systems where such a species is likely to be located. Should burrows and/or records of this species be identified, relocation activities should be undertaken to nearby similar habitats.	Additional Survey	Submission of report	Prior to construction	Once; before construction	EPC Contractor
		Implement proper housekeeping practices on the construction site at all times	Mitigation	Visual inspections	At construction active areas	Daily / weekly	EPC Contractor
Birds (avi-fauna)	Construction activities could disturb existing habitats of birds breeding and/or nesting within the Project site.	Implement proper housekeeping practices on the construction site at all times	Mitigation	Visual inspections	At construction active areas	Daily / weekly	EPC Contractor
		Develop a protocol to swiftly report and dispose of any dead or injured wildlife or animals recorded onsite.	Mitigation	Submission of report	Prior to construction	Prior to construction	EPC Contractor
Archaeology and Cultural Heritage	Improper management of construction activities could disturb/damage archaeological remains which could be buried in the ground (if any).	As required by the SCA, during excavation activities, SCA must be notified to check if they will provide any observers to oversee the process and ensure that no underground archaeological remains of importance are unearthed and/or disturbed	Mitigation	Submission of evidence of communication with SCA	Not applicable	Prior to construction	EPC Contractor
		If potential archaeological remains in the ground are discovered, appropriate measures for such chance find procedures are implemented. Those mainly require that construction activities be halted and the area fenced along with proper signage, while immediately notifying the Ministry of Tourism and Antiquities/Red Sea and Suez Antiquities Inspection Office. No additional work will be allowed before the Ministry/Inspection Office assesses the found potential archaeological site and grants a clearance to resume the work. Construction activities can continue at other parts of the site if no potential 219rchaeologyical remains were found. If found, same procedures above apply	Mitigation	Visual inspections and submittal of chance find report	At applicable area	Upon occurrence	EPC Contractor
Air Quality and Noise	Construction activities will likely result in an increased level of dust, particulate matter and pollutant emissions as well as noise which in turn will directly impact ambient air quality and noise levels.	If dust or pollutant emissions were found to be excessive due to construction activities, the source of such emissions should be identified and adequate control measures must be implemented (as identified below)	Mitigation	Visual inspections	At construction active areas and other receptors to include nearby petroleum activities and internal road networks	Upon occurrence	EPC Contractor
		Comply with the Occupational Safety and Health Administration (OSHA) requirements and the Egyptian Codes to ensure that for activities associated with high dust and noise levels, workers are equipped with proper Personal Protective Equipment	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Apply basic dust control and suppression measures which could include: (i) regular watering of roads for dust suppression; (ii) proper planning of dust causing activities to take place simultaneously in order to reduce the dust incidents over the construction period; (iii) proper management of stockpiles and excavated material (e.g. watering, containment, covering, bundling); (iv) proper covering of trucks transporting aggregates and fine materials (e.g. through the use of tarpaulin); and (v) adhering to a speed limit of 15km/h for trucks on the construction site.	Mitigation	Visual inspections	At construction active areas	Daily / weekly	

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
		Develop a regular inspection and scheduled maintenance program for vehicles, machinery, and equipment to be used throughout the construction phase for early detection of issue to avoid unnecessary pollutant and noise emissions	Mitigation	Submission of maintenance program	Not applicable	Monthly	
		If noise levels were found to be excessive from construction activities, the source of such excessive noise levels should be identified and adequate control measures must be implemented	Mitigation	Visual inspections	At construction active areas and other receptors to include petroleum storage facilities	Upon occurrence	
		Apply adequate general noise suppressing measures. This could include the use of well-maintained mufflers and noise suppressants for high noise generating equipment and machinery, developing a regular maintenance schedule of all vehicles, machinery, and equipment for early detection of issues to avoid unnecessary elevated noise level, etc.	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
Infrastructure and Utilities	Traffic and transport management	Develop a Traffic and Transport Plan to ensure transportation process of turbine components does not pose a risk of damage to the existing roads, highways, overpasses whilst ensuring public safety. The Plan must analyse and study the entire route for transportation of the Project components from the port till the Project site. The study must investigate any constraints which need to be considered along the highways leading to the Project site such as bridges, overhead utility cables, slants in roads, etc. and identify accommodations which need to be taken into account.	Additional study	Submission of Traffic and Transport Plan and approval from local authorities	Not applicable	Once before commencement of construction	EPC Contractor
	Civil and Military Aviation	Establish coordination with the relevant entity to provide information on the Project (to include location and specifications of turbines in specific) and include any specific requirements to be considered as part of the detailed design to include setback distances if required (e.g. from radar systems if applicable) and navigational safety requirements (e.g. navigational lights, blade paintings, etc.)	Additional requirement	Submit of formal non-objection letter (or similar) with relevant entity	Not applicable	Once before commencement of construction	Developer
	Improper planning and design of project could affect petroleum facilities	Establish coordination via NREA with the General Petroleum Company's head office in Cairo to discuss and determine any specific requirements to be taken into account for the detailed design of the Project as well as coordination agreement requirement during the construction and operation phase (e.g. avoidance of such areas, buffer distances to be considered, etc.)	Additional requirement	Submit formal communication letter (or similar) with relevant entity	Not applicable	Once before commencement of construction	Developer
	Water resources management	Coordinate with the Ras Ghareb Water Company to sector the water requirements of the Project	Additional requirement	Submit formal communication letter (or similar) with Ras Ghareb Water Company	Not applicable	Once before commencement of construction	EPC Contractor
	Waste utilities	Undertake the following: (i) coordinate with the Ras Ghareb Water Company and obtain list of authorized contractors for collection of wastewater from the site; (ii) coordinate with the Ras Gharib City Council to hire a competent private contractor for the collection of solid waste from the site; and (iii) obtain list of authorized contractors for collection of hazardous waste from the site	Additional requirement	Submit formal communication letter with relevant entities	Not applicable	Once before commencement of construction	EPC Contractor

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
	Telecommunication and TV/Radio management	Establish coordination via NREA/EETC with relevant entity and other applicable local agencies to provide information on the Project (to include location and specifications of turbines in specific) and include any specific requirements to be considered as part of the detailed design to include setback distances if required for telecommunication, radio and TV infrastructure (e.g. from LoS connections)	Additional requirement	Submit formal communication letter with relevant entities	Not applicable	Once before commencement of construction	Developer
	Nearby Wind Farms	Further follow/communication with NREA to ensure if buffer distance of the Project from other nearby wind farm projects is considered sufficient and appropriate from a technical perspective	Mitigation	Submit formal communication letter with relevant entities	Not applicable	Once before commencement of construction	Developer
Occupational Health and Safety	There will be some generic risks to workers health and safety from working on construction sites, as it increases the risk of injury or death due to accidents.	Develop and submit an Occupational Health and Safety Plan (OHSP) that is project and site specific to ensure the health and safety of all personnel in order to concur and maintain a smooth and proper progress of work at the site and prevent accident which may injure personnel or damage property.	Additional study	Submit OHSP plan	Not applicable	Once before commencement of construction	EPC Contractor
		Develop and submit an Emergency preparedness and Response Plan that is project and site specific and account for all potential emergency situations onsite to ensure the health and safety of all personnel and property onsite.	Additional study	Submit EPRP	Not applicable	Once before commencement of construction	EPC Contractor
Human Rights	Inappropriate management of the workforce during both the construction and operation phase could entail several human right risks and violations by employing entities such as the EPC Contractor and Project Operator. This could include but not limited to engaging child workers, confiscation of passports of foreign workers, unsuitable working hours, and other.	(i) Providing reasonable working conditions and terms of employment to include but not limited to contract management, working hours, salaries/wages, annual and medical leaves, bereavement leaves, accommodation, etc. (ii) Recognizing workers' rights to form and to join workers' organizations and to bargain collectively (iii) Prohibition of child labour within the workforce (iv) Overall management of young workers within the labour force (v) Prohibition of forced labour (vi) Non-discrimination throughout the entire work cycle in all its forms (vii) Providing equal opportunities for all throughout procurement and employment opportunities including women groups (viii) Overall management of daily workers, migrant workers and third-party workers	Mitigation	(i) Undertake monthly inspections during construction and quarterly during operation against the developed HR procedure (ii) Submission of HR inspection report that identifies any corrective measures undertaken	At applicable area	Monthly	EPC Contractor
Public health and safety	Relatively large worker influx could result in H&S issues such as risk of diseases, inappropriate code of conduct, social vices, etc.	Submit a worker influx plan which takes into account the following: (i) medical examination program for workers; (ii) procedures to maintain hygienic conditions onsite; (iii) code of conduct for workers; (iv) induction training and awareness requirements for risk of diseases, etc; (v) consider impacts from workers migration into nearby communities including pressure on rental accommodations and infrastructures	Additional study	Submit worker influx plan	Not applicable	Once before commencement of construction	EPC Contractor
	Inappropriate management of security issues and incidents by security personnel towards local communities could result in resentment, distrust and escalation of events	Prepare a Security Management Plan that identifies appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues	Additional study	Submit security management plan	Not applicable	Once before commencement of construction	EPC Contractor

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
Socio-economics	The Project is expected at a minimum to provide job opportunities for local communities. This, to some extent, could contribute to enhancing the living environment for its inhabitants, elevate their standards of living, and bring social and economic prosperity	Local Recruitment Procedure: the procedure must identify the number of job opportunities targeted for local communities to include skilled and unskilled workers. Such job opportunities shall also take into account employment of local communities in the area around the project to include fresh graduate engineers, technicians, labourers, etc. In addition, the procedure must include details on how job opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all including females. Local Procurement Procedure: the procedure must identify the procurement opportunities targeted for local communities to include for example local subcontractors, local supplies and services, cleaning services, etc. In addition, the procedure must include details on how procurement opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all. Social Responsibility Program: it is recommended that the Developer implement a social responsibility program which aims to benefit the local communities to the greatest extent possible. In this case, a structured approach must be developed which must identify priority development projects which could benefit local communities (e.g. based on a needs assessment if available). Based on that the social responsibility program can prioritise projects for local communities based on available budget, company vision, timeline for implementation as well as other factors.	Recommendation	Regular reporting on outcomes of Program implementation	Not applicable	Continuous	Project Developer/EPC Contractors

Table 84: Framework ESMP for the Operation Phase

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
Geology, Hydrology and hydrogeology	Solid waste management	Coordinate with Ras Gharib City Council for the collection of solid waste from the site to the municipal approved dumpsite (the closest dumpsite being Ras Gharib Public Dumpsite)	Mitigation	Submit contract	Not applicable	Once before commencement of operation	Project Operator
		Prohibit fly-dumping of any solid waste to the land	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Distribute appropriate number of properly contained litter bins and containers properly marked as "Municipal Waste	Mitigation	Visual inspections	At operational active areas	Once before commencement of operation	
		Implement proper housekeeping practices onsite at all times	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Maintain records and manifests that indicate volume of waste generated onsite, collected by contractor, and disposed of at the landfill	Mitigation	Submit manifests	Not applicable	Throughout operational period	
	Wastewater management	Coordinate with Ras Gharib Water Company to hire a private contractor for the collection of wastewater from the site to the closest WWTP	Mitigation	Submit contract	Not applicable	Once before commencement of operation	Project Operator
		Prohibit illegal disposal of wastewater to the land	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Ensure that septic tanks are emptied and collected by wastewater contractor at appropriate intervals to avoid overflowing	Mitigation	Visual inspection	At applicable area	Daily/weekly	
		Maintain records and manifests that indicate volume of wastewater generated onsite, collected by contractor, and disposed of at the WWTP	Mitigation	Submit manifests	Not applicable	Throughout operational period	

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
	Hazardous waste management	Hire approved private contractor for the collection of hazardous waste from the site to the approved hazardous waste disposal facilities	Mitigation	Submit contract	Not applicable	Once before commencement of operation	Project Operator
		Ensure that hazardous waste is disposed in a dedicated area that is enclosed, of hard surface, with proper signage and suitable containers as per hazardous waste classifications and that they are labelled for each type of hazardous waste	Mitigation	Visual inspections	At applicable area	Once before commencement of operation	
		Ensure hazardous waste storage area is equipped with spill kit, fire extinguisher and anti-spillage trays and a hazardous waste inventory is available	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		Prohibit illegal disposal of hazardous waste to the land	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Possibly contaminated water (e.g. runoff from paved areas) must be drained into appropriate facilities (such as sumps and pits). Contaminated drainage must be orderly disposed of as hazardous waste	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Ensure that containers are emptied and collected by the contractor at appropriate intervals to prevent overflowing	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Maintain records and manifests that indicate volume of hazardous waste generated onsite, collected by contractor, and disposed of at the hazardous waste disposal facilities	Mitigation	Submit manifests	Not applicable	Throughout operational period	
	Hazardous material management	Ensure that hazardous materials are stored in an area that is of hard impermeable surface, flame-proof, accessible to authorized personnel only, locked when not in use, and prevents incompatible materials from coming in contact with one another	Mitigation	Visual inspections	At applicable area	Once before commencement of operation	Project Operator
		Maintain a register of all hazardous materials used and accompanying MSDS must present at all times. Spilled material should be tracked and accounted for	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		Incorporate dripping pans at machinery, equipment, and areas that are prone to contamination by leakage of hazardous materials (such as oil, fuel, etc.)	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Maintenance activities and other activities that pose a risk for hazardous material spillage (such as refuelling) must take place at a suitable location (hard surface) with appropriate measures for trapping spilled material	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Ensure that a minimum of 1,000 litters of general-purpose spill absorbent is available at hazardous material storage facility.	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		If spillage on soil occurs, spill must be immediately contained, cleaned-up, and contaminated soil disposed as hazardous waste	Mitigation	Visual inspection	At applicable area	Upon occurrence	
Biodiversity	Improper management of the site could disturb existing habitats (e.g. improper conduct and housekeeping practices).	Implement proper management measures to prevent damage to the biodiversity of the site.	Mitigation	Inspection	At applicable area	Continuous	Project Operator
Birds (avi-fauna)	Wind turbines are associated with impacts on birds from risks of strikes and collision on both migratory soaring birds and resident soaring birds in the area. Generally, such impacts depend on several factors but could affect the population levels of certain species especially those with international/national critical conservation status.	Avi-Fauna Monitoring and On-Demand Turbine Shutdown	Mitigation	Submission of report	At operational active areas	Continuous	Consultant
		Avi-Fauna Carcass Search during Operation	Additional requirement	Submission of report	At operational active areas	Continuous	
		Carcass Search Surveys	Additional requirement	Submission of report	At operational active areas	Continuous	
Bats	The potential impacts from the Project during operation are mainly related to risk of bat strikes and collisions with rotors of the operating wind turbines.	Undertake at height bat acoustic surveys for one (1) year during first or second year of operations. Such acoustic surveys will be done at the met masts and should be undertaken by a third-party entity with experience in bat assessments and studies.	Mitigation	Submission of report	At operational active areas	Once during operation	Project Operator
		Carcass Search Surveys	Mitigation	Submission of report	At operational active areas	Continuous	Consultant

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
Infrastructure and Utilities	Water resources management	Coordinate with the Ras Gharib Water Company to sector the water requirements of the Project.	Additional requirement	Submit formal communication letter (or similar) with Ras Gharib Water Company	Not applicable	Once before commencement of construction	Project Operator
	Waste utilities	Undertake the following: (i) coordinate with the Ras Gharib Water Company and obtain list of authorized contractors for collection of wastewater from the site; (ii) coordinate with the Ras Gharib City Council to hire a competent private contractor for the collection of solid waste from the site; and (iii) obtain list of authorized contractors for collection of hazardous waste from the site	Additional requirement	Submit formal communication letter with relevant entities	Not applicable	Once before commencement of construction	Project Operator
Occupational Health and Safety	There will be some generic risks to workers health and safety from working on construction sites, as it increases the risk of injury or death due to accidents.	Develop and submit an Occupational Health and Safety Plan (OHSP) that is project and site specific to ensure the health and safety of all personnel in order to concur and maintain a smooth and proper progress of work at the site and prevent accident which may injure personnel or damage property.	Additional study	Submit OHSP plan	Not applicable	Once before commencement of operation	Project Operator
Human Rights	Inappropriate management of the workforce during the construction phase could entail several human right risks and violations by employing entities such as the EPC Contractor and Project Operator. This could include but not limited to engaging child workers, confiscation of passports of foreign workers, unsuitable working hours, and other.	Providing reasonable working conditions and terms of employment to include but not limited to contract management, working hours, salaries/wages, annual and medical leaves, bereavement leaves, accommodation, etc.	Mitigation	Submit HR inspection report that identifies any corrective measures undertaken	Not applicable	Monthly	EPC Contractor
		Recognizing workers' rights to form and to join workers' organizations and to bargain collectively	Mitigation	Submit HR inspection report that identifies any corrective measures undertaken	Not applicable	Monthly	
		Prohibition of child labour within the workforce	Mitigation	Submit HR inspection report that identifies any corrective measures undertaken	Not applicable	Monthly	
		Overall management of young workers within the labour force	Mitigation	Submit HR inspection report that identifies any corrective measures undertaken	Not applicable	Monthly	
		Prohibition of forced labour	Mitigation	Submit HR inspection report that identifies any corrective measures undertaken	Not applicable	Monthly	
		Non-discrimination throughout the entire work cycle in all its forms	Mitigation	Submit HR inspection report that identifies any corrective measures undertaken	Not applicable	Monthly	
		Providing equal opportunities for all throughout procurement and employment opportunities including women groups	Mitigation	Submit HR inspection report that identifies any corrective measures undertaken	Not applicable	Monthly	
		Overall management of daily workers, migrant workers and third-party workers	Mitigation	Submit HR inspection report that identifies any corrective measures undertaken	Not applicable	Monthly	
Public Health and Safety	Public access of unauthorized personnel to the various Project components.	A Security Risk Assessment should be developed for the Wind Farm Project and which takes into account the following: (i) each turbine to be fitted with locked doors to prevent unauthorized access to the turbines; (ii) substation area to be completely fenced with concrete walls to prevent unauthorized access; (iii) onsite guards; (iv) post informative signs on the turbines and substation about public safety hazards and emergency contact information, and other as applicable.	Additional study	Submit Security Risk Assessment	Not applicable	Once before commencement of operation	Project Operator

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
	Inappropriate management of security issues and incidents by security personnel towards local communities could result in resentment, distrust and escalation of events	Prepare a Security Management Plan that identifies appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues	Additional study	Submit security management plan	Not applicable	Once before commencement of operation	Project Operator
	Blade or tower glint can impact nearby receptors in the area	Consideration should be given to the use of non-reflective finishes to ensure potential impacts are not significant	Mitigation	Visual inspection	Turbines	Once before commencement of operation	Project Operator
Socio-economics	The Project is expected at a minimum to provide job opportunities for local communities. This, to some extent, could contribute to enhancing the living environment for its inhabitants, elevate their standards of living, and bring social and economic prosperity	Local Recruitment Procedure: the procedure must identify the number of job opportunities targeted for local communities to include skilled and unskilled workers. Such job opportunities shall also take into account employment of local communities in the area around the project to include fresh graduate engineers, technicians, labourers, etc. In addition, the procedure must include details on how job opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all including females. Local Procurement Procedure: the procedure must identify the procurement opportunities targeted for local communities to include for example local subcontractors, local supplies and services, cleaning services, etc. In addition, the procedure must include details on how procurement opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all. - Social Responsibility Program: it is recommended that the Developer implement a social responsibility program which aims to benefit the local communities to the greatest extent possible. In this case, a structured approach must be developed which must identify priority development projects which could benefit local communities (e.g. based on a needs assessment if available). Based on that the social responsibility program can prioritise projects for local communities based on available budget, company vision, timeline for implementation as well as other factors.	Recommendation	Regular reporting on outcomes of Program implementation	Not applicable	Continuous	Project Developer/ Operator

10 ASSESSMENT FOR ASSOCIATED FACILITIES

This section presents an overall description of the associated facilities for the Project along with an E&S assessment. As discussed previously under "Section 2.3.3", the main associated facility includes the Overhead Transmission Line (OHTL).

10.1 Project Description

The OHTL is considered a key component for the Project as it will supply the electricity produced by the Wind Farm to the National Grid. Without the OHTL, the Wind Farm Project cannot be realised.

The following describes the main OHTL (Project) components. This has been based on current available information provided by the Developer.

The OHTL will connect from the substation located within the Project site (as discussed previously under "Section 2.3.2") until the connection with National Grid towards the end of the OHTL route.

10.1.1 Transmission Towers

The main component of the OHTL is the transmission towers. The transmission tower will be a three (3) phase steel beam Double-Circuit Transmission Towers (DCT), which will transport the electricity from the substation located within the Wind Farm to the High Voltage National Grid. The typical structure of the DCT tower is presented in the figure below.

The OHTL is likely to consist of around 35 towers that will be distributed throughout the route. The height of each tower will around 50 m.

Each transmission tower will consist of the following:

- **Foundations:** each tower will be fixed and bolted to the ground through reinforced concrete foundations. The exact area for each foundation was not provided by EETC but it will be determined at a later stage as part of the detailed design; and
- **Cross-Arms:** each tower will have six (6) steel beam cross arms (3 on each side) which connects the conductors (discussed below) with the towers (refer to Figure 102 below).

10.1.2 Conductors

The conductor is the line used to carry electrical energy from one tower to the next until its connection with the High Voltage National Grid. There will be six (6) conductors, three (3) on each side of the tower that will through the cross-arms (refer to Figure 102 below). The conductor will be a 220kV line.

10.1.3 Infrastructure Elements

The only infrastructure requirements for the Project will be access roads, which might be required in areas where the towers are inaccessible based on existing site conditions. Such access roads are required for access of construction vehicles and machinery during construction and for maintenance activities during operation. The layout of the access roads within the Project site will be determined at a later stage as part of the detailed design to be prepared by the OHTL Contractor.

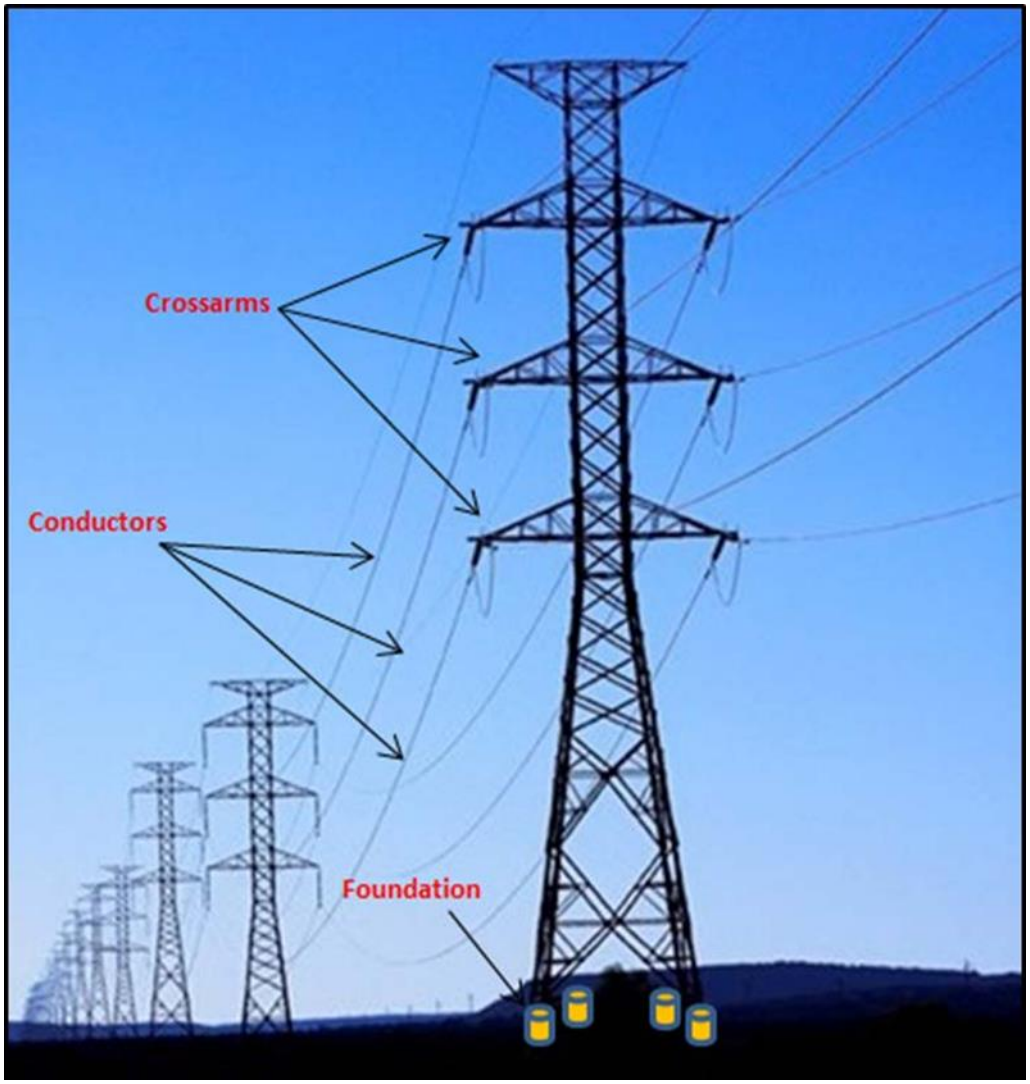

Figure 102: Typical Structural Components of DCT towers

10.1.4 Right of Way for the OHTL

Electricity transmission and distribution projects require Rights-of-Way (RoW) to protect the system from windfall, contact with trees, branches, utilities, buildings, and other potential hazards that may result in damage to the system, or power failures, as well as public health and safety concerns. RoW are also utilized to access, service, and inspect transmission and distribution systems.

The IFC EHS Guidelines for Electric Power Transmission and Distribution (2007), states that the RoW width for transmission lines ranges from 15 to 100m depending on voltage and proximity to other RoW, but typical range is between 15 and 30m.

Within the local requirements, EETC will take into account the requirements of the Electricity Law 87/2015, which provides requirements for safe distance between the conductors and the neighboring lands and buildings and other receptors. Based on the law, the requirements of the RoW distances applicable for the 220kV OHTL is 25m horizontal distance from each side. Any successive buildings, structures or other receptors to be built shall take into account this safety distance/ RoW.

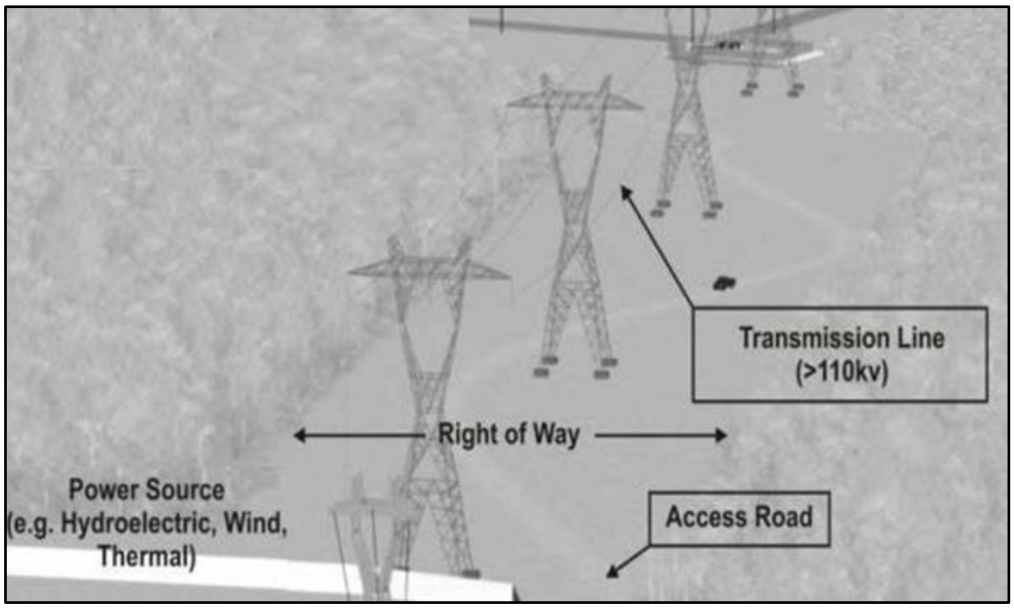

Figure 103: Right of Way and Access Road for OHTL (IFC, 2007)

10.1.5 OHTL Route

Currently, there are to (2) possible options for the OHTL route as presented in the figure and table below.

Table 85: OHTL Routing Options

Distances	Option A	Option B
Total Distance (km)	12.6	13.6
Distance within Project site (km)	5.1	7.5
Distance outside of Project site (km)	7.5	6.1

Other Option

Another third option was investigated for the OHTL route. This involved relocating the substation to the northern area of the Project plot to reduce OHTL length. However, based on a techno-commercially evaluation undertaken by the Developer, this option was not considered feasible.

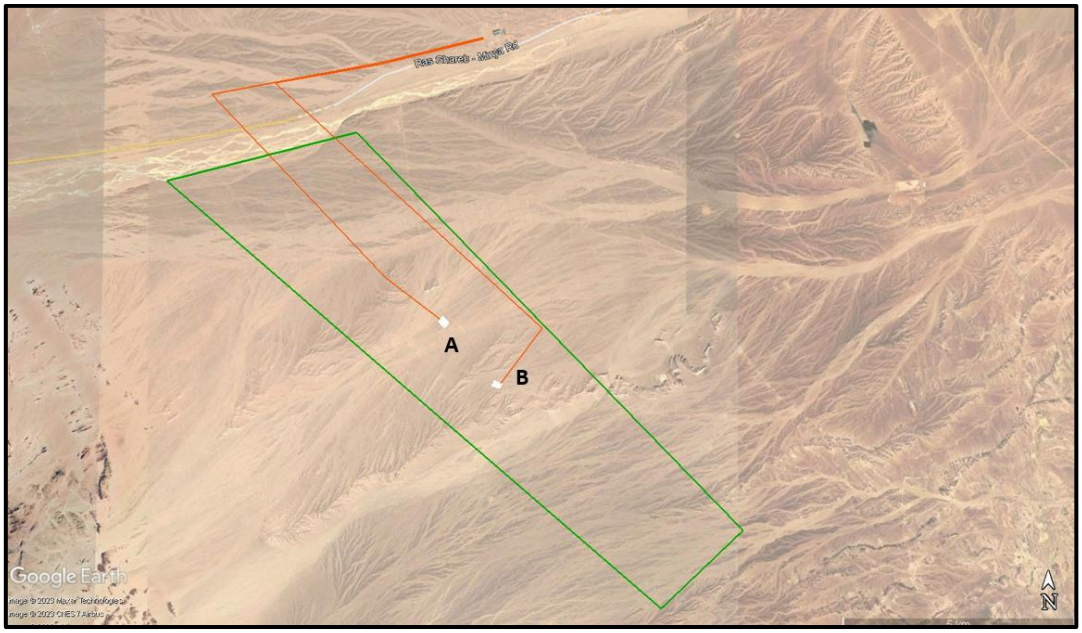

Figure 104: OHTL Routing Options

10.1.6 Overview of Project Phases

This section presents the likely activities to take place during the Project development and which will include three (3) distinct phases: (i) construction, (ii) operation and (iii) decommissioning each of which is summarised below.

Planning & Construction Phase

Typical activities during the construction phase for the OHTL include the following:

- Transportation of various Project components to the Project site. The components are expected to be transported by road to the Project area;
- Site preparation activities for the tower foundations. Such activities are limited to the individual footprint of the towers and therefore the actual area of disturbance is small. Nevertheless, such activities could include land clearing activities, excavations, and levelling;
- Installation of components such as the DCT towers, cross-arms, and conductors; and
- In addition to the erection of each DCT, there is additional construction work (which could include excavations, land clearing activities, etc.) for the road network that will be developed for access of equipment and machinery onsite.

Throughout the construction phase, the Project will require skilled labour (such as engineers, technicians, surveyors, etc.) and unskilled labour. It is likely that the OHTL Contractor will have his own team to cover such employment opportunities.

Operation Phase

The OHTL is expected to remain operational throughout the operation period of the Wind Farm – which is set for 20 years. The operational phase will be mainly limited to maintenance and repair activities for the OHTL when needed. These could also include some routine maintenance activities (based on a set schedule) as well as maintenance in case of failure of any of the Project components. Maintenance activities are generally undertaken by a dedicated team of technicians from EETC and do not normally require any permanent staff to be onsite. The EETC Team would undertake required technical activities during any given day and leave the site.

Decommissioning Phase

Decommissioning activities will depend on the Wind Farm. As discussed earlier, the Wind Farm Project is expected to remain operational for 20 years after which the Project could be decommissioned. Decommissioning activities will include disassembly of the towers for final disposal. However, most of these materials are salvageable (i.e. recyclable).

10.2 E&S Assessment

10.2.1 Landscape and Visual

The OHTL route can be characterized to be located within a desert area that is barren, with a relatively flat topography with no sudden changes throughout the entire route. The elevation ranges from around 235m to 300m above sea level, with gentle decrease in elevation from the Project site till the connection point with the National Grid. The figure below presents the general topography and landscape character of the OHTL route.

Based on the site visit undertaken for the Project area and the 100m buffer on both sides, no critical visual receptors were identified. In fact, the route and the buffer area are devoid of any receptors as discussed further in the section below.

Within the wider area, the key receptors are those similar to the Wind Farm and which were identified previously under "Section 7.1.1". This included the following:

- Petroleum activities mainly within the northern, eastern and western areas. Note: There are also closed drilling wells within the Project site itself and its immediate surrounding areas (refer to "Section **Error! Reference source not found.**" for additional details);
- Several planned and existing wind farms to the north, south and east;
- Infrastructure elements such as existing Overhead Transmission Lines (OHTL), a substation, highways, a dumpsite, a dam and a stone crusher facility; and
- Several military posts.

Figure 105: General Topography for OHTL Route

Key impacts are mainly limited to the operational phase. Visual impacts associated typically concern the OHTL towers themselves (e.g. colour, height, and number) and impacts relating to their interaction with the character of the surrounding landscape and the visual receptor which might be present. Nevertheless, in general, such structures are not considered mega or huge structures that would impose a key change on the landscape and visual character of the area. More importantly, such impacts are considered insignificant due to the following:

- Within the Project area and surrounding there are no key sensitive visual receptors.
- Project area is considered a barren and desert area and in general is located within an industrial area with petroleum activities and wind farm developments for which its aesthetical value loses some importance.
- There are several electricity transmission lines within the area (refer to section below), and therefore the addition of this Project will not be a significant impact to the visual and landscape characteristic of the area.

Mitigation Measures

There are no mitigation or monitoring measures to be considered.

10.2.2 Land Use

Based on the site survey, no physical structures were noted within the OHTL route and 100m buffer area on both sides. In addition, no economical activities were noted (such as grazing, agricultural, petroleum activities or Bedouin groups) nor any evidence of any such activities. The entire route is vacant and runs within unoccupied desert and barren lands.

Based on information from EETC, it was indicated that the entire OHTL route is located under state owned lands which include mainly areas that are part of the 284km^2 plot allocated to NREA for wind farm developments by the Government of Egypt through a Prime Ministerial Decree.

Based on consultation with EETC, the procedure for the development of the OHTL was explained. EETC will first obtain an approval for the route from the Egyptian Armed Forces Operations. After the approval is obtained, EETC will enter into an agreement with NREA and the General petroleum Company for passage of the OHTL within their allocated areas. However, given that all entities involved are governmental entities (EETC, NREA and General Petroleum Company), there will be no compensation to be paid by EETC for the OHTL route and its RoW. Therefore, there is no land acquisition or land compensation measures to be undertaken or implemented.

Inappropriate siting of Project components could result in land use impacts related to physical displacement and/or economical displacement or similar. Nevertheless, no such impacts are anticipated from the Project due to the following as discussed earlier in the baseline section:

- The Project site itself (to include the OHTL route and 100m buffer on both sides) in general is uninhabited and vacant and does not include any physical or economical land use activities. Therefore, physical and economical displacement impacts are considered irrelevant.
- The Project site is under governmental ownership and has been allocated to NREA. Therefore, no land acquisition or compensation process is required.

Taking the above into account, there are no anticipated impacts on land use and there are no mitigations or monitoring measures to be considered.

10.2.3 Biodiversity

A site survey was undertaken for the OHTL route during spring 2023 to assess the biodiversity elements along the route.

In general, the biodiversity of the OHTL is similar to that of the Project site. The OHTL route has low vegetation cover with a low number of species (as expected in a desert) with absence of restricted range species and with only few species of conservation concern. The diversity is that typical of the Egyptian Red Sea coast with no exceptional features. In addition, no key or sensitive habitats were recorded within the Project site, and all floral and faunal species recorded where in general considered common and typical to such habitats and generally of least concern. Finally, the Project site is considered a Natural Habitat in accordance with EBRD PR 6 requirements.

Three species that are believed to be present in the Project site are of conservation concern and evaluated as globally threatened (Vulnerable), none of them are believed to be present in globally significant numbers. However, special consideration should be given to the globally threatened Egyptian Dabb Lizard *Uromastyx aegyptia* and the Dorcas Gazelles (*Dorcas Gazelle*) since the Project site provides a typical habitat for the species.

In particular, eleven (11) active Egyptian Dabb Lizard burrows and five (5) inactive burrows were found within the 100m buffer from OHTL Option A and Option B as noted in the figure below. None are within the actual OHTL route and none are outside of the Project footprint.

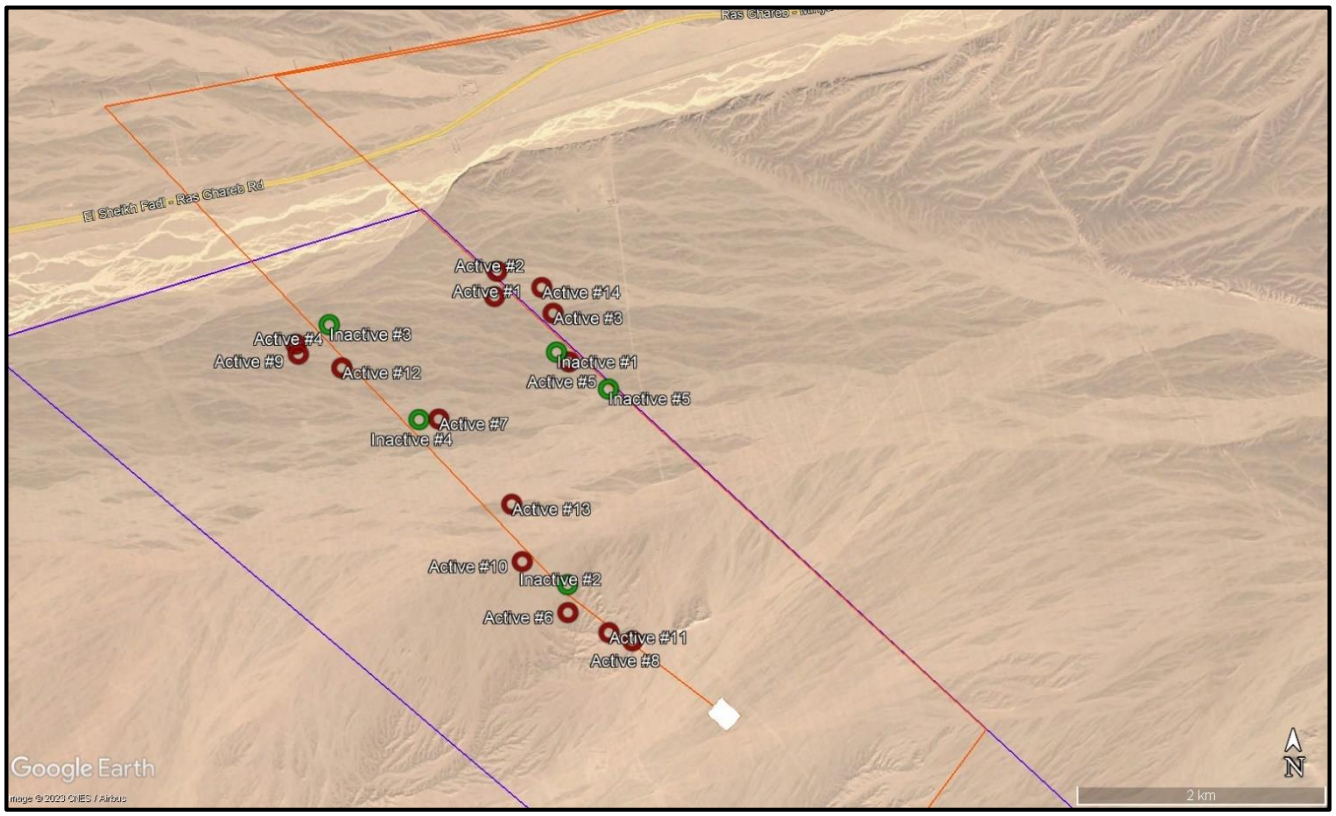

Figure 106: Egyptian Dabb LizardBurrows

Site preparation activities which are to take place onsite by the OHTL Contractor for the OHTL transmission towers and the various Project components to include foundations, access roads, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Although such activities are limited to the relatively small individual footprints of these components and the actual area of disturbance is relatively minimal, if such activities are improperly managed, they could still likely result in the alteration of the site's habitat and thus potentially disturb existing habitats. Other impacts on the biodiversity of the site are mainly from improper management of the site, which could include improper conduct and housekeeping practices by workers (i.e. hunting of animals, discharge of hazardous waste to land, etc.).

Mitigation Measures

Note: as discussed in "Section 8.5.1" previously, a relocation program will be undertaken by a biodiversity expert prior to commencement of any construction activities onsite. Given that all the burrows are located within the Project site (none located outside), these mitigations will be applied for the OHTL.

The following identifies the additional studies and mitigation measures to be applied by the OHLT Contractor during the construction phase and which include:

- Implement proper management measures to prevent damage to the biodiversity of the site. This could include establishing a proper code of conduct and awareness raising / training of personnel and good housekeeping which include the following:
  - Prohibit hunting of any wildlife at any time and under any condition by construction workers onsite;

- Ensure proper storage, collection, and disposal of waste streams generated as discussed in detail in "Section 8.4.2";
- Restrict activities to allocated construction areas only, including movement of workers and vehicles to allocated roads within the site and prohibit off-roading to minimize disturbances; and
- Avoid unnecessary elevated noise levels at all times. In addition, apply adequate general noise suppressing measures as detailed in "Section 8.9.1".

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

10.2.4 Birds

This section has been prepared based on secondary data sources to include the following:

- NREA (2013)
- Endeco. 2023. FMP Report for OHTLs Ras Ghareb Wind Energy (RGWE) Gulf of Suez, Egypt, Spring & Autumn 2022.
- Endeco. 2022a. Final FMP Report Optimized Bird Fatality Monitoring Program for Lekela Power 250 MW West Bakr Wind Farm in the Gulf of Suez, Egypt, Spring 2022.
- Endeco. 2022b. 3rd Monthly Report Optimized Bird Fatality Monitoring Program for Lekela Power 250 MW West Bakr Wind Farm in the Gulf of Suez, Egypt, Autumn 2022
- SENS.2021. Bird and Bat Fatality Monitoring Program in Spring 2021. BOO RGWE Wind Farm 262.5 MW at Gulf of Suez, Egypt

The main risk of the OHTL once being built is the risk of collision for birds, and very rarely electrocution. Resident birds include true desert species such as Mourning Wheatear (*Oenanthe lugens*), Desert Wheatear (*Oenanthe deserti*), Spotted Sandgrouse (*Pterocles senegallus),* Crowned Sandgrouse (*Pterocles coronatus*), Greater Hoopoe Lark (*Alaemon alaudipes*), Desert Lark (*Ammomanes deserti*) and Cream-coloured Cursor (*Cursorius cursor*). Two species of concern, the Sooty Falcon (*Falco concolor*) and the Barbary Falcon (*Falco pelegrinoides*), have been also previously recorded from the wider area (NREA, 2013). The area near to Ras Ghareb is highly influenced by human activities. This is reflected on fauna which is mainly composed of commensal and opportunistic species. For example, a large colony of Desert Raven (*Corvus ruficollis*) is present in the area. Other common resident birds include the House Sparrow (*Passer domesticus*), Barn Swallow (*Hirundo rustica*) and Rock Dove (*Columba livia*).

There are no cliffs, trees or any other feature where large birds could breed or roost within the project footprint. Impact to birds do not restrict to the large birds but affects any kind of avian size. The risk may increase in areas where birds do not have perching sites and electricity infrastructure is prominent in the landscape. This is also a major issue along migration routes like here in the RVRSF.

As showed in the bird monitoring report for IPH and other projects in the region, large number of MSBs crosses the Red Sea area twice per year during the spring and autumn migration periods. They comprise mainly birds of prey, but also storks and pelicans. When required, like because of sudden sand storms, late evening migration, they rest near the coastline and on the surrounding desert plains and hills. Resting and roosting storks especially, utilize the two bays of Ghubbet El Zeit and Ghubbet El Gemsa and the salt marsh at Sabkhet Ras Shukeir. The most numerous birds of prey are Steppe Eagle (*Aquila nipalensis*), Steppe Buzzard (*Buteo buteo*), Honey Buzzard (*Pernis apivorus*) and Levant Sparrow Hawk (*Accipiter brevipes*). These are species mainly migrating in flocks but there are other endangered ones like the Egyptian vulture (*Neophron percnopterus*) doing almost solitary or in very small groups.

The impact that OHTL pose for all these birds is mainly collision. Due to the size of the insulators and the span of the cross arms, electrocution risk is minimal compared to collision. In addition, some of the powerlines in the region run parallel to the coast, intercepting the birds on their flying routes.

The main risk for any species and regardless their sizes is collision. Overall, it would be expected the shortest length being the best, as the risk would be lower due to a lower exposure to conductors. The following reports were reviewed and which were available fully or partially and include OHTL fatality monitoring:

- Endeco. 2023. FMP Report for OHTLs Ras Ghareb Wind Energy (RGWE) Gulf of Suez, Egypt, Spring & Autumn 2022.
- Endeco. 2022a. Final FMP Report Optimized Bird Fatality Monitoring Program for Lekela Power 250 MW West Bakr Wind Farm in the Gulf of Suez, Egypt, Spring 2022.
- Endeco. 2022b. 3rd Monthly Report Optimized Bird Fatality Monitoring Program for Lekela Power 250 MW West Bakr Wind Farm in the Gulf of Suez, Egypt, Autumn 2022
- SENS.2021. Bird and Bat Fatality Monitoring Program in Spring 2021. BOO RGWE Wind Farm 262.5 MW at Gulf of Suez, Egypt

Figure 107: Bird deterrents on the conductors at RGWE project after Endeco (2023)

Results of the OHTL PCFM revealed actual fatalities caused by collision with conductors. Overall, all species of MSBs have been recorded at the above-mentioned project or any other powerline infrastructure in the region like the Black kite, Honey Buzzard, White Stork, Great White Pelican, or Steppe Buzzard.

Other Powerline & Bird Interaction Studies in the Gulf of Suez not related to wind projects

The most comprehensive work developed up to now has been that by Nature Egypt (unpublished) between 2019 and 2021. Data were presented at the Conference *Safe Flyways: Conference on Energy and Birds October 8th -10th, 2022*. In 2019 (spring) and 2020 (spring and autumn) the fieldwork took place in the western side of the Gulf of Suez; in 2021 in the Sinai Peninsula side.

Transects were surveyed once per week, recording data on carcass persistence. Up to 333 fatalities of 22 species were recorded. From that amount, around 151 belonged to Migratory Soaring Birds, but large amounts were

unidentified remains (118 cases). The most abundant was the White Stork, followed by the Honey and Steppe buzzards. No eagles were reported but four Common Cranes. The study reported 87% of soaring birds but, in it is believed to be an overestimation given that this group comprises larger species with longer carcass persistence (pers. obs.) compared to smaller species.

Considering the two study areas the reported fatality rates (birds/km of powerline) were higher in the Sinai Peninsula (1.9 birds per km) compared to the Gulf of Suez (1.37). However, it is believed that this data could be skewed due to two reasons:

- Results we have obtained were raw number, without confidence intervals which could demonstrate the existence or not of significant differences between the two shores of the Red Sea.
- it is not known if there has been a deeper analysis of the data. As Shirihai et al. (2000) show there is a differential migration between spring and autumn but also among the different species involved in the migration routes. A more detailed analysis of the data is required.

However, the data clearly showed a significant relationship in the number of fatalities related to the distance to the coast. The closer to the coast, the higher number of fatalities recorded. In the case of IPH the powerline is far from the coast and within the turbines, which could pose a lower risk for the birds crossing, causing a barrier effect.

The study also considers the use of bird deterrents but by the time of the presentation it is just an intention and some budget has been allocated but we do not know about its implementation.

Considerations for IPH

Considering that there have not been specific pre-construction bird monitoring studies at the IPH site on birds' behavior towards the powerline in addition to the known widespread collision impact in the region, general mitigation rules are required for IPH or any powerline in the region to reduce potential collision impacts. The target species are the same as those recorded during the spring and autumn 2021 and spring 2023.

The following three points must be consulted with a powerline and avifauna expert before the powerline is constructed, closely working with the project engineers:

- Pylons: Final design including insulators, lengths of the cross arms, jumpers and other related materials and supplies
- Conductors and ground wire
- Type and installation of bird deterrents: The main mitigation measure will be the installation of bird deterrents to reduce the collision risk along the entire powerline. The type of bird deterrent will be selected according to demonstrated efficiency and manufactured by a certified company in this field. As a general rule, deterrents are installed along the ground wire/s at the appropriate distance between them. If required, they will also be installed on the conductors as well. In case there are no ground wires, the diverters will be installed on the conductors. A certified manufacturing bird-deterrent company will check and replace any damaged deterrent.
- A post-construction fatality monitoring program is to be in place, supervised by an international expert (IE) on this field. The consulting company will work closely together with the IE at least for the first three years of operation of the wind farm.
- Post-construction fatality monitoring design and analysis: This is an essential part of the assessment and should be additional to the turbine fatality monitoring.

10.2.5 Archaeology and Cultural Heritage

Based on the site survey undertaken, no archaeology and cultural heritage sites were identified or recorded within the OHTL route as well as the 100m buffer area.

Site preparation activities which are to take place onsite by the OHTL Contractor for the OHTL transmission towers and the various Project components to include foundations, access roads, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Although such activities are limited to the relatively small individual footprints of these components and the actual area of disturbance is relatively minimal, if such activities are improperly managed, they could damage or disturb archaeological remains present on the surface of the Project site. However, as discussed earlier there are no surface archaeology or cultural heritages sites within the Project area and therefore no impacts are relevant.

Nevertheless, there is a chance that throughout such construction activities, archaeological remains buried in the ground are discovered. Improper management (if such sites are discovered) could potentially disturb or damage such sites which could potentially be of archaeological importance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the OHTL Contractor during the construction phase and which include:

- Throughout the construction phase, and as the case with any Project development that entails such construction activities, there is a chance that potential archaeological remains in the ground might be discovered. It is expected that appropriate measures for such chance find procedures are implemented. Those mainly require that construction activities be halted and the area fenced along with proper signage, while immediately notifying the Ministry of Tourism and Antiquities/Red Sea and Suez Antiquities Inspection Office. No additional work will be allowed before the Ministry/Inspection Office assesses the found potential archaeological site and grants a clearance to resume the work. Construction activities can continue at other parts of the site if no potential archaeological remains were found. If found, same procedures above apply.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the OHTL Contractor during the construction phase and which include:

- For chance find procedure, inspection of actions taken in case of new discoveries, including fencing, limiting access to site, and contacting the Ministry of Tourism and Antiquities/ Red Sea and Suez Antiquities Inspection Office. Report should be prepared and submitted to the Ministry in such a case which details the above.

10.2.6 Air Quality and Noise

Site preparation activities which are to take place onsite by the OHTL Contractor for the OHTL transmission towers and the various Project components to include foundations, cables, access roads, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, such activities will likely result in an increased level of dust and particulate matter emissions, which in turn will directly and temporarily impact ambient air quality. If improperly managed, there is a risk of nuisance and health effects to construction workers onsite. In addition, construction

activities will likely entail the use of vehicles, machinery and equipment (such as generators, compressors, etc.) which are expected to be a source of other pollutant emissions (such as SO_2, NO_2, CO, etc.) which would also have minimal direct impacts on ambient air quality.

In addition, all the above activities will likely include the use of machinery and equipment such as generators, hammers, compressors, etc. and which are expected to be a source of noise and vibration generation within the Project site and its surroundings. If improperly managed, there is risk of nuisance and health affects to construction workers onsite.

Mitigation Measures

The following identifies the mitigation measures to be applied by the OHTL Contractor during the construction phase:

- Based on inspections and visual monitoring undertaken, if dust or pollutant emissions were found to be excessive due to construction activities, the source of such emissions should be identified and adequate control measures must be implemented;
- Comply with the Occupational Safety and Health Administration (OSHA) requirements and the Egyptian Codes to ensure that for activities associated with high dust and noise levels, workers are equipped with proper Personal Protective Equipment (e.g. masks, eye goggles, breathing masks, ear muffs, etc.);
- Apply basic dust control and suppression measures which could include:
  - Regular watering of construction active areas for dust suppression;
  - Proper planning of dust causing activities to take place simultaneously in order to reduce the dust incidents over the construction period.
  - Proper management of stockpiles and excavated material (e.g. watering, containment, covering, bundling).
  - Proper covering of trucks transporting aggregates and fine materials (e.g. through the use of tarpaulin).
  - Adhering to a speed limit of 15km/h for trucks on the construction site.
- Develop a regular inspection and scheduled maintenance program for vehicles, machinery, and equipment to be used throughout the construction phase for early detection of issue to avoid unnecessary pollutant emissions.
- Based on inspections and visual monitoring undertaken, if noise levels were found to be excessive from construction activities, the source of such excessive noise levels should be identified and adequate control measures must be implemented; and
- Apply adequate general noise suppressing measures. This could include the use of well-maintained mufflers and noise suppressants for high noise generating equipment and machinery, developing a regular maintenance schedule of all vehicles, machinery, and equipment for early detection of issues to avoid unnecessary elevated noise level, etc.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the OHTL Contractor during the construction phase and which include:

- Inspection and visual monitoring of the works should be carried out at all times. In addition, periodic inspections should be conducted at nearby sites (e.g. roads) to determine whether harmful levels of dust and noise from construction activities exist; and

- Reporting of any excessive levels of pollutants/dust or noise and the measures taken to minimize the impact and prevent it from occurring again.

10.2.7 Occupational Health and Safety

This section identifies and assesses the anticipated impacts from the Project activities occupational health and safety. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels. Throughout this section, the impacts during the construction and operation phase have been discussed collectively due to the similarity in nature of the impacts.

Throughout the construction phase, there will be generic occupational health and safety risks to workers, as working on construction sites increases the risk of injury or death due to accidents. The following risks are generally associated to construction sites and apply for the construction of the Project and could include:

- Slips and falls;
- Working at heights;
- Struck-by objects;
- Moving machineries;
- Working in confined spaces and excavations;
- Exposure to chemicals, hazardous or flammable materials; and
- Exposure to electric shocks and burns when touching live components.

Similarly, throughout the operation phase, there are occupational health and safety risks to workers from the various operation and maintenance activities expected to take place for the Project. The following risks are generally associated to such a Project and which could include:

- Working at heights during maintenance activities; and
- Exposure to a variety of hazards such as electric shock, and thermal burn hazards.

Mitigation Measures

The OHTL Contractor will be required to submit an Occupational Health and Safety Plan (OHSP) regarding the Project's construction activities. The objective of the Plan is to ensure the health and safety of all personnel in order to concur and maintain a smooth and proper progress of work at the site and prevent accident which may injure personnel or damage property of the OHTL Contractor and all involved sub-contractors. It is expected that such a plan provides details on the following:

- Identifies in details information in relation to emergency measures and plans, communication protocols, first aid instructions and facilities, training programs, occupational health and safety culture, inspection programs, monitoring and reporting requirements, incident management, etc.
- Identifies in details the activities that are expected for the Project (e.g. civil works, electrical wiring, tower assembly, electrical installation, commissioning, etc.) and lists the specific jobs which are to be undertaken under each activity and the hazards which may be associated for each (electric hazards, working with machinery, vertical works, etc.);
- For each of the activities above, the OHSP is expected to identify the preventive equipment and systems that must be in place to eliminate or reduce such risks. This includes: (i) collective protective equipment

(safety signs, traffic signs, hand signs, marking and signaling of work in progress, etc.); (ii) personal protective equipment (this includes the compulsory equipment for any worker or visitor onsite and obligatory equipment based on the tasks being carried out) (iii) detailed safety measures on how the task should be implemented in a safe manner to reduce any occupational health and safety risks.

In addition, similar to the above, it is expected that EETC has its own OHSP, which is implemented for all their maintenance activities for high voltage electricity lines in Egypt. It is expected that such a plan will be implemented for this Project in specific.

The OHTL Contractor and EETC are expected to adopt and implement the recommendations/provisions of the OHSP throughout the Project construction and operation phase.

10.2.8 Community Health, Safety and Security

This section identifies and assesses the anticipated impacts from the Project activities on community health, safety and security during the operation phase. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels. There are no foreseen impacts on community health, safety and security during the construction and planning phase.

In particular, the potential impacts on community health and safety, which are discussed throughout this section, include the following:

- Potential impacts from public access to Projects components during operation; and
- Potential impacts from exposure of Electric and Magnetic Field (EMF).

Potential Impacts from Public Access to Project Components during Operation

Such an impact is related to public access of unauthorized personnel to the various Project components. Such access could result in safety issues such as unauthorized climbing of the transmission tower, which could result in safety hazards (electric shock, thermal burn hazards and other).

Mitigation Measures

The following presents the mitigation measures that are to be implemented by EETC during the operation phase of the Project and which include:

- Post informative signs on the transmission towers about public safety hazards and emergency contact information in both Arabic and English language. Signs, especially warnings need to be pictorial as well as written to ensure they are understood by those unable to read

Potential impacts from Exposure of Electric and Magnetic Field (EMF) during Operation

Electric and magnetic fields (EMF) are radiation associated with the use of electric power such as household wiring, electric appliances and also from OHTL. Electric fields are produced from the voltage in the transmission line while magnetic fields are produced from the electric current. While electric fields can be shielded by objects (such as buildings or trees), magnetic field pass through most objects. Such fields are strongest at the source and decrease significantly with increasing distance from the source.

Extensive scientific research and studies have been undertaken to address potential human health impacts from long term exposure to EMF from transmission lines. The general consensus is that the overall scientific evidence

for human health risk from EMF exposure is weak however EMF exposure could not yet be recognized as entirely safe.

Similarly, the EHS Guidelines for Electric Power Transmission and Distribution issued by the IFC also states that although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern.

The IFC EHS Guideline also requires that exposure level limits to the public should remain below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) limits provided in the table below.

Table 86: ICNIRP Exposure Limits for General Public Exposure to Electric and Magnetic Fields

Frequency	Electric Field (V/m)	Magnetic Field (μT)
50 Hz	5000	100
60 Hz	4150	83

The National Grid (an international electricity and gas company based in the UK and north-eastern US) provides typical electric and magnetic field limits for various voltage lines (132kV, 275kV, and other). The values indicate that electric and magnetic fields are within the ICNIRP limits and even reach negligible amounts at around 50m – 100m from the OHTL (source: http://www.emfs.info/sources/overhead/specific/132-kv/)

In addition, according to the National Institute of Environmental Health Sciences (NIEHS) at a distance of around 100m EMF from power lines are similar to typical background levels found in most homes ("Electric and Magnetic Fields Associated with the Use of Electric Power" (NIEHS, 2012)). Finally, the IFC EHS guideline also state that transmission lines require RoW to protect the system and also protection from potential hazards and in which RoW for transmission lines are generally from 15m to 100m.

Taking the above into account, as noted earlier, the OHTL and 100m buffer on both sides is completely vacant and no activities or receptors were recorded (e.g. permanent settlements or similar) which could be impacted by EMF.

Mitigation Measures

There are no mitigation or monitoring measures to be considered.

Potential Impacts from Noise during Operation

According to the "IFC EHS Guidelines for Electric Power Transmission and Distribution" (IFC, 2007) noise in the form of buzzing or humming can be often heard around high voltage power lines producing corona – however noise produced by power lines does not carry any known health risks. In addition, such noise quickly dissipates with distance and is easily drowned out by typical background noises.

Noise impacts from the OHTL are expected to be negligible. As noted earlier, the Project area and 100m buffer on both sides is completely vacant and no activities or receptors were recorded (e.g. permanent settlements or similar) which could be impacted by EMF.

Mitigation Measures

There are no mitigation or monitoring measures to be considered.

10.2.9 Infrastructure and Utilities

A field survey was undertaken with the objective of identifying any infrastructure and utility elements within the Project site. The survey was undertaken to cover the entire OHTL route as well as 100m buffer on both sites.

Based on the above, the following elements were identified:

- Another OHTL runs near the proposed OHTL for the Project and within the northern parts in specific. The existing OHTL is presented in green in the figure below. The existing electricity line is under the responsibility of the Egyptian Electricity Transmission Company (EETC); and
- The OHTL runs over a key existing highway. The highway is presented in yellow in the figure below. The highway is under the responsibility of Roads Directorate in Red Sea Governorate

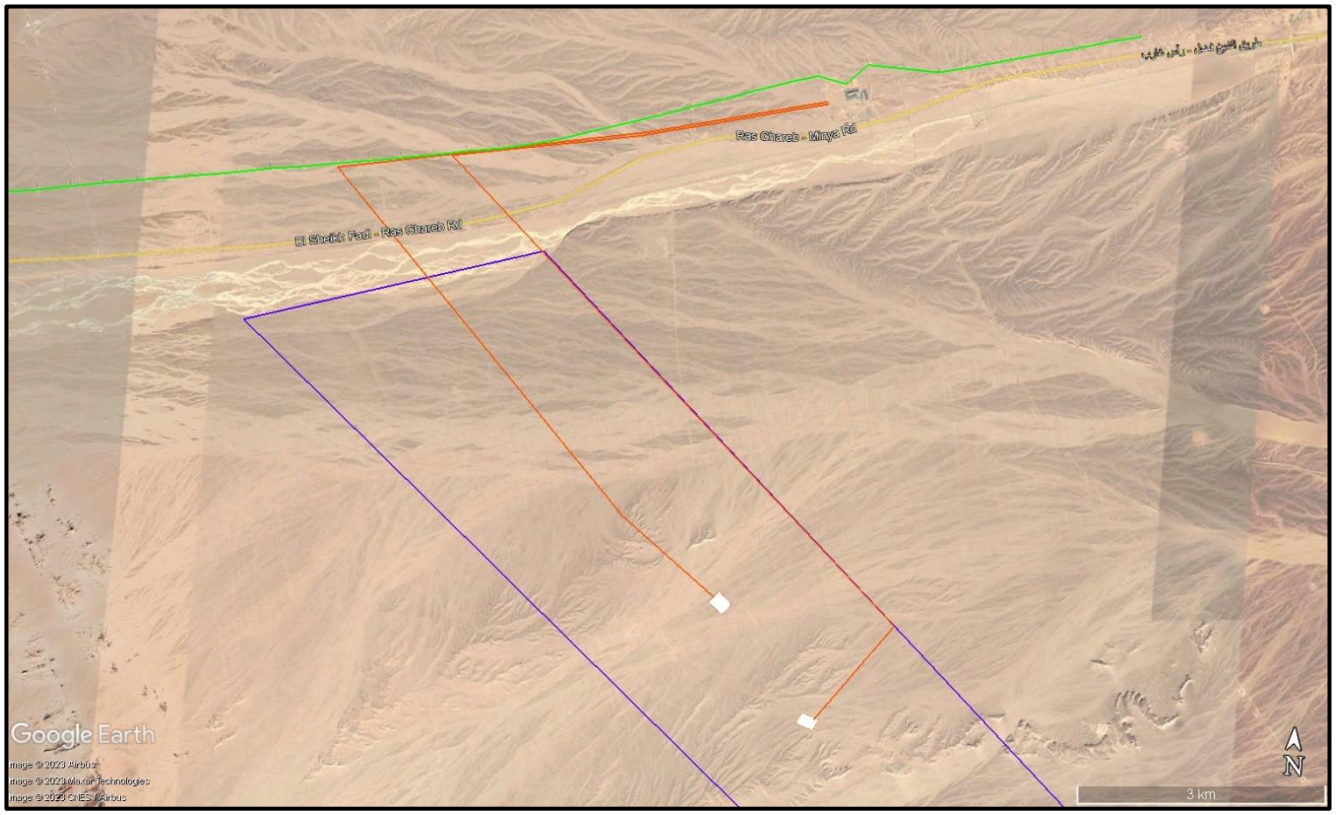

Figure 108: Existing Infrastructure and Utility Elements within the Project Area

Inappropriate design of the OHTL could affect the infrastructure and utility elements noted onsite to include the road and the electricity networks. This could include for example inappropriate vertical height of the transmission line from roads which could be a public safety concern for vehicles on the road, or inappropriate horizontal height of the transmission lines from other nearby OHTL lines which could also entail public safety concerns.

Apart from the above, as noted in the baseline sections there are no existing infrastructure and utility elements within the OHTL route.

Mitigation Measures

Discussions should be undertaken between EETC and Roads Directorate to discuss the OHTL route design and identify appropriate vertical and horizontal distance requirements from the existing OHTL and road networks to ensure health and safety measures are maintained.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the OHTL Contractor and EETC during the planning phase:

- Review of detailed design to ensure appropriate vertical and horizontal buffer distances are maintained for all infrastructure and utility elements recorded within the OHTL route