

# Site-Specific Environmental and Social Impact Assessment (ESIA)

## NIAT and RASGHA 500MW Windfarm in Gulf of Suez, Egypt

### Biodiversity Management Plan

May 2026

REV-0



Client:



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## TABLE OF CONTENTS

<b>TABLE OF CONTENTS.....</b>	<b>4</b>
<b>TABLE OF Tables .....</b>	<b>4</b>
<b>TABLE OF Figures .....</b>	<b>4</b>
<b>1 INTRODUCTION.....</b>	<b>6</b>
1.1 The Report .....	6
1.2 Purpose and Scope .....	6
1.3 The Project Site and the Study Area .....	6
1.4 Lenders Standards .....	9
<b>2 Overview of Biodiversity.....</b>	<b>10</b>
2.1 Designated Areas.....	10
2.2 Habitats, Flora and Terrestrial Fauna .....	10
2.3 Bats .....	12
2.4 Birds.....	12
2.5 Assessment of Ecological Receptors.....	12
<b>3 Impact Assessment .....</b>	<b>15</b>
3.1 Priority Biodiversity Features .....	15
3.2 Habitats and Flora .....	15
<b>4 Mitigation and Management .....</b>	<b>16</b>
4.1 Overall Approach to Biodiversity.....	16
4.2 General – Biodiversity .....	16
4.3 Construction Phase.....	18
4.4 Operational Mitigation to be Installed During the Construction Phase .....	23
4.5 Operational Phase .....	23
4.6 Development of a Biodiversity Action Plan .....	29
<b>5 Roles and Responsibilities.....</b>	<b>30</b>
5.1 Developer .....	30
5.2 Biodiversity Manager .....	30
5.3 Site Workers .....	31
<b>6 Appendix 1 – BMP tables .....</b>	<b>32</b>
<b>7 Appendix 2 - Scope of Shutdown On Demand Protocol.....</b>	<b>42</b>
<b>8 Appendix 3 – Post Construction Fatality Monitoring (PCFM) Program .....</b>	<b>50</b>

## TABLE OF TABLES

Table 1: Species considered to be triggering Critical Habitat.....	13
Table 2: Species considered to be Priority Biodiversity Features .....	13
Table 3: Metric for the Calculation of Habitat Condition (to be updated to reflect results of detailed quadrat surveys).....	19
Table 4: Habitat Condition Rating and corresponding Habitat Condition Scores.....	20
Table 5: Monitoring Program .....	27

## TABLE OF FIGURES

Figure 1: Project Site.....	8
Figure 2: Map of the main elements of the Rift Valley/Red Sea flyway showing key bottleneck sites (Source: BirdLife International) .....	8
Figure 3: Egyptian Spiny-tailed Lizard Records (Red stars) and Burrows (Circles) within and around Project Site during 2021.....	11
Figure 4: Distribution of Active and Inactive Egyptian Spiny-tailed Lizard Indicators within the Project Site during 2026.....	11
Figure 6: Scheme of main communication channels to implemented in the course of the AMP & ATMP (Colours represent responsibility: dark red – Responsible Entity for execution of the AMP and the ATMP; dark green – Other Responsible Entities; red – Technical/Steering Committee; and dark orange consultants; dark blue – Wind Farm Owner; light gray – all involved parties) .....	48

## Abbreviations

ATMP	Active Turbine Management Plan
BMP	Biodiversity Management Plan
CHA	Critical Habitat Assessment
EBRD ESR6	European Bank for Reconstruction and Development Environmental and Social Requirement 6
EEAA	Egyptian Environmental Affairs Agency
ESIA	Environmental and Social Impact Assessment
HSSE	Health, Safety, Security and Environment
IBA	Important Bird Area
IFC PS6	International Finance Corporation Performance Standard 6
IUCN	International Union for the Conservation of Nature
KBA	Key Biodiversity Area
NCE	Nature Conservation Egypt
RCREEE	Regional Centre for Renewable Energies and Energy Efficiency

## **1 INTRODUCTION**

### **1.1 The Report**

This document details a Biodiversity Management Plan (BMP) for the NIAT and RASGHA 500MW Wind Power Project, Gulf of Suez, Egypt. This BMP details the procedure for the implementation of the Project's biodiversity mitigation and management measures during the construction phase that will be followed by the Project Company and the Contractors. It also includes outline details of the mitigation, monitoring and management measures for the operational phase of the Project that will be fully detailed in an updated BMP, when all project details are known.

### **1.2 Purpose and Scope**

This BMP details the Project's biodiversity management initiatives, commitments, and obligations to safeguard and promote the viability of priority species and habitats associated with the Project.

Implementation of this BMP will ensure the Project's alignment with best practice, legislative requirements and the Project's commitments to biodiversity. It is a dynamic document that will be adapted and updated as and when new information becomes available throughout the lifespan of the Project to ensure its relevancy.

The purpose of this document is to:

- Set out the Project commitments and obligations related to biodiversity, and ensure compliance with relevant legislation, and the overarching requirements of the Project.
- Provide a summary of the baseline biodiversity conditions within the Project site.
- Identify activities that may have an impact on fauna and flora, highlighting the major biodiversity threats.
- Specify management, mitigation and enhancement measures / actions to be implemented for the Project to control impacts affecting the biodiversity within the project's area of influence.
- Identify roles and responsibilities for the implementation of identified actions.
- Outline training requirements, including awareness raising for workers.
- Specify monitoring and evaluation criteria, including KPIs to demonstrate no-net loss and net gains where applicable.
- Outline reporting requirements to Project stakeholders.

This document is considered part of the ESMS that will be implemented during the construction and operation of the Project.

The BMP is structured as follows:

- Section 1: Introduction
- Section 2: Provides an overview of the biodiversity elements within the Project Area
- Section 3: Presents the key impacts anticipated from each phase of the Project
- Section 4: Presents the mitigation requirements to be implemented
- Section 5: Roles and responsibilities related to the plan.

### **1.3 The Project Site and the Study Area**

The NIAT and RASGHA 500MW Wind Power Project is located in the Ras Gharib Local Governmental Unit of the

Red Sea Governorate of Egypt, approximately 250 km to the south-east of the capital city of Cairo. The nearest town is Ras Gharib, which is located 8 km to the east of the Project area. The Project is proposed to occupy approximately 73 km<sup>2</sup> (shown in *Figure 1*).

Being located by the western coastline of the Gulf of Suez, the project site and the general study area are located along the Red Sea/Rift Valley flyway. This is one of the most important migration flyways for migratory soaring birds in the world with over 1.5 million soaring birds migrating through it twice a year (Birdlife, 2020). The flyway links the European breeding grounds with the African wintering areas for at least 37 migratory soaring bird species. Regular migration monitoring along the western coast of the Gulf of Suez where the project is located has shown that there is a significant difference in the level of use of the area during migration seasons. Research has shown that this part of the flyway is used by much larger numbers of birds during spring migration in comparison with autumn migration seasons.

The Project area lies to the west of the Gebel El Zeit Key Biodiversity Area (KBA), at approximately 1km to 2.5 km west of the KBA, which is a narrow, 100-km-long strip of land extending along the Gulf of Suez/Red Sea coast, from Ras Gharib in the north to the bay of Ghubbet El Gamsa in the south. This contains several pools of hyper-saline water and large patches of saltmarsh as well as two large shallow bays with extensive intertidal mud and sandflats (Birdlife, 2023). The KBA and surrounding area is known to be used by over 250,000 migratory soaring birds each year, with many of these birds crossing between the western shore of the Gulf of Suez and the Sinai Peninsula on their spring and autumn migrations. A map of the concentrated Rift Valley/Red Sea flyway elements is shown in *Figure 2* (N.B. birds migrate across the general area in Spring and Autumn, however concentrated crossing points have been identified at several locations along the coastal areas of Egypt).

As part of the Environmental and Social Impact Assessment (ESIA) for the project, in-flight monitoring assessments were undertaken at the project site during the spring and autumn seasons 2021 and 2022 as well as autumn 2025 and spring 2026. Additionally, a comprehensive literature review was completed.

A Critical Habitat Assessment has also been completed for the Project. This found that two species meet CH-qualifying thresholds, namely the White Stork (*Ciconia ciconia*) and Steppe Eagle (*Aquila nipalensis*). These species are present on site due to the presence of a landfill. This is being removed prior to commissioning and at that point the site would no longer be considered Critical Habitat for these two species. Furthermore, high numbers of migratory soaring birds were observed flying over the site.

Habitat on site appears to broadly be natural habitat, but it is in some cases disturbed and degraded, for example by the dumpsite and oil and gas facilities. Twenty-one migratory soaring bird species comprising Black Kite (*Milvus migrans*) (IUCN LC), Black Stork (*Ciconia nigra*) (IUCN LC), Booted Eagle (*Aquila pennata*) (IUCN LC), Common Crane (*Grus grus*) (IUCN LC), Common Kestrel (*Falco tinunculus*) (IUCN LC), Eastern Imperial Eagle (*Aquila heliaca*) (IUCN VU), Egyptian Vulture (*Neophron percnopterus*) (IUCN EN), Eurasian Sparrowhawk (*Accipiter nisus*) (IUCN LC), Honey Buzzard (*Pernis apivorus*) (IUCN LC), Great White Pelican (*Pelecanus onocrotalus*) (IUCN LC), Greater Spotted Eagle (*Clanga clanga*) (IUCN VU), Lesser Spotted Eagle (*Clanga pomarina*) (IUCN LC), Levant Sparrowhawk (*Accipiter brevipes*) (IUCN LC), Long-legged Buzzard (*Buteo rufinus*) (IUCN LC), Montague's Harrier (*Circus pygargus*) (IUCN LC), Osprey (*Pandion haliaetus*) (IUCN LC), Pallid Harrier (*Circus macrourus*) (IUCN NT), Short-toed Snake Eagle (*Circaetus gallicus*) (IUCN LC), Sooty Falcon (*Falco concolor*) (IUCN VU), Steppe Buzzard (*Buteo vulpinus*) (IUCN LC) and Western Marsh Harrier (*Circus aeruginosus*) (IUCN LC) and one reptile - the Egyptian Spiny-tailed lizard (IUCN VU) are considered to be Priority Biodiversity Features and will be the focus of this BMP document.



Figure 1: Project Site

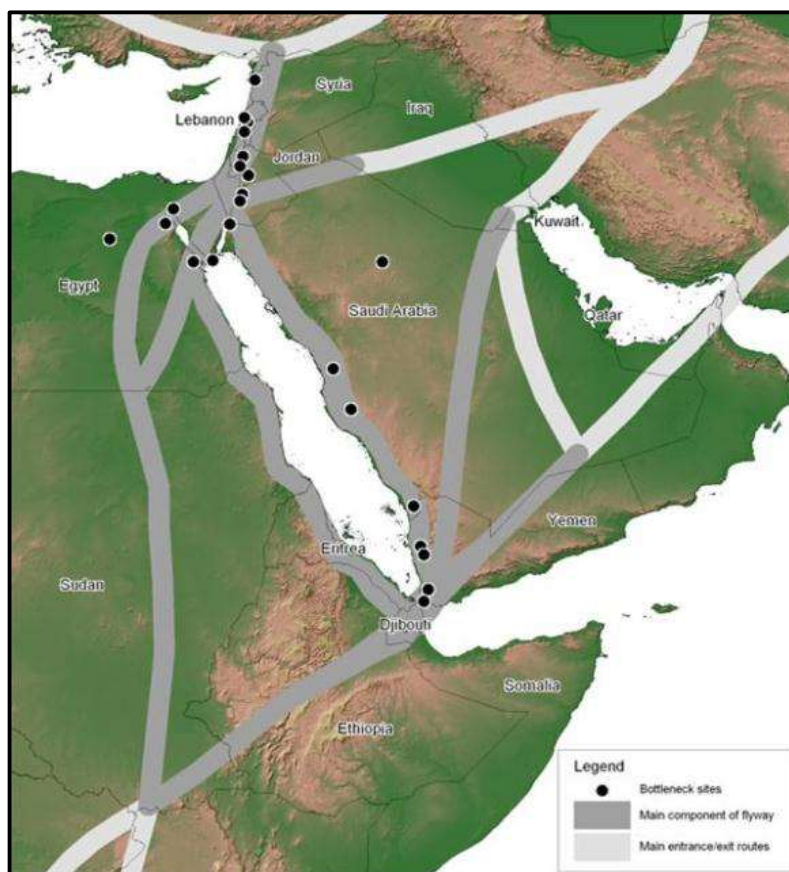


Figure 2: Map of the main elements of the Rift Valley/Red Sea flyway showing key bottleneck sites (Source: BirdLife International)



## 1.4 Lenders Standards

Standards for the IFC, EBRD and EIB performance standards/requirements are detailed below.

The Lender requirements indicate that protecting and conserving biodiversity, and its ability to change and evolve, is fundamental to sustainable development. The requirements set out in the standards/requirements have been guided by the Convention on Biological Diversity, which defines biodiversity as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems.” The three principal objectives are:

- a) to protect and conserve biodiversity,
- b) to maintain the benefits from ecosystem services, and
- c) to promote the sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities.

The overall biodiversity objective of the Project is to ensure:

- Ecological processes are maintained and are not disrupted.
- Impacts on fauna and flora species as a result of construction and O&M activities are minimized.
- “No net loss” for any Priority Biodiversity Features / Feature of Significant Biodiversity Value.
- Net Gains for Critical Habitat qualifying species; and
- Ensure no significant negative residual impact on other ecological receptors.

Achieving these objectives requires that the mitigation hierarchy is exercised to manage project related impacts by taking appropriate avoidance, minimization and restoration measures before biodiversity offsets are considered to compensate for significant residual impacts.

## 2 OVERVIEW OF BIODIVERSITY

### 2.1 Designated Areas

#### 2.1.1 Legally Protected Areas

No national or international designations were identified within the site boundary for NIAT and RASGHA 500MW Wind Power Project.

The Project location is not located within any existing or planned natural protectorates, with the closest around 15km away - Malahet Ras Shukeir proposed Protected Area.

#### 2.1.2 Internationally Recognized Areas

The Project site is located around 1.5 km west of the internationally recognised Gebel El Zeit IBA. This is designated as an important migration corridor for soaring migrants, particularly birds of prey, White Storks (*Ciconia ciconia*) and Great White Pelicans (*Pelecanus onocrotalus*).

### 2.2 Habitats, Flora and Terrestrial Fauna

The field survey for baseline biodiversity data was undertaken at the Project site during the spring and autumn of 2021 as well as spring 2022. The focus of the field survey was mainly to identify key habitats and identify any outstanding biodiversity taxa and/or elements that could require specific focus. In addition, an updated survey for Egyptian Spiny-tailed Lizard in specific was undertaken in 2025 due to the importance of this species.

The initial field survey mainly included field observations, where the site was examined carefully for the presence of active animals, animal signs and tracks, active burrows, remains or any other signs that indicate the activity of animals. Due to the large size of the Project site, the research team focused on areas of high priorities; mainly wadis since they are believed to be the main corridors that animals would use in moving around the site. The team carried out route-transects along the wadis searching for any of the above-mentioned signs of animal presence. Similar approach was followed for the flora survey where the survey focused on sides of wadis and any areas where vegetation was noticed. In addition, the site was surveyed for occurring plant species which were noted and recorded to include number of species, coverage interception per species, etc.

No rare or threatened habitats were identified during the surveys, although the Project Area is considered largely natural habitat, being primarily coastal plains habitat and the wadis. No endemic or higher conservation status plant species were identified in the surveyed area, similarly no endemic fauna species were identified in that area either. Wide ranging species such as the Striped Hyena (*Hyaena hyaena*) (IUCN NT) Nubian Ibex (*Capra nubiana*) (IUCN VU) and Dorcas Gazelle (*Gazella dorcas*) (IUCN VU) were identified as having ranges which overlap with the Project Area, however no evidence of these was found during the surveys and their core range in the region is in the mountains to the west well away from the site.

One globally threatened IUCN Vulnerable reptile species, the Egyptian Spiny-tailed Lizard was found in the Project Area during the surveys. This species was recorded along with their burrows as noted below.

#### *Egyptian Spiny-tail Lizard*

During the 2021/2022 surveys, a total of 7 Egyptian Spiny-tail Lizards and 30 burrows were identified in and within the buffer of the Project site at different stages of age (Juvenile, subadult and adult) near their burrows or sometimes at the entrance of the burrows. The records were mainly at the suitable habitats related to the vegetated Wadis within and around the Project site, as shown in Figure 3.

During the 2025 targeted field survey for Egyptian Spiny-tail Lizard, approximately 20 indicators of presence were identified within the Project site including 17 burrows, which were both active at the time of survey (defined by having footprints, drag marks or signs of fresh digging at the entrance) and not active, and other signs such as scat and tracks. Observations of burrows were at a density of 0.136 per km<sup>2</sup>. The spatial distribution of these

observations in the project site shows a generally random distribution with no distinct clustering pattern observed, as shown in Figure 4.

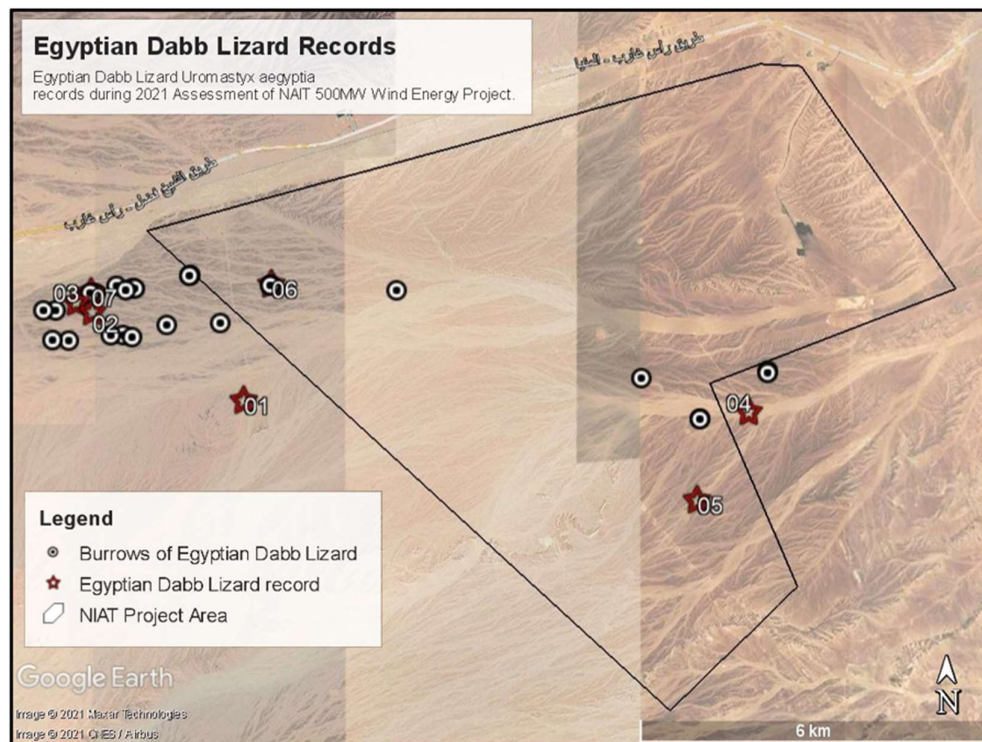


Figure 3: Egyptian Spiny-tailed Lizard Records (Red stars) and Burrows (Circles) within and around Project Site during 2021

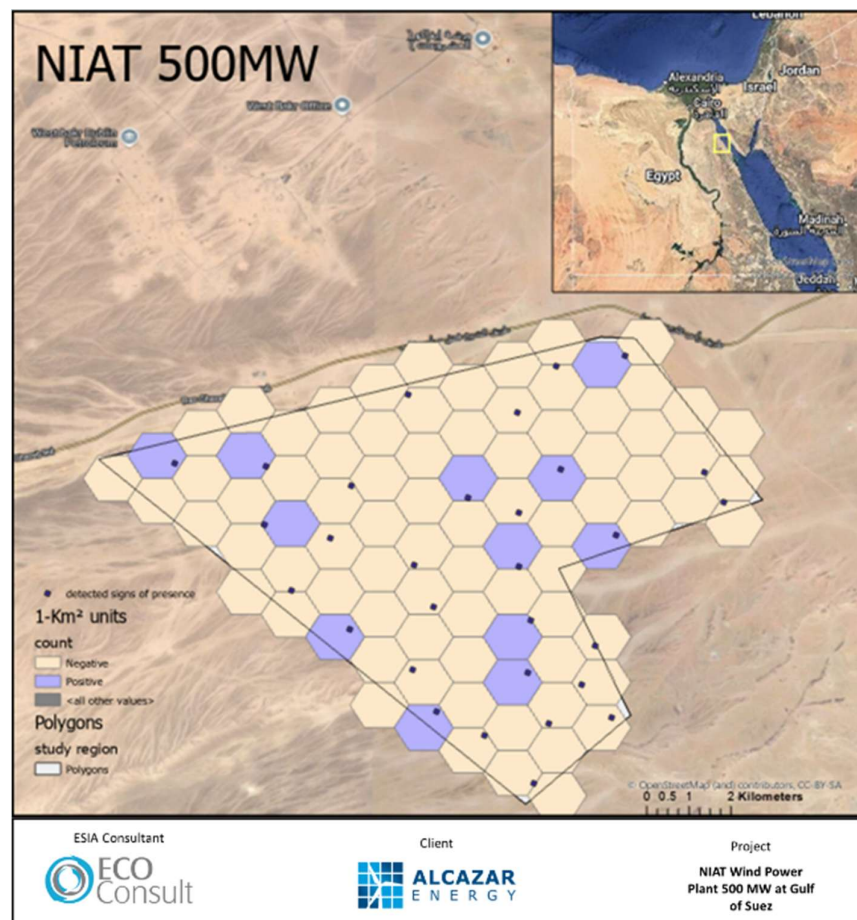


Figure 4: Distribution of Active and Inactive Egyptian Spiny-tailed Lizard Indicators within the Project Site during 2026

## 2.3 Bats

Automated detector surveys were undertaken during May to October 2025 at four locations on site. The detectors were on site for a total of 145 nights (combined total of 290 nights) and recorded from 30 minutes before sunset until 30 minutes after sunrise. All recorded audio files were checked and any bat calls analysed with “Anabat Insight” using Auto ID.

There are no natural or man-made structures on site suitable for use by roosting bats.

Only 80 bat calls/passers were recorded during the monitoring period with 34 calls of *Hypsugo ariel* and 46 calls of *Taphozous nudiventris* recorded on 22<sup>nd</sup> September 2025 and 5<sup>th</sup> October 2025 respectively. Both of these species are listed as Least Concern on the IUCN Red List.

## 2.4 Birds

Vantage point surveys were undertaken at the site in spring and autumn 2021-2022 as well as autumn 2025 and spring 2026, with eight vantage points selected to cover the entire Project Area. These were surveyed by experienced surveyors, with all flight times, direction and heights recorded on standardized forms. In total the site received over 5,517 hours of survey across spring 2021 and 2022 and a further 1,284 hours over spring 2026 with surveys ongoing. 9,531 hours of survey have been completed across autumn 2021, 2022 and 2025 to cover the major periods of migration in the region.

Spring 2021 and 2022 recorded a total of 339,798 birds of 28 species. 97-98% of the birds recorded (depending on the year) belonged to only six (6) species, White Stork (*Ciconia Ciconia*), Steppe Buzzard (*Buteo buteo vulpinus*), Steppe Eagle (*Aquila nipalensis*), Levant Sparrowhawk (*Tachyspiza brevipes*), Black Kite (*Milvus migrans*), and European Honey Buzzard (*Pernis apivorus*). Spring 2026 (February to March) recorded a total of 68653 birds of 22 species (with an additional 34 birds identified to group level. Spring 2026 surveys are ongoing and will be analysed and detailed within the updated BMP once complete.

Autumn 2021, 2022 and 2025 recorded a total of 14,304 birds of 25 species. 90-97% of the birds recorded (depending on the year) belonged to only five (5) species; the European Honey Buzzard, White Stork, Great White Pelican, Western Marsh Harrier and Black Kite.

Five of these species are globally threatened, including two (2) Endangered-EN (Steppe Eagle and the Egyptian Vulture), and three (3) Vulnerable-VU species (Sooty Falcon, Great Spotted Eagle and Eastern Imperial Eagle). In addition, one (1) species is Near Threatened-NT (Pallid Harrier). All the remaining species observed are classified as Least Concern-LC.

Surveys on site identified the dumpsite as an important feeding area within the survey area. Overall, the rubbish dump was used by eight (8) species and 2,723 individuals, with the Steppe Eagle and the White Stork being the most abundant, accounting for 81.5% and 16.5% of the observed birds. Other species included Black Kites, Common Kestrels, Western Marsh Harrier, Steppe and European Honey Buzzard, and Osprey. The dumpsite was closed in 2025 and a new dumpsite has been created. Prior to construction, the dumpsite within the project site will be cleared.

## 2.5 Assessment of Ecological Receptors

### 2.5.1 Modified and Natural Habitats

The Project Area contains natural habitat, being primarily desert habitat and wadis. No endemic or higher conservation status plant species were identified in the surveyed area. Approximately 0.9km<sup>2</sup> of natural habitat will be impacted during the proposed works.

### 2.5.2 Critical Habitats

Species triggering Critical Habitats were identified during the surveys and these are shown in Table 1.

**Table 1: Species considered to be triggering Critical Habitat**

Species	Status	CH Criterion Reached
Steppe Eagle	IUCN EN	Criterion 1 & 3
White Stork	IUCN LC	Criterion 3

### 2.5.3 Priority Biodiversity Species

Twenty-one migratory soaring birds and one reptile species qualifying as PBF's have been confirmed on site. These species and the relevant qualifying criteria are shown below in Table 2.

**Table 2: Species considered to be Priority Biodiversity Features**

Species	Status	PBF Criterion Reached
Black Kite	IUCN LC	Criterion 4a -
Black Stork	IUCN LC	Criterion 4a -
Booted Eagle	IUCN LC	Criterion 4a -
Common Crane	IUCN LC	Criterion 4a -
Common Kestrel	IUCN LC	Criterion 4a -
Eastern Imperial Eagle	IUCN VU	Criterion 2 - Vulnerable Species and 4a
Egyptian Vulture	IUCN EN	Criterion 4a
Eurasian Sparrowhawk	IUCN LC	Criterion 4a
Honey Buzzard	IUCN LC	Criterion 4a -
Great White Pelican	IUCN LC	Criterion 4a -
Greater Spotted Eagle	IUCN VU	Criterion 2 - Vulnerable Species and 4a
Lesser Spotted Eagle	IUCN LC	Criterion 4a -
Levant Sparrowhawk	IUCN LC	Criterion 4a -

Species	Status	PBF Criterion Reached
Long-legged Buzzard	IUCN LC	Criterion 4a -
Montagu's Harrier	IUCN LC	Criterion 4a -
Osprey	IUCN LC	Criterion 4a -
Pallid Harrier	IUCN NT	Criterion 4a -
Short-toed Snake Eagle	IUCN LC	Criterion 4a -
Sooty Falcon	IUCN VU	Criterion 2 - Vulnerable Species and 4a
Steppe Buzzard	IUCN LC	Criterion 4a -
Western Marsh Harrier	IUCN LC	Criterion 4a -
Egyptian Spiny-tailed Lizard	IUCN VU	Criterion 2 - Vulnerable Species



### 3 IMPACT ASSESSMENT

This section presents the key anticipated impacts of the Project.

#### 3.1 Priority Biodiversity Features

##### 3.1.1 Avifauna

The construction phase of the project is expected to include clearance/levelling of land, excavation of turbine foundations, crane pads and building footprints, cable route trenching and the construction of internal roads.

The potential impacts are created during the construction phase only, and of a short-term duration. 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 environmental receptor is determined to be of medium sensitivity. Given all of the above, such an impact is considered to be minor significance.

Impacts during the operation of the wind farm are also possible as a result of collision with the operational turbines, displacement and disturbance impacts and collision and electrocution with the OHTL. Some of the mitigation will be installed during construction (e.g. Bird Flight Diverters (BFDs) on the OHTL) along with operation mitigation e.g. an active turbine management plan.

##### 3.1.2 Terrestrial

Direct impacts to Spiny-tailed Lizard are possible as a result of construction (habitat clearance, levelling or any other works) activities including killing or injuring, disturbance, direct habitat loss from construction of site roads, WTGs, substations, compound area and access roads and habitat loss through fragmentation/barrier effect, poaching and collection, and indirect impacts from noise, pollution, non-native invasive species. Habitat loss along the OHTL AoI is also likely. Impacts are likely to be medium-term and irreversible.

Impacts to Dorcas Gazelle, Nubian Ibex and Striped Hyena during the construction phase (habitat clearance, levelling or any other works) of the WF (and OHTL) are not predicted based on no presence during survey. However they are recorded in the wider vicinity and so should they be recorded during construction consideration will be given to potential impacts on direct mortality and injury from vehicles and other plant machinery, displacement and disturbance impacts, as well as loss of habitat, poaching and collection and indirect impacts from noise, pollution and non-native invasive species.

Significant operational impacts on reptiles and mammals are not predicted. Impacts associated with vehicle collisions are however possible as well as impact associated with maintenance activities to a lesser extent.

#### 3.2 Habitats and Flora

Habitats present on the Project site are considered to be largely natural habitat but no endemic plant species, species of conservation importance or threatened habitats have been identified during the studies. In total the Project footprint will result in the permanent loss of an estimated 0.9 km<sup>2</sup>. Losses of desert habitat are due to the construction of turbine bases, crane pads, building infrastructure, cable trenching and internal road networks and are considered to be of minor significance at a local level.

## 4 MITIGATION AND MANAGEMENT

### 4.1 Overall Approach to Biodiversity

The Project will seek to proactively address impacts and proposes to use an adaptive management approach (plan-do-check-act-replan) to reduce their potential severity.

The Project will follow the principles of the “mitigation hierarchy” as defined under IFC, EBRD and EIB E&S requirements. Those require that measures are taken to avoid creating E&S impacts from the outset of development activities, and where this is not possible, to implement additional measures that would minimize, mitigate, and as a last resort, offset and/or compensate any potential residual adverse impacts.

Management is defined as any actions that correspond to the four elements of the mitigation hierarchy, as described below.

- **Avoidance:** actions taken to fully prevent impacts to biodiversity values, such as changing the spatial design of a project to prevent impacts in specific locations
- **Minimization:** actions taken to reduce the duration, intensity and/or extent of impacts that cannot be completely avoided
- **Rehabilitation/Restoration:** actions taken to return areas to beneficial use and, if possible, assist in the recovery of the ecosystem that has been degraded, damaged, or destroyed
- **Biodiversity Offset:** measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people’s use and cultural values associated with biodiversity.

The measures detailed in this chapter of the BMP deals with the first three steps in the mitigation hierarchy and any actions are based on impacts identified in the Project’s ESIA. Offsetting is related to potential impacts on CH triggering species (White Stork and Steppe Eagle) which will be covered in a BAP. A BAP will be developed to understand potential residual impacts and if required provide comment on offsetting strategies that would cover the residual impact.

### 4.2 General – Biodiversity

The measures detailed in this section are designed to avoid or minimize general impacts on the environment and biodiversity. Specific actions in relation to Priority Biodiversity Features are also included which will ensure that there are no-net losses for the qualifying species.

#### Biodiversity Manager

The Contractor is responsible for the appointment of an in-county Biodiversity Specialist who will oversee all construction mitigation and monitoring that is detailed in the following sections.

#### Induction and Training

As required within the **ESMS Manual**, the Contractor will design and deliver to all Project Employees, including subcontractors, mandatory E&S training covering all aspects of this BMP.

Training will be provided through an induction program, toolbox talks, ongoing job specific training, refreshers, and exercise/drills. A copy of the induction-training program shall be submitted to the Developer for comment prior to mobilisation onsite. The Contractor shall provide training and attendance records to the Developer on a monthly basis. Only specific topics relevant to biodiversity are included in this document.



All personnel and visitors shall have completed the Project's induction before having access to the Project Site and/or commencement of a task or any other works on the Project Site.

Training and inductions will include a specific section in relation to biodiversity and the measures that have been put in place to avoid and / or minimize impacts to biodiversity as well as mitigation measures and habitat re-instatement and enhancements. A summary of the controls relating to biodiversity is included below and these measures are in place in order to avoid and minimize direct impacts within the project site as well as indirect impacts to the wider landscape and locally and internationally Protected Areas (e.g., IBA/KBA).

#### Pollution Control

The **Waste Management Plan** must identify pollution control measures to be applied across the whole of the site and for the off-site disposal of wastes. These measures will avoid or minimize impacts on habitats and biodiversity.

To avoid contamination, hydrocarbons will be stored in secured bunds to be located on impermeable surfaces with controlled drainage away from natural water courses. Bunds will be sufficient to contain 110% of the volume of liquids to be stored within. They will also be fully contained to stop contamination of rainwater run-off. In addition, refuelling of vehicles and machinery will only occur in designated areas.

All hazardous materials must be correctly stored to limit chances of contamination of the area. Generally, it would be advisable to use biodegradable hydraulic oils, where possible. Hazardous waste and materials should be managed in accordance with Section 8.4 Geology, Hydrology and Hydrogeology within the ESIA.

#### Speed Limits and Driving Limits within the Project Site

The **Traffic and Transport Management Plan** must require that all driving be permitted on formal site roads and off-road driving is prohibited, unless it is driving within a works area (e.g. moving equipment or infrastructure around the site or for maintenance operations). Site wide speed limits and limits of driving are to be strictly enforced by the Contractor in order to avoid / minimize the impacts of driving and vehicles on biodiversity. Speed limits should be set to 15 kmph on on-site roads/tracks and no off-road driving. Enforcement of speed limits and limits of driving will minimize impacts on habitats, flora, birds, mammals, reptiles on site through the prevention of killing and injuring and reducing the likelihood of erosion and degradation of the habitats.

All site workers should adhere to national speed limits when driving to and from site.

#### Hunting / Collection of Animals and Plants

The worker code of conduct within the **Labor and Working Conditions Management Plan** must include the ban on hunting and or collection of animals and plants from the Project Area to be strictly enforced and this will avoid and minimize any construction related impacts on biodiversity features within the Project Area, especially Egyptian Spiny-tailed Lizards since hunting/collection are considered some of the major threats to this species. Any training should also include details of any relevant national legislation protecting rare and endangered species as well as any national schemes (e.g. to reduce impact of trade in species).

#### Invasive Species

Measures regarding the control of invasive species will be fully implemented to avoid the introduction and spread of invasive species within the Project Area *or the wider landscape and nearby Protected Areas*. In order to control / limit the spread or introduction of invasive species the following will be completed:

- Any material that is imported into the site will be sourced responsibly by the contractor
- Continual survey of the site and any laydown areas, including soil storage areas, for the presence of non-native or invasive species and recording and reporting if any are observed
- Training of contractors / site staff as part of the induction process
- Consideration within the Project-specific ESMS of Invasive Species Management measures. This will include:

- Identification of non-native or invasive species within the site boundary. This will be done by reporting any species thought to be non-native or invasive to the site manager
- Details of mechanical removal (e.g. cutting, pulling) and disposal to a safe location off site (invasive species should not be composted or simply cut and left as these methods can contribute to their proliferation)
- 

#### Site Cleanliness and Control of Pest Species (e.g. Rats)

The **Waste Management Plan** must state that the site, including all offices and workers buildings are to be kept free of rubbish and litter, including food waste, as these might attract pest species and/or scavenging birds. All waste will be placed into appropriate bins and containers which will be appropriately sealed (e.g. lids or covers) to prevent pest species entering. In all cases priority will be for the use of mechanical control measures for pest species such as setting of live traps. Passive methods of control, such as chemical poisoning with baits or glue traps will only be used if there are no other feasible alternatives due to the potential to harm non-target species found within, and outside of, the Project Area. Finally, if pest species are caught, they will be humanely killed and if any non-target species are caught will be released, unharmed, away from site buildings.

### **4.3 Construction Phase**

#### **4.3.1 Habitats and Flora**

No sensitive habitats or species of plant were identified during the surveys but the site is situated within largely natural habitat and therefore habitat loss for Project infrastructure will be kept to a minimum. All areas of natural habitat being removed will be measured and recorded prior to work taking place so that a quantitative assessment of habitat loss can be completed.

Following construction an area of 0.9 km<sup>2</sup> will be enhanced using appropriate, native planting in suitable parts of the Project Area, this will ensure that no net loss of habitat as a result of the works. This planting enhancement will be away from the main construction works, to benefit species as much as possible. Any areas of additional planting will be monitored as part of the biodiversity monitoring program and any species which do not establish will be replaced.

Prior to construction works, working areas will be subject to a botanical walkover survey to identify areas of non-native or invasive species. Any such specimens will be clearly marked, and the specimen will be removed and disposed of. Working areas will be clearly demarked using temporary fencing (e.g. orange netting attached to wooden posts), so that site workers fully understand the working area. Encroachment into areas outside of agreed working areas will be prohibited and working areas will be subject to regular check by the Biodiversity Manager to check enforcement of working areas.

On completion of phased construction works the Contractor will be responsible for habitat restoration works in all areas that have been subject to temporary disturbance. A Habitat Restoration Plan including a habitat metric is described below.

Habitat condition assessment surveys will be carried out based on methodologies adapted from published methodologies (Sopotlieva et al 2018<sup>1</sup>). Broadly the aim is to:

- Survey the extent and condition of the habitats to be impacted at the outset of works;
- Assess the total habitat loss based on aggregating the scores/area for all different areas being impacted;

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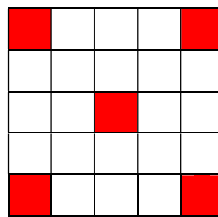
<sup>1</sup> Sopotlieva et al 2018 Ecosystem condition assessment of semi-natural grasslands outside the Natura 2000 network in Bulgaria, using vegetation data. TUEXENIA 38:385-404

- Ensure during rehabilitation that the total habitat restoration effort meets an increased total habitat score.

Surveys will need to include control plots within parts of the project area that will not be impacted by the works. All of the pre-clearance habitat survey work will be undertaken within desert habitat, which is largely contiguous. However, there are some finer spatial habitat changes, for example within wadis. Plant species richness will be determined as a result of the detailed quadrat surveys and the final scoring within the metric may be updated to reflect this most representatively.

Surveys will include quadrat (2m x 2m) surveys across all areas and will be completed within the pre-commencement surveys. Exact locations for quadrat survey will be finalised during the survey to ensure representative locations are chosen. The quadrats will be oriented with their sides aligned north-south and a GPS location will be taken in the south-eastern corner of the quadrat to ensure repeatability. Photos of the quadrats will also be taken.

At each location for quadrat survey, five 2x2m quadrats will be undertaken in a grid pattern as shown below.



10x10m survey plots will be undertaken at each separate works location. Where habitats change at a survey location a plot will be required for each habitat (e.g. one in desert, one in wadi). Effort in each work location will include:

- WTG bases. One plot and one control plot adjacent in untouched land per base.
- Along roads (likely to be permanent habitat loss) and along tracks (temporary loss). One plot approximately every 1 km along the road. In addition a 'control' plot will be completed every third plot.
- Along the OHTL routes where there will be some permanent habitat loss at tower locations and temporary loss/damage along route. A quadrat location will be recorded approximately every 1 km.
- Substation and other permanent infrastructure within the windfarm work areas where there will be permanent habitat loss quadrats will be recorded at 4 per hectare with one control plot corresponding in adjacent untouched land.
- Within the windfarm work areas where there will be temporary habitat loss quadrats will be recorded at 4 per hectare with one control plot corresponding in adjacent untouched land.
- Other areas – sometimes areas outside of the above are impacted by contractors working outside of the correct proposed areas. If this occurs work should be conducted in these areas to ensure that the overall impact on habitat is kept up to date and restoration can be all encompassing going forward.

Table 3 shows what will be recorded during each quadrat survey and how each quadrat will be scored in order to determine the condition of the habitat area surveyed. The parameter scores for each of the five 2m x 2m quadrats will be averaged to give a final score for wider 10m x 10m quadrat.

**Table 3: Metric for the Calculation of Habitat Condition (to be updated to reflect results of detailed quadrat surveys)**

Parameter	Unit	Approach	Score 1 (Very Poor)	Score 2 (Poor)	Score 3 (Moderate)	Score 4 (Good)	Score 5 (Very Good)
1. Plant Species	Number of species	Observation	0-1	2-3	4-5	6-7	8+

Richness	per sample plot area						
2. Vegetation Cover	% (full number) per habitat type	Estimation based on Observation (quadrat)	0-9	10-24	25-49	50-74	75-100
3. Abundance of native weeds and alien species	% of native weed/alien cover within the vegetation present (i.e. a % of plants coverage excluding bare ground)	Estimation based on Observation (quadrat)	26-100	11-25	6-10	1-5	0
4. Visible damage from human activities, as vehicles, geological exploration, fire, evidence of domestic livestock (grazing, paths, manure, clearings), etc.	% (full number)	Estimation based on Observation (quadrat)	26-100	11-25	6-10	1-5	0

For all parameters whole numbers will be used and will be rounded up, or down to the closest whole number.

Where vegetation cover is less than 10% a score of 0 will be applied to cover of Parameter 3. This is to avoid artificially inflating habitat condition scores for quadrats that are poorly vegetated.

The Metric maximum score is 20 (e.g. 4 x Score of 5). The Metric minimum score is 3.

Once the survey is completed the total score for each quadrat will be determined by adding up the scores for that quadrat (quadrat score). Once determined the Habitat Condition Score for that area is calculated by dividing the Quadrat Score by the Maximum Score (e.g. Quadrat Score of 20 = Habitat Condition Score of 1 (20 / 20), Quadrat Score of 15 = Habitat Condition Score of 0.75 (15 / 20)). Habitat Condition Rating and corresponding Habitat Condition Scores are shown in the table below.

**Table 4: Habitat Condition Rating and corresponding Habitat Condition Scores**

Habitat	Condition Rating	Condition Score
	Very Poor	0.15 - 0.2
	Poor	0.25 – 0.4
	Moderate	0.45 – 0.6
	Good	0.65 – 0.8
	Very good	0.85 - 1

### *Habitat Restoration*

Habitat restoration will be completed in areas of the Project Aol that have been damaged by Project related construction activities and habitats will be restored to their former condition or better.

Additional habitat rehabilitation areas within the WF Aol (areas that are existing damaged/poor) will be identified during the pre-commencement survey, to be enhanced to ensure no net loss is achieved or an overall net gain. The area of land that will need to be restored will be determined following confirmation by the Contractor of working areas for the WF and OHTL Projects (e.g. confirmation of area sizes of permanent lost habitat and temporary damaged habitat). Areas of habitat subject to restoration and rehabilitation will be improved through a process of re-grading earth, including filling in and re-profiling existing rutted tracks for example.

To utilise this metric in the field to provide information for habitat restoration / rehabilitation, habitat hectares

(HH) would be calculated from the total amount of habitat loss (ha) multiplied by the condition of the habitat (e.g. 100ha of good condition habitat is  $100 \times 0.75 = 75HH$ ).

Following the restoration it should be ensured that the Habitat Hectares are greater than at the outset of the project.

#### **4.3.2 Mammals**

Wide ranging species such as the Striped Hyena (*Hyaena hyaena*) (IUCN NT), Nubian Ibex (*Capra nubiana*) (IUCN VU) and Dorcas Gazelle (*Gazella dorcas*) (IUCN VU) were identified as having ranges which overlap with the Project Area, although no evidence of these species has been found during the surveys.

If any large mammals are seen during the construction process, the construction manager will be informed, and photographs will be taken, if possible, for identification. This ongoing monitoring will be undertaken, and the results of the monitoring will be included in seasonal reporting.

Site-wide lighting is not planned so any lighting impacts during operation will be very limited. Night-time working is not anticipated and will be limited as required for the concrete pouring of WTG foundations and WTG installation if needed. Where lighting is required within worker compounds, site offices etc. ensure that any lighting is shielded and protected to reduce light-spill and glare. Low intensity lighting should also be used, where possible, to further reduce light spill. For external security lights PIR trigger units should be used and these should be timed to automatically switch off after five minutes. T Aviation lights will be as per protocol and Civil Aviation Authority requirements.

#### **4.3.3 Birds**

The site does not have any nest activity for the species listed as triggering Critical Habitat, White Stork and Steppe Eagle. These species are present on site due to the presence of a landfill only. This is being removed prior to commissioning and at that point the site would no longer be considered Critical Habitat for these two species. A wider coverage of the whole site must be carried out to ensure no new dumping sites are created.

There are twenty-one Priority Biodiversity Features comprising Black Kite, Black Stork, Booted Eagle, Common Crane, Common Kestrel, Eastern Imperial Eagle, Egyptian Vulture, Eurasian Sparrowhawk, Honey Buzzard, Great White Pelican, Greater Spotted Eagle, Lesser Spotted Eagle, Levant Sparrowhawk, Long-legged Buzzard, Montagu's Harrier, Osprey, Pallid Harrier, Short-toed Snake Eagle, Sooty Falcon, Steppe Buzzard and Western Marsh Harrier. Whilst these species move through the area there is no clear interaction with the land and the site does not represent a bottleneck for the migratory birds therefore, the Project's impacts on birds during the construction phase are expected to be negligible.

Immediately prior to construction, a walk-over survey will be undertaken of all working areas to check for the presence of ground nesting birds which would be at risk from construction related impacts. Surveys will be completed by an appropriately qualified ornithologist, and surveys will be undertaken in the hours after sunrise (up to 10:00). The surveyors will aim to identify behaviour indicative of breeding activity (e.g. carrying food / nesting material / fecal sacs, presence of nests, eggs or chicks (both nidifugous and nidicolous)).

Where nests are found during construction, they will be recorded in full and their locations mapped, with the data transferred to Excel master sheets and Google Earth. Mapping will then be circulated to the project team along with details of a works exclusion zone if needed. Exclusion zones will be established based on the survey results and the expertise of the qualified Ornithologist and the Project Ecologist. All clearance work within this period will be done under the supervision of an on-site Ecologist.

Mitigation during construction will include timing work to remove suitable nesting habitat outside of the most sensitive times of year for ground nesting species, and for all clearance work within this time period to be done under the supervision of an on-site ecologist. The more sensitive times of year are from February to June however it is important to note that weather, in particular rainfall, impacts breeding period in a desert context and

accordingly this is not fixed as the only suitable breeding times.

Impacts to migratory soaring birds through the construction period for either turbine or OHTL tower construction are considered to be unlikely based on surveys to date and none of these species having been recorded landing or interacting with the ground during their migration.

#### **4.3.4 Reptiles**

Pre-construction surveys for sensitive species (i.e. those qualifying Priority Biodiversity Features) of herpetofauna have taken place in 2021, 2022 and 2025. The locations of known/active burrows used by Egyptian Spiny-tailed Lizard have been marked throughout the Project Area. Currently none of the known burrows intersect with the proposed infrastructure areas.

Given the change in location of evidence of Spiny-tailed Lizard activity between surveys, in case new burrows are created, prior to the start of construction suitable sites for the release of relocated Egyptian Spiny-tailed Lizards will be identified and mapped. During this process a consideration on the carrying capacity of the proposed release area will be undertaken (considering habitat quality, area and density of other individuals present). Other windfarms within the area have had success with their translocation projects and therefore this is considered to be a suitable mitigation strategy. A suitable translocation receptor site must:

- Preferably be within the project wide boundary but certainly be within 10 km of the Project site.
- Contain appropriate vegetation (both for food and cover).
- Have suitable soil types to allow animals to dig and create new burrows.
- Not already be close to carrying capacity for this species.
- Not within another existing or proposed development site (or where there is likely to be a proposed site).

In order to ensure that the receptor area is suitable for Egyptian Spiny-tailed Lizards a translocation plan will be produced prior to any work to more specifically detail the plan for lizard translocations on this project. This should include details on the receptor site baseline (including carrying capacity) as well as the practical steps to be followed to ensure safe capture and handling of lizards (including involvement of veterinary specialist on the site).

Capture and movement of Spiny-tailed Lizards will only be completed as a last resort. All works will aim to be completed at least 250m from active burrows. Locations where burrows are present up to 500m of construction will be monitored throughout the construction period and if significant negative impacts (i.e., abandonment of burrows or increased mortality) are observed the remaining burrows in closest proximity will be excavated and the animals captured and translocated to holding areas in accordance with the below protocols for the duration of the construction window in that location.

Should fresh burrows be identified at the commencement of clearance works, these burrows will be excavated by hand and the animals captured and translocated, details of this are provided below.

Prior to work in an area containing Spiny-tailed Lizard burrows any remaining burrows within 100m of proposed works will be re-checked by the Biodiversity Manager using an endoscope and if empty, will be dug out and destroyed. If any animal is found back in the working areas, the burrow will be dug out carefully by hand and the animal captured and placed in a secure box before being taken to a cool location ready for translocation to the receptor site. Once the lizard is removed from the burrow the hole will be collapsed and made unsuitable for future use.

If areas suitable for translocation exist within the Project Area these will be prioritized as this minimizes the impacts of transporting animals away from the Project site. Where possible animals will be moved to existing, but inactive, burrow sites – as long as the site is still suitable for use, with nearby food and cover plants etc.

Studies have shown that soft releasing Spiny-tailed Lizards leads to a better survival rate than simply releasing the

animals into a new site<sup>2</sup> so any animal which is translocated will be soft-released into an individual mesh enclosure within an area of suitable habitat. The pen will measure at least 2m x 2m and be covered to provide shade and prevent attack from above. A “starter hole” will be dug using a 20cm auger to a depth of approximately 30cm to provide some initial shelter. Supplementary feeding will also be given and after a period of seven days the enclosure will be removed to allow the lizards to move and forage naturally.

After the relocation period, a report will be prepared which will include the following information:

- Survey dates and timing of capture and release
- Weather conditions during survey and relocation effort
- Location of captured individuals
- Number of captured individuals during each relocation effort
- Number of juveniles, mature males and mature females
- Release sites used for relocation of each effort
- Number of males and females released at each site
- Number of mortalities during relocation effort

#### 4.4 Operational Mitigation to be Installed During the Construction Phase

Mitigation is being installed to reduce the operational impact of the OHTL on migrating birds including birds of prey, waterbirds and other large soaring birds. Bird Flight Diverters (BFDs) are to be installed along whole length of the OHTL. The BFDs installed should be ones that glow or light up at night and move with the wind to increase visibility for nocturnal migrants (e.g. Hawk Eye diverters). They will be required to install diverters that meet the required long-term guarantee (e.g. of ten years or more) and specifications that are equal to or better than Hawk Eye diverters. Installation of earthing wire and attached BFDs should be completed at the time the lines are strung or at the very latest installed within 1 week of line stringing.

The installation of BFDs will need to be recorded by the Project Ecologist, and these checks need to be included in the annual reports. BFDs should be checked every 6 months before the spring and autumn migration seasons so that they are in place and operational for higher risk periods. Any damaged or defective BFDs will need to be replaced within 2 months of being reported as faulty.

A separate ESIA is being undertaken for the OHTL and mitigation will be updated following this.

#### 4.5 Operational Phase

##### 4.5.1 Operational Management Plan

The Operator will implement proper Mitigation, monitoring and 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;

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<sup>2</sup> Translocation trial of spiny-tailed lizard or dhub in Dubai, UAE. Soorae, P. S. (ed.) (2018). Global Reintroduction Perspectives: 2018. Case studies from around the globe. IUCN/SSC Reintroduction Specialist Group, Gland, Switzerland and Environment Agency, Abu Dhabi, UAE. xiv + 286pp [https://iucn-ctsg.org/wp-content/uploads/publications/14\\_2018\\_Spiny-tailed\\_Lizard\\_UAE.pdf](https://iucn-ctsg.org/wp-content/uploads/publications/14_2018_Spiny-tailed_Lizard_UAE.pdf)



- 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 above; 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.

#### **4.5.2 Avifauna Monitoring and On-Demand Turbine Shutdown**

The Project Aol is flat or gently undulating and as such turbines will be more obvious to birds migrating over the site than within hilly terrain. Nonetheless, Monitoring during the operation of the wind farm will be completed in order to inform the actual impact caused by the wind farm on resident and migratory birds. The monitoring will be undertaken with the primary objective of collision avoidance but also secondary for migration monitoring behavior, to ensure adaptive management.

Monitoring must take place during the spring migration season (from 20<sup>th</sup> of February until 20<sup>th</sup> of May) and autumn migration season (from 10<sup>th</sup> of August till 10<sup>th</sup> of November). Throughout these periods, monitoring must take place continuously on a daily basis with full site coverage using vantage points and experienced surveyors.

Shutdown on demand (SDOD) will take place ensuring the following principles are followed:

- All of the turbines and a buffer area will be covered by constant observation.
- The buffer will ensure that enough time is available for WTG to be shut down when birds approach.
- Observers will work in pairs and in shifts to ensure a vigilant effort from observers.
- Observers will communicate both with shutdown operatives and other observers to ensure effective practices.

Shutdown protocol process will include discussions with other operatives in the region to ensure coordination whenever possible to minimise impacts on biodiversity. Depending on the detailed findings of the follow-up in-flight monitoring, a detailed protocol will be prepared for the Shutdown on Demand, including a comparison between the various available shutdown on demand options. Also, based on the accumulated findings of the assessments of the various seasons, the highest areas of sensitivity would be identified and key species of concern will be further identified so that they can be considered during the shutdown on-demand procedures and any appropriate adaptive management.

Avifauna monitoring and SDOD protocol requirements (within the Active Turbine Management Program (ATMP)) are detailed further in Appendices.

The use of observer led SDOD in the region has proven effective to date. It should be noted however that the potential use of automated SDOD should be considered as a possibility as part of a range of adaptive management measures should observer led SDOD unexpectedly be proven to not be effective.

#### **4.5.3 Avifauna and Bat Carcass Search during Operation**

During the operation phase, Post Construction Fatality Monitoring (PCFM) will be undertaken, with carcass search surveys covering each turbine across the entire wind farm (*Table 5*). The carcass search will demonstrate the effectiveness of mitigation measures such as turbine shut down and allow an estimation of the annual number of bird and bat deaths caused by the turbines.

Post construction fatality monitoring will be completed at all of the turbines and the program of post construction monitoring will include carcass searching, searcher efficiency trials and carcass persistence trials. The results of the post-construction fatality monitoring will be used to inform a GenEst Analysis. Such effort will be in line with the Post-construction Bird and Bat Fatality Monitoring for Onshore Wind Energy Facilities in Emerging Market Countries – Good Practice Handbook and Decision Support Tool (2023) or the most up to date guidance as it is released.

An adaptive management strategy will be developed, and additional mitigation will be undertaken if the results of the post-construction fatality monitoring indicate higher than predicted mortality, especially in relation to species



of elevated conservation concern.

PCFM protocol requirements are detailed further in Appendices.

#### **4.5.4 All Fauna Chance Find Procedure**

A chance find procedure will be developed and implemented by the Biodiversity Manager and all staff trained in its use.

This document will establish the procedure for actions in case of discovering species that may be impacted by the works and may require further mitigation to avoid or minimise impacts. This includes the animals themselves, and signs of them, e.g. burrows or nests. Training is to include what to do in the event of finding different types of receptor e.g. live small mammals, live large mammals, lizards, etc. Such discoveries must be immediately reported to the Biodiversity Manager who must then undertake further investigation, report the findings to the Project Biodiversity manager and appropriate actions implemented (which will depend on conservation significance of the find). This may require further actions to be agreed by the Lenders.

In addition to reporting live animals, all site staff must report ALL incidents of dead animals within the Project Aol, and all incidents should be investigated by the Biodiversity Manager or suitably qualified specialist. This is very important for all large carcasses as these will need to be removed from the site to avoid creating an attractant to other large mammals or scavenging birds. This element of the chance-find procedure will be included in the on-site induction.

The initial actions and report to the Biodiversity Manager must include, but not be limited to:

- The relevant person (e.g. team leader etc.) must inform the Biodiversity Manager of the find as soon as possible same day or within 24 hrs. This information must include GPS coordinates, and if possible photographs of the find;
- The relevant person (e.g. team leader etc.) must compile a Preliminary Report. The Preliminary Report will record basic information about the find including:
  - The date and time of the find
  - A description of the discovery (live or dead animal, type of evidence (burrow/nest etc.))
  - A description of its context, where and how the find was discovered
  - If the animal was alive, what did it do/where did it go
  - Photographs to accompany the preliminary report if possible (the more the better):
    - Photos of the find itself
    - Photos of location from several angles.
  - Who specifically found the species and who recorded details/took photos
- A chance finds procedure will also be implemented should any site worker find a wild animal, especially one that has become a nuisance (e.g. scavenger in the works camp, presence of a snake or a scorpion on the works site) and the Contractor will arrange for an appropriately qualified person to capture and relocate. Where scavengers have been identified within the works site additional housekeeping measures may be required. Any additional actions will be recorded and documented.

#### **4.5.5 Invasive Species**

Measures regarding the control of invasive species will be fully implemented to avoid the introduction and spread of invasive species within the project area or the wider landscape and nearby Protected Areas. In order to control / limit the spread or introduction of invasive species the following will be completed:

- Material imports to be taken from licensed local quarries or borrow pits to avoid importing non-native and invasive species.

- On arrival at the Project area vehicle will go into a wheel-cleaning facility that will be established before entry into the Project Area. The vehicle will then be subject to a visual inspection and if necessary water or compressed air will be used to remove any other loose dirt debris.
- Measures to remove any identified non-native or invasive species within the site boundary if found. Measures will include:
  - Mechanical removal (e.g. cutting, pulling) and disposal to a safe location off site (invasive species should not be composted or simply cut and left as these methods can contribute to their proliferation)
  - Chemical removal (e.g. blanket application of pesticides, spot treatments) will only be used as a last resort and in line with Lender Safeguards and only once Lender approval for their use has been agreed.

#### **4.5.6 Site Cleanliness and Control of Pest Species (e.g. Rats)**

The **Waste Management Plan** must state that the site, including all offices and substation buildings, are to be kept free of rubbish and litter, including food waste, as these might attract pest species and/or scavenging birds. All waste will be placed into appropriate bins and containers which will be appropriately sealed (e.g. lids or covers) to prevent pest species from entering. In all cases priority will be for the use of mechanical control measures for pest species such as setting of live traps. Passive methods of control, such as chemical poisoning with baits or glue traps will only be used if there are no other feasible alternatives due to the potential to harm non-target species found within, and outside of, the project area. Any chemical treatments will be used as a last resort and in line with Lender Safeguards and only once Lender approval for their use has been agreed. Finally, if pest species are caught, they will be humanely killed and if any non-target species are caught they will be released, unharmed, away from site buildings.

#### **4.5.7 Pest Species: Cats and Dogs**

Where feral cats and dogs are identified the Contractor / Ecologist must be notified and efforts made to catch these animals and transport them to appropriate animal shelters away from the site. Guard dogs for the works site (e.g. security for site offices, workers accommodation) must not be used. Pet cats and dogs are not allowed. These measures are in place to ensure no direct or indirect impacts to small mammals, reptiles and birds which are present within the site boundary.

#### **4.5.8 Lighting**

The following mitigation measures will be applied throughout the operational period to avoid/reduce the potential negative impact of lighting on valued ecological receptors:

- Night-time working will be limited and only completed when strictly necessary. Some emergency/unplanned night-time working may however be required but any such work would be limited and not permanent or regular (over extended periods). Any lighting required for such activities will be low intensity lighting and will be shielded to reduce light spill. Night-time working will be monitored to ensure minimal impacts (e.g. looking for grounded birds or bats) and if significant impacts are identified, night-time working will be ceased and alternative operational maintenance approaches explored.
- Where lighting is required within site offices etc. ensure that any lighting is of a warm hue (2700k or less), cowed and angled downwards to reduce light-spill and glare. Lights with a low component of UV will also be used, to further reduce impacts of lighting.
- For external security lights PIR trigger units maybe used and these should be timed to automatically switch off after for example a maximum of five minutes.
- No lighting will be installed along site perimeter or along any sections of the OHTL.

#### 4.5.9 Disturbance

Human disturbance at the site during the operational phase of the Project is expected to be minimal and limited to very occasional maintenance visits to limited areas of the site. No additional mitigation to reduce disturbance is considered necessary.

#### 4.5.10 Poaching and Animal Collection

The following mitigation measures will be employed throughout the operational phase of the project to prevent (avoid) the potential negative impact of poaching and animal collection:

- The Project will enforce strict controls on hunting, gathering, poaching and otherwise disturbing flora and fauna within the Project Aol. Any breaches of this ban will be strictly enforced, and any workers found in breach of this control measure will be subject to disciplinary procedures which will entail instant dismissal where species of international conservation concern (IUCN CR/EN/VU) or high in-country conservation concern are affected. For more common species a formal warning will be issued, followed by dismissal if the offence is repeated.
- The ban on hunting etc. will be included in the site induction along with clear confirmation of the sanctions for breaches of this control measure.

#### 4.5.11 Driving and Vehicle Collision

The following mitigation measures will be employed throughout the operational phase of the project to prevent (avoid) the potential negative impact of vehicle collisions:

- Appropriate speed limits will be enforced on internal road networks (40kmph).
- Speed limits will be enforced by regular speed checks to be undertaken by the site security staff and workers/contractors in breach of these will be fined. The results of monitoring will be included in annual reports.
- Regular signage will be installed along the site internal roads informing all drivers of the speed limit.
- Regular checks of the internal roads for carcasses and if found these will be removed and included in fatality reporting.
- A chance find procedure will be implemented so that all workers report any road (or infrastructure) collisions so that any such incident can be investigated in full.

#### 4.5.12 Summary of mitigation and monitoring

In addition to the operational turbine management and post construction fatality monitoring plans detailed above, mitigation and monitoring measures are to be applied during the operational phase of the project (*Table 5*). These are largely the same management prescriptions as the construction phase but must be adhered to during operation.

**Table 5: Monitoring Program**

Receptor	Impact	Mitigation / Monitoring	Frequency
Habitats	Destruction of habitats because of site maintenance works	Clearly defined working areas, working on existing tracks / roads where possible, pre-works checks for flora species of conservation concern	Daily monitoring by contractor site staff and fortnightly checks by biodiversity manager.
Habitats and Flora	Invasive Species	During routine maintenance, any invasive flora species should be identified and removed.	Any invasive species noted and project manager informed.

Receptor	Impact	Mitigation / Monitoring	Frequency
Habitats and Flora	All above	Monitoring using quadrats approach within Aol to measure rehabilitation work.	Years 1, 2, 5, 10 and 15
Terrestrial Fauna (e.g., breeding birds / reptiles)	Killing and injury	Site wide speed limits (15 kmph) to be enforced during operations phase. Pre-works checks of maintenance areas. Prohibition of hunting on site, including collection of live animals or plants.	Prior to any site maintenance works Any identified breaches to this will result in dismissal and individual to be reported to the relevant authorities. Any reptiles or any large mammals seen on site should be reported to the biodiversity manager.
Egyptian Spiny Tailed Lizard	-	Operational phase monitoring required if translocation undertaken prior to or during construction	Survey and monitoring in line with Translocation Plan. Burrows / lizards within the vicinity of works that are not translocated should be monitored at least weekly.
Herpetofauna (particularly Egyptian Spiny Tailed Lizard)	All above	Monitoring using repeat survey methods to assess against baseline populations. In particular use of year 5 to measure against baseline and understand requirement for adaptive management.	Years 1, 2, 5, 10 and 15
Ornithology	Collision with turbines and OHTL – soaring birds.	Shut down on demand of the turbines Carcass Searches BFDs (Firefly and big orange balls or Hawkeye) to be installed along the entire length of the OHTL at construction, replace any non-operational BFDs bi-annually.	Monitoring will be undertaken and will include daily monitoring surveys for 10 – 12 hours each day, between one hour after sunrise and one hour before sunset.
Ornithology	Attraction of birds to site	Monitoring of dump site	Monitoring will be undertaken weekly during the construction phase to ensure no dumping continues on site. Should it continue this must be reported to Biodiversity Manager
Bats	Collision with turbines	Carcass Searches	Carcass monitoring for bats will be adaptively monitored by post construction fatality monitoring to international best practice. Methods will be followed in accordance with the Post-construction Bird and Bat Fatality Monitoring for Onshore Wind Energy Facilities in Emerging Market Countries – Good Practice Handbook and Decision Support Tool (2023).

## 4.6 Development of a Biodiversity Action Plan

The CHA concluded that the Project meets the CH-qualifying thresholds under IFC PS6, EBRD ESR6 and EIB ESS4 for two species: Steppe Eagle and White Stork. Both species trigger CH only because of the attraction effect of the dumpsite. The dumpsite will be removed prior to commissioning, and as a consequence the CH-qualifying status of both species is expected to no longer apply. The Project commits to preparing and implementing a Biodiversity Action Plan (BAP) to ensure NNL commitments for Natural Habitat and PBFs and NG for CH-qualifying species should the CH thresholds still be met.

### 4.6.1 Scope of BAP

The BAP will describe the strategy to achieve NG for CH-qualifying species (if CH is confirmed after dumpsite removal) and NNL for Natural Habitat and PBFs. It will include:

- A demonstration of the full mitigation hierarchy applied to each receptor, showing that avoidance, minimisation and restoration have been applied before any offset measures are considered.
- Actions to be undertaken in case of a near miss or fatality of a priority VEC, PBF or CH-qualifying species, including review of the process, revision of mitigation measures, offsetting (if necessary based on the identified thresholds) and reporting
- An offset and compensation plan, scoped to deliver NG where significant residual impacts on CH-qualifying species remain
- Translocation plan for the Spiny-tailed Lizard
- Biodiversity monitoring and evaluation programme aligned with the operational monitoring already specified in this BMP.
- Defined roles, responsibilities, and reporting requirements for implementation of the BAP.

## 5 ROLES AND RESPONSIBILITIES

### 5.1 Developer

Measures have been included in this BMP to ensure that the construction and operation of the Project does not result in short, medium, or long-term negative impacts on site and broader ecological receptors, including those Critical Habitat or Priority Biodiversity Feature species.

The Developer is responsible for ensuring that the measures set out in this BMP are completed in full and this will be achieved by ensuring that the Contractor discharges their responsibility to conserve and enhance the ecological receptors found on the site, including Priority Biodiversity Features. This will ultimately be under the responsibility of the Developer HSSE Manager.

### 5.2 Biodiversity Manager

The Contractor shall appoint an appropriately qualified and experienced Biodiversity Manager whose overall responsibility will be to oversee the implementation of the BMP during the project.

The Biodiversity Manager will be the custodian of this BMP, checking the Project performance against its requirements as well as triggers for additional actions. The BMP will be updated periodically as required depending on the results of the surveys and if necessary additional works may be required in line with the monitoring requirement / targets.

The Biodiversity Manager will be present on-site during periods when construction activities pose significant risk to priority species. The Biodiversity Manager should be granted the authority to issue permit to work and to stop works, if deemed necessary.

The Developer and Contractor are required to support the Biodiversity Manager and provide them with the necessary resources, including personnel, in order that they can fulfil their responsibilities.

The Biodiversity Manager should be well trained in the practical elements of protected and sensitive species including handling of species that they may have to move and the recognition of sensitive habitats and plant species; he/she should also have a working understanding of wider environmental issues and the construction/engineering process. If these skills are difficult to obtain in country, then training exercises from international ecologists to 'upskill' the Biodiversity Manager may be required.

The key responsibilities of the Biodiversity Manager, include but are not limited to:

#### Document Management & Review

- Maintain the BMP and update as and when required.
- Draft biodiversity protocols and method statements including biosecurity protocols etc.
- Review and approve Contractor method statements to ensure biodiversity risks have been appropriately considered and that adequate management measures are specified.
- Liaise with Contractor to ensure biodiversity is considered within the 'permit to work' systems.

#### On-site Activity

- Conduct walkthrough (rapid assessment) surveys immediately prior to works commencing in an area to identify features such as sensitive locations and species including the presence of Egyptian Spiny-tailed Lizard burrows and bird nesting areas along with other sensitive ecological receptors.
- This is required for all construction activities that pose risk to local biodiversity, such as site clearance, trenching, piling etc.

- Supervise the site clearance works and provide advice to the workforce when required. If clearance work is taking place in multiple locations at any one time the Biodiversity Manager may require additional assistance, if this is the case additional field ecologists may be hired to help cover the sites fully.
- Ensure the monitoring of the dumpsite during the construction period takes place weekly. This should continue through the first migration season following construction. Should no dumping take place the Biodiversity Manager can agree an updated monitoring protocol.

#### Training and Worker Awareness

- Provide worker awareness and training sessions on the requirements of the BMP, the need for the protection of local fauna, and the code of conduct that forbids poaching or deliberate killing of animals.
- Contribute to the production of an ecology section for the site wide induction which all new staff will have to complete prior to completing works on the site. This information should include details on the ecology of the site as well as identification charts for species found on the site.
- Prepare and deliver biodiversity management and control measures as part of the Toolbox Talks (TBT), which should include protocols for recording of incidental sightings as well as any road casualties.
- Organize and train personnel on animal rescue and relocation protocol.

#### Checking and Reporting

- Conduct daily checks of the site during construction, such as working areas for cleaning operations and ensuring the requirements of the BMP are followed and prepare daily field notes.
- Monitor works and ensure that any species discovered are moved away from the work areas.
- Maintain a species database and update weekly based on site observations.
- Undertake biodiversity monitoring, data analysis and reporting throughout construction and operation phase of the project.
- Report any issues of non-compliance or incidents that require immediate action to the Developer HSSE Manager.
- Submit all data to the Global Biodiversity Information Facility (GBIF).

### **5.3 Site Workers**

All site workers should be made aware of the ecological receptors present in the Project Area and all measures contained within this document will be included in the site induction. All workers are to be informed of their responsibility to the environment including but not limited to:

- Protection of all ecological receptors. Staff to be informed of discipline procedures for failure to comply to this.
- Adherence to site wide speed limits and informed that they will be enforced by site security staff.
- Reporting any spills of fuel, lubricants or other potentially polluting materials.
- Good housekeeping and disposal of all waste in accordance with site-wide policies, which should include recycling as much waste material as possible.
- Chance finds reporting in accordance with the BMP.

## 6 APPENDIX 1 – BMP TABLES

The appended BMP table provides a comprehensive tabular format including breakdown by receptors/ receptor groups, showcasing how monitoring and evaluation will be done to ensure that ESIA, BAP, CEA and BMP requirements are carried out in accordance with the associated plan(s).

Receptors / Receptor Grouping	Required Mitigation Measures (Management / Monitoring Activity)	Phase	Responsible Person for Ensuring Action Implementation	Means of Verification that Commitment has been Met	Timing and Frequency of Monitoring	Parameters	Locations	Reporting Requirements	KPIs	Budget Estimate
Birds and bats	Minimize attractiveness to birds and bats to prevent, nesting, roosting and feeding on and near turbines	Design	Contractor	Review of WTG and associated infrastructure detailed design	When design is provided	No bat/bird attracting elements such inappropriate lighting, lattice towers and crevices	N/A	N/A	N/A	
Birds and bats	Micro-siting of turbines	Design	Contractor	Review of WTG detailed design	When design is provided	Turbine locations to adhere to approved project footprint as provided in the ESIA	N/A	N/A	N/A	
Birds	Removal of dumpsite and monitoring to ensure no further dumping activity	Pre-construction / construction / operation	Waste contractors hired by developer for dumpsite removal and contractor for avoiding further dumping	Monitoring report	Weekly during construction and first migration season (to be updated if clear during these periods)	Removal of existing dumpsite  Monitor current dumpsite to ensure no additional dumping and wider site to ensure no	Dumpsite	Monthly Monitoring Report	No continued dumping at dumpsite or across site	



Receptors / Receptor Grouping	Required Mitigation Measures (Management / Monitoring Activity)	Phase	Responsible Person for Ensuring Action Implementation	Means of Verification that Commitment has been Met	Timing and Frequency of Monitoring	Parameters	Locations	Reporting Requirements	KPIs	Budget Estimate
						new dumpsites				
Reptiles (Egyptian Spiny-tailed Lizard)	Relocation of Spiny-Tailed Lizard if necessary from construction footprint prior to any ground clearance works	Pre-construction/Construction	Local Expert, subcontracted by Contractor	Records of relocation efforts to be kept on the implementation of the Reptile Relocation Plan	Where necessary	N/A	Locations with identified burrows	Reptile Relocation Report	No Egyptian Spiny-tailed Lizard loss in the construction footprint	
Reptiles (Egyptian Spiny-tailed Lizard)	Release Site Identification of areas suitable for release of relocated reptiles	Pre-construction/Construction	Local Expert, subcontracted by Contractor	Record of release site identification survey	N/A	N/A	Release Site, as close to Project Site as possible	Release Site Identification Report	Identification of suitable release sites	
Reptiles (Egyptian Spiny-tailed Lizard)	Population monitoring surveys of relocated Egyptian Spiny-tailed Lizard at release sites during the appropriate seasons following the first release effort and continued for a minimum period of 3 years following the final release effort (if relocation is found to be necessary).	Construction / Post-construction	Local Expert, subcontracted by Contractor / O&M Contractor	Records of post-release monitoring efforts to be kept and regularly reviewed	Annually during active season for three years	Population monitoring	Release Site	Post-release monitoring report	Population numbers constant or increasing	
All Sensitive Ecological Receptors Native Flora and Fauna	Implementation of vehicular speed limits within the project site. Enforcement of ban against driving outside the delineated access roads	Construction	Contractors HSSE Manager	Zero incident logs of over speeding in the project site and driving outside of the delineated access roads	Daily checks, Weekly Site Inspections throughout construction phase	Monitoring to ensure controls are being implemented and enforced	Construction footprint	Incident logs, Monthly reports, Quarterly audits	No speeding within the project site	
Scavenging Raptors	Removal of any carcasses on roads	Construction	Contractors HSSE Manager	Zero observations of	Daily checks, Weekly Site Inspections	Monitoring to ensure	Construction footprint	Incident logs, Monthly	No carcasses observed	

Receptors / Receptor Grouping	Required Mitigation Measures (Management / Monitoring Activity)	Phase	Responsible Person for Ensuring Action Implementation	Means of Verification that Commitment has been Met	Timing and Frequency of Monitoring	Parameters	Locations	Reporting Requirements	KPIs	Budget Estimate
	immediately upon observation to at least 50m away from the roads			animal carcasses within 50m of roads within the project footprint	throughout construction phase	controls are being implemented and enforced		reports, Quarterly audits	remaining on the roads within the project footprint	
All Sensitive Ecological Receptors	Implementation of controls prohibiting gathering, poaching or otherwise disturbance of flora or fauna on site	Construction	Contractor to appoint on-site Ecologist, under supervision of the HSSE Manager	Zero incident logs of take in the form of gathering, poaching/hunting or other disturbance to flora or fauna	Daily checks, Weekly Site Inspections throughout construction phase	Monitoring to ensure controls are being implemented and enforce	Construction footprint	Incident logs, Monthly reports, Quarterly audits	No take of flora/fauna on site	
All Sensitive Ecological Receptors	Induction training and regular toolbox talks on sensitive flora and fauna species and overall importance of ecosystem integrity	Construction	Contractor to appoint on-site Ecologist, under supervision of the HSSE Manager	Records are to be kept and regularly reviewed for the implementation of personnel training on sensitive flora and fauna species awareness	Upon new staff starting and as required throughout construction phase	Monitoring to ensure controls are being implemented and enforced	Construction footprint	Incident logs, Monthly reports, Quarterly audits	All workers receive induction and trainings/toolbox talks as relevant to their scope of work	
All Sensitive Ecological Receptors	Regular training on appropriate waste management practices and ban on provision of food to feral domestics	Construction	Contractor's the HSSE Manager	Records are to be kept and regularly reviewed for the implementation of personnel training waste management protocol	Upon new staff starting and as required throughout construction phase	Monitoring to ensure controls are being implemented and enforced	Construction footprint	Incident logs, Monthly reports, Quarterly audits	No Non-compliances with Waste Management Plan	
All Sensitive Ecological	Enforcement of ban on littering	Construction	Contractor's HSSE Manager	Zero incident logs of littering on site	Daily checks, Weekly Site Inspections throughout	Monitoring to ensure controls are	Construction footprint	Incident logs, Monthly reports,	No Non-compliances with Waste	

Receptors / Receptor Grouping	Required Mitigation Measures (Management / Monitoring Activity)	Phase	Responsible Person for Ensuring Action Implementation	Means of Verification that Commitment has been Met	Timing and Frequency of Monitoring	Parameters	Locations	Reporting Requirements	KPIs	Budget Estimate
Receptors					construction phase	being implemented and enforced		Quarterly audits	Management Plan	
All Sensitive Ecological Receptors	Minimize habitat loss or maintain existing habitat - 5m construction buffer on either side of access roads; 10 m construction buffer around the permanent built-up area of the substation; And 30 m construction buffer around OHTL tower base	Construction	Contractor to appoint on-site Ecologist, under supervision of the HSSE Manager	Regular checks to ensure compliance with construction buffers	Daily, Weekly Site Inspections throughout construction phase	Monitoring to ensure controls are being implemented and enforced	Construction footprint	Incident logs, Monthly reports, Quarterly audits	No Non-compliances with BMP and associated plans	
All Sensitive Ecological Receptors	Implementation of light pollution control measures such as: Minimise external lighting as much as possible. Ensure lighting is fit for purpose. Duration of lighting to be controlled and minimized as much as possible. Lights will be shielded to prevent skyglow, spill and glare	Construction	Contractor to appoint on-site Ecologist, under supervision of the HSSE Manager	Records of implementation of light pollution mitigation. Regular monitoring of use of artificial light within the project site	Daily checks, Weekly Site Inspections throughout construction phase	Monitoring to ensure controls are being implemented and enforced	Construction footprint	Incident logs, Monthly reports, Quarterly audits	No non-compliances of CESMP	
All Sensitive Ecological Receptors	Prevention and control of contamination through development and implementation of	Construction	Contractor's the HSSE Manager	Records of site inspections, audits and incident logs to	Daily checks, Weekly Site Inspections throughout construction phase	Monitoring to ensure controls are being	Construction footprint	Incident logs, Monthly reports, Quarterly	No non-compliances of CESMP	

Receptors / Receptor Grouping	Required Mitigation Measures (Management / Monitoring Activity)	Phase	Responsible Person for Ensuring Action Implementation	Means of Verification that Commitment has been Met	Timing and Frequency of Monitoring	Parameters	Locations	Reporting Requirements	KPIs	Budget Estimate
	hazardous material control measures, emergency action plan, spill prevention and control measures			be kept to ensure implementation of the spill prevention and control measures, waste management protocols, handling of hazardous materials, emergency action plans		implemented and enforced		audits		
All Ecological Receptors	Strict controls to prevent driving out of designated corridors to control impacts to soil	Construction	Contractor's HSSE Manager	Regular checks to ensure compliance with construction buffers.	Throughout construction -Daily checks, Weekly inspections, Monthly reporting	Monitoring to ensure controls are being implemented and enforced	Construction footprint	Incident logs, Monthly reports, Quarterly audits	Zero incident logs of driving outside access roads	
Native flora and fauna	Biosecurity control through import of soil from local quarries or borrow pits as close to the site as reasonably practical to avoid the risk of foreign seeds and invasive species	Construction	Contractors' HSSE Manager	Regular checks and inspections to ensure compliance with Biosecurity Control Plan.	For all soil procured	Monitoring to ensure controls are being implemented and enforced	Construction footprint	Incident logs, Monthly reports, Quarterly audits	Zero incident logs of non-native and/or invasive species	
Native flora and fauna	Biosecurity control through checks on soil imports from outside of the area prevent the accidental introduction of exotic species/pathogens	Construction	Contractors' HSSE Manager	Regular checks and inspections to ensure compliance with Biosecurity Control Plan.	For all soil procured	Monitoring to ensure controls are being implemented and enforced	Construction footprint	Incident logs, Monthly reports, Quarterly audit	Zero incident logs of non-native and/or invasive species	
Native	Plant and machinery	Construction	Contractors'	Regular checks	Throughout	Monitoring to	Construction	Incident logs,	Zero incident	

Receptors / Receptor Grouping	Required Mitigation Measures (Management / Monitoring Activity)	Phase	Responsible Person for Ensuring Action Implementation	Means of Verification that Commitment has been Met	Timing and Frequency of Monitoring	Parameters	Locations	Reporting Requirements	KPIs	Budget Estimate
flora and fauna	will require an HSE certificate of inspection, issued by the contractor, before coming onto the site and this will include necessary cleaning /pressure washing to reduce risks of importing invasive species		HSSE Manager	and inspections to ensure compliance with Biosecurity Control Plan.	construction - Daily checks, Weekly inspections, Monthly reporting	ensure controls are being implemented and enforced	footprint	Monthly reports, Quarterly audits	logs of non-native and/or invasive species	
Native flora and fauna	Designation of appropriate cleaning stations inside and outside the project boundary. Run-off from washdown will be captured and treated to remove/kill pests prior to appropriate discharge	Construction	Contractors' HSSE Manager	Regular checks and inspections to ensure compliance with Biosecurity Control Plan.	Throughout construction - Daily checks, Weekly inspections, Monthly reporting	Monitoring to ensure controls are being implemented and enforced	Construction footprint	Incident logs, Monthly reports, Quarterly audits	Zero incident logs of non-native and/or invasive species	
Native flora and fauna	Staff training on the potential sources of biosecurity breaches, impacts, control measures, required actions and roles and responsibilities	Construction	Contractors' HSSE Manager	Records are to be kept and regularly reviewed for the implementation of personnel training on biosecurity risks and control measures	Throughout construction as and when any new staff are inducted -Daily checklist, Weekly inspections, Monthly reporting	Monitoring to ensure controls are being implemented and enforced	Construction footprint	Incident logs, Monthly reports, Quarterly audits	All staff fully trained	
All Ecological Receptors	Post-construction Habitat Restoration of areas temporarily disturbed during	Post-construction	Local Expert, subcontracted by Contractor	Records of post-construction habitat restoration	N/A	N/A	N/A	Restoration Completion Report(s)	N/A	

Receptors / Receptor Grouping	Required Mitigation Measures (Management / Monitoring Activity)	Phase	Responsible Person for Ensuring Action Implementation	Means of Verification that Commitment has been Met	Timing and Frequency of Monitoring	Parameters	Locations	Reporting Requirements	KPIs	Budget Estimate
	construction			efforts						
Flora / All Ecological Receptors	Post-restoration Habitat Restoration Monitoring for determination of success rate	Post-construction	Local Expert, subcontracted by Contractor	Records of post-construction habitat restoration monitoring to be kept and reviewed regularly	The Spring, Summer and Autumn seasons during first year post restoration	Monitoring the effectiveness of the restoration effort (has natural ecosystem succession occurred?)	Sampling to be done throughout restored areas	Post-restoration Monitoring Report(s)	Successful, healthy habitats in restored areas showcasing vegetation coverage and biodiversity indices aligned with or approaching similar undisturbed habitat in the area	
Birds and bats	Shut Down on Demand	Operation	Local Expert Team, subcontracted by Project Company	Monthly reporting and seasonal summary report	Spring and Autumn migration seasons through lifetime of project	Monitoring effectiveness of ATMP system	Across whole site (covering all WTG)	Monthly and seasonal reporting	Ensuring ATMP process is working and any problems are sorted within next reporting period	
Birds and bats	Monitoring fatality of birds and bats from collision and electrocution fatality of birds from WTGs and OHTL (to include monitoring, searcher efficiency trials and carcass persistence trials)	Operation	PCFM team (see appendix 3), subcontracted by Project Company	Records and findings of carcass searches and trials to be kept to ensure implementation of the PCFM	Monthly during all seasons for birds and bat active period (May through November for bats) from the timing of commissioning of turbines and installation of OHTL	Fatality should not exceed thresholds calculated as per CEA	WF grounds and `OHTL	Monthly Carcass Search Report	Fatality to not exceed thresholds calculated as per CEA (see below)	
Black Kite	SDOD and PCFM	Operation	Subcontracted by Project Company	See above (SDOD and PCFM)	See above (SDOD and PCFM)	Fatality should not exceed	WF grounds and `OHTL	See above (SDOD and PCFM)	Fatality should remain below CEA threshold of	

BMP for NIAT and RASGHA 500MW Wind Power Project

Receptors / Receptor Grouping	Required Mitigation Measures (Management / Monitoring Activity)	Phase	Responsible Person for Ensuring Action Implementation	Means of Verification that Commitment has been Met	Timing and Frequency of Monitoring	Parameters	Locations	Reporting Requirements	KPIs	Budget Estimate
						thresholds calculated as per CEA			0	
Eurasian Buzzard	SDOD and PCFM	Operation	Subcontracted by Project Company	See above (SDOD and PCFM)	See above (SDOD and PCFM)	Fatality should not exceed thresholds calculated as per CEA	WF grounds and OHTL	See above (SDOD and PCFM)	Fatality should remain below CEA threshold of 5	
Great White Pelican	SDOD and PCFM	Operation	Subcontracted by Project Company	See above (SDOD and PCFM)	See above (SDOD and PCFM)	Fatality should not exceed thresholds calculated as per CEA	WF grounds and OHTL	See above (SDOD and PCFM)	Fatality should remain below CEA threshold of 0	
Pallid Harrier	SDOD and PCFM	Operation	Subcontracted by Project Company	See above (SDOD and PCFM)	See above (SDOD and PCFM)	Fatality should not exceed thresholds calculated as per CEA	WF grounds and OHTL	See above (SDOD and PCFM)	Fatality should remain at CEA threshold of 0	
Steppe Eagle	SDOD and PCFM	Operation	Subcontracted by Project Company	See above (SDOD and PCFM)	See above (SDOD and PCFM)	Fatality should not exceed thresholds calculated as per CEA	WF grounds and OHTL	See above (SDOD and PCFM)	Fatality should remain at CEA threshold of 0	
White Stork	SDOD and PCFM	Operation	Subcontracted by Project Company	See above (SDOD and PCFM)	See above (SDOD and PCFM)	Fatality should not exceed thresholds calculated as per CEA	WF grounds and OHTL	See above (SDOD and PCFM)	Fatality should remain below CEA threshold of 5	

BMP for NIAT and RASGHA 500MW Wind Power Project

Receptors / Receptor Grouping	Required Mitigation Measures (Management / Monitoring Activity)	Phase	Responsible Person for Ensuring Action Implementation	Means of Verification that Commitment has been Met	Timing and Frequency of Monitoring	Parameters	Locations	Reporting Requirements	KPIs	Budget Estimate
Birds and bats	Calculating assumed fatality rate per species based on carcass counts and corrections	Operation	PCFM team, subcontracted by Project Company	Records of the fatality assessments to be kept and reviewed	Semi-annual (after spring and autumn migration periods) from timing of commissioning of turbines and Installation of OHTL	Fatality should not exceed thresholds calculated using PBR analysis	Construction footprint	Semi-Annual Fatality Monitoring Report	Fatality not to exceed thresholds	
Birds	BFDs to be installed at least every 10m along the entire length of the OHTLs	Construction	Contractors' HSSE Manager	Regular checks to ensure they are installed and continuing to function	To be checked every six months, prior to Spring and Autumn migration periods	N/A	Construction footprint	Semi-annual report	All damaged or missing BFDs replaced within two months of being reported	
Scavenging Raptors	Livestock Carcass Removal/Disposal to reduce attractiveness to vultures and carrion-eating birds	Operation	Local Expert Team, subcontracted by Project Company	Records of livestock carcasses in the project footprint and timely disposal of these carcasses	Weekly checks	Zero fatalities due to scavenging opportunities	N/A	Carcass Removal Report	Zero fatalities due to scavenging opportunities	
All	Data sharing – annual summaries of monitoring made publicly available	Operation and construction	Project Company	Record that reporting is available publicly	Annually	Reporting to cover all monitoring	WF grounds and OHTL	Annual	Ensure previous years annual reports are available publicly each year before end of year	
Birds	Training of observers	Operation and Construction	Project Company	Recording of budget use and observers on site	Annually	Project to contribute to training of observers locally to carry out surveys on the project area	WF grounds and OHTL	Annual	Confirm agreed effort (eg budget) has gone to training annually and after year two observers via this route are working on site	
All bird	Discussion Forum –	Operation	Project Company	Confirmation of	Annual	Contribute	na	Na	Ensure annual	



BMP for NIAT and RASGHA 500MW Wind Power Project

Receptors / Receptor Grouping	Required Mitigation Measures (Management / Monitoring Activity)	Phase	Responsible Person for Ensuring Action Implementation	Means of Verification that Commitment has been Met	Timing and Frequency of Monitoring	Parameters	Locations	Reporting Requirements	KPIs	Budget Estimate
species	support annual forum (workshop/conference) in the area to facilitate knowledge exchange			event taking place or recording of budget towards organisation		to information dissemination			forum takes place	

## 7 APPENDIX 2 - SCOPE OF SHUTDOWN ON DEMAND PROTOCOL

The Avifauna Monitoring Program and ATMP (Shutdown on Demand Program (SDOD) & Predictive Shutdown Program (PSD)) Protocols will include:

- Evaluating flight activity by species of migratory soaring birds in a defined survey area during the different seasons and how this activity is spatially and temporally distributed
- Defining/delimiting key flight activity periods at the project site;
- Drawing on bird monitoring data, bird behavioral variables, site-specific characteristics and weather data and other relevant data;
- Identifying high-risk areas and times; defining the groups of WTGs by zones for the SDOD Protocol;
- Adopting a predictive/responsive approach to mitigation but which will be informed and refined through a predictive approach;
- Determining strategically located vantage points for monitoring flight activity and facilitating effective turbine shutdown; and
- Improving effective communication networks between the Project's bird observers as well as between bird observers and project wind turbine operators.

### Management and Implementation of the Avifauna Monitoring Program and the ATMP

#### Involved Parties and Responsibilities

The following parties will be involved in the Avifauna Monitoring Program and the ATMP

#### – Responsible Entities

The Avifauna Monitoring Program and the ATMP programs are jointly governed by EEAA, EETC, NREA, and RCREEE. RCREEE is responsible for the ATMP and Predictive Shutdown Program (PSD) implementation on behalf of wind power investors. An ATMP Technical Committee, comprising EEAA, NREA, EETC, and RCREEE and chaired by RCREEE, oversees implementation of the Bird Migration Protocol. The Technical Committee provides technical oversight through preparing/approving TORs, selecting qualified consultants, conducting site oversight, and elevating technical findings to the Steering Committee<sup>3</sup> for strategic decision-making.

#### – Technical Committee

In order to guarantee a thorough execution of the Avifauna Monitoring Program and the ATMP of all wind farms along the Gulf of Suez, a Technical Committee consisting of 9 personnel is appointed by the Responsible Entities. The Technical Committee is involved from the very beginning of the Avifauna Monitoring Program and the ATMP, i.e. already in the planning and preparatory phase, and will review and comment on the main steps to be conducted in the course of the Avifauna Monitoring Program and the ATMP, e.g. proposed technical approaches, proposed data analysis methodologies, conclusions and recommendation made by the ATMP consultant(s). Therefore, the ATMP consultant(s) will provide the Technical Committee with the required information on a regular basis (e.g. once a month). In addition, meetings will be held to discuss all technical issues (twice a year). In doing so, the Avifauna Monitoring Program and the ATMP will be adjusted, if necessary, according to the recommendations of

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<sup>3</sup> An ATMP and FMP Steering Committee has been established and is composed of the Chief Executive Officers of the relevant authorities (EEAA, NREA, EETC, and RCREEE). The Steering Committee provides high-level governance and oversight, and is responsible for reviewing and approving strategic decisions related to the implementation of the ATMP and FMP programs. This includes endorsement of key policies, approval of major mitigation and adaptive management measures, and resolution of strategic or inter-institutional issues to ensure alignment with national regulatory requirements, biodiversity protection objectives, and the signed Bird Migration Protocol.

the Technical Committee strengthening the outcome of the Avifauna Monitoring Program and the ATMP and contributing to an effective adaptive management process.

– Consultant(s)

A consultant(s) experienced in bird migration and shutdown on-demand in the GoS and in bird/wind turbine-interactions should be selected and assigned by the Responsible Entities. The selected consultant(s) will be responsible for the overall execution of the Avifauna Monitoring Program and ATMP Program, mainly including coordination and communication between all involved parties, execution of meetings and workshops, organization and execution of the field work, data analysis and preparation of reports, compilation of databases and capacity building. The Consultant will have overall responsibility and will need to appoint appropriate personnel (Team Leader/s) to oversee the avifauna monitoring and SDOD. All proposed personnel will have expertise in Bird Migration Patterns, SDOD Programs and Predictive Fixed Shutdown Programs for Wind Farms in Gulf of Suez. The key roles and responsibilities will include the following:

- Overall quality assurance/control on observer and observations undertaken
- Developing schedule for observers/VPs
- Overall management of observers to include but not be limited to assignment, daily checks on VP observers to ensure they are onsite, ensure observations are done and completed properly, etc .
- Collection of data from observers and undertaking quality control review
- Responding/resolving any issues within the site /observers

The Main Team Leader will be supported by one Supportive Team Leader, who will be onsite at all times. The Supportive Team Leader will be assigned VP areas and observer teams as applicable, in addition to undertaking VP survey responsibilities.

– Sponsors of NIAT and RASGHA wind farm

Sponsors of NIAT and RASGHA Wind Farm will be informed of the current status and the progress of the Avifauna Monitoring Program and the ATMP, the main conclusions and any recommended adjustments regularly. Therefor RCREEE will provide final reports prepared by the Avifauna Monitoring Program and the ATMP consultant(s) in due time. In addition, Sponsors will be invited to participate in regular meetings to discuss the approach and results and recommend adjustments.

**Avifauna Monitoring Program**

The methodology and scope of work will be developed considering the relevant national Egyptian requirements as well as International Financing Institution (IFI) requirements to include: (i) IFC Performance Standards (PS) and EHG Guidelines (General, Wind Energy and Electric Power Transmission); (ii) EBRD Environmental and Social Requirements (ESR); (iii) EIB Environmental and Social Standards (ESS); and (iv) internationally acclaimed methodologies and best practices.

– **Data Collection Methodology**

*Bird Monitoring (Migrating, Resting, and Local Birds) and Key MSB Species*

The Avifauna Monitoring Program will be conducted in accordance with the EIA guidelines and monitoring protocols for wind energy developments in Egypt as well as internationally acclaimed bird survey methods of onshore wind farms. The bird monitoring aims to:

- Collect monitoring data on migrating, resting and local birds;
- Describe migration patterns and altitudes of concerned MSBs within the Project Site in a quantitative way;
- Identify and assess likely impacts caused by the project; and
- Recommend mitigation measures to minimize impacts.

Migratory soaring birds (MSBs) are divided into the following:

- Globally threatened species, mainly (but not limited to): Egyptian Vulture, Steppe Eagle, Eastern Imperial Eagle, Greater Spotted Eagle, Sooty Falcon, and Pallid Harrier
- Species known to occur in high numbers, mainly (but not limited to): Great White Pelican, White Stork, European Honey Buzzard, Black Kite, Levant Sparrowhawk, Steppe Buzzard, Steppe Eagle, Common Crane
- Species known to occur in notable numbers and other (threatened) species: Black Stork, Short-toed Eagle, Harriers, Lesser Spotted Eagle, Booted Eagle, Lesser Kestrel, Saker Falcon.

The eleven Priority MSB Valued Environmental Component (VEC) Species for the wind farm based on cumulative effects analysis are as follows: Black Stork, Booted Eagle, Common Crane, Eastern Imperial Eagle, Steppe Buzzard, Pallid Harrier, Steppe Eagle, Black Kite, Eurasian Buzzard, Great White Pelican, and White Stork

#### – **General**

Bird observation will be undertaken daily between 1 hour after sunrise to 1 hour before sunset and will be 10-12 hours at chosen VP locations. All public holidays will be accounted for and undertaken regardless. Rotational breaks of 30-60 minutes will ensure that no viewshed is missed throughout the monitoring period.

Flight heights will be recorded as follows:

- Band A: 0-17m is a ground clearance;
- Band B: 17-162m is a collision height;
- Band C: 162m-300m is a risk height;
- Band D: 300-500 m;
- and Band E above 500m.

#### – **Data Collection by Visual Observation**

The focus of observation will be soaring and gliding birds as these birds have limited flight ability, are less manoeuvrable, have larger body sizes and spans, and therefore are significantly more vulnerable to wind farms than other bird species.

Vantage Points will be selected based on practical viewshed analysis during site visits.

To ensure a standardized recording and a safe identification of soaring and gliding birds, the main part of the analysis will be restricted to birds migrating at distances up to 2 km from each VP.

#### – **Data Collection**

Data will be recorded on spreadsheets form. These spreadsheets will be filled on a daily basis by the Bird Observers.

- VPs. The recording of observations will follow the methods described by NatureScot (formally Scottish Natural Heritage), which are summarized below. Observers at VPs must position themselves to minimize their effects on bird behaviour. A complete circle of 360 degrees will be scanned using a combination of natural eyesight and use of 10x magnification binoculars. If a migratory species is detected, it will be followed until it ceases flying or is lost from view. For each observation of a target species, data collected will include the following:
  - The time the species was detected
  - Estimate of the bird's flight height above ground level at the point of first detection, where flight heights to be classified based on turbine specifications

As a guidance to observers to define their area of survey before starting the observation, determining the cardinal directions (North, South, East and West), and also pre-defining several landmarks of reference in the field, if possible, is also recommended. Observers should constantly scan the whole covered buffer of 360 degrees around, from each VP until a species is detected.

Weather conditions (such as wind speed, wind direction, visibility, cloud cover and precipitation) will be recorded at start time of monitoring activities, then at every subsequent hour and at the end time of monitoring activities. This is particularly important in the case of soaring birds when wind direction and strength is likely to affect migration behaviour.

It is important to note that complete information on all records including the records detected outside the buffer radius around the VP have to be collected, this including number of birds and distance. Also, the distance between the detected record and the observer has to be collected and documented within datasheets. Flight direction as well as heights of all records are among the basic information to be collected.

#### – **Accounting for roosting and resting of birds**

Many birds must utilise roosting and resting sites during migration to/from overwintering and breeding ranges, and identifying roost sites/habitat features is an important aspect of migratory bird studies for proposed wind energy projects within migratory flyways. MSB and other target species and groups exhibit different migratory strategies, and such strategies are also influenced by bottleneck sites, topography, weather, behaviour, and other factors which influence the location of roost and rest sites. Migration timing, coupled with the condition of individual location of roosting or resting sites along migratory routes, especially in cases where long-distance over-water crossings are involved, such as across the Red Sea between the Sinai Peninsula and the western GoS coast, where the proposed sites are located.

This can result in dynamic spatial use of an area for roosting/resting, even for the same species. For example: one flock of birds undertakes the over-water crossing at a similar time to another, but the first encounters more difficult conditions or requires rest earlier than the second. While the second group passes through an area during the daytime, the first group stops for rest and roosts overnight. Therefore, the study design will aim to document and characterise the extent to which migratory soaring birds rested or roosted in the proposed project areas and the immediate surrounding areas using the following approach:

- Recording resting/roosting birds during VP observations - visible ground will be scanned thoroughly for any birds, and any birds identified resting or roosting on the ground will be documented using the appropriate data sheet.
- Recording roosting/resting birds outside of VP surveys – During travel to/from VPs or between VPs and within 2-km of the sites, observers to record any resting or roosting migratory soaring birds. These observations will be recorded on a data sheet and roosting/resting sites were mapped. pp**Data evaluation on bird/wind turbine-interactions**

The Avifauna Monitoring Program will encompass the following components:

- General avifauna analysis, including:
  - Species abundance and frequency
  - Average flight altitude
  - Species-specific flock size
  - Daily and seasonal migration patterns
  - Spatial distribution of migration routes
  - Identification of potential high-risk areas
- Assessment of bird-wind turbine interactions, comprising:
  - Evaluation of micro-avoidance behaviour of Migratory Soaring Birds (MSBs)
  - Identification of periods with elevated collision risk
  - Analysis of species-specific behavioural responses when passing through the wind farm area,

including:

- Macro-avoidance
- Meso-avoidance
- Assessment of the magnitude of barrier effects, considering influencing factors such as:
  - Flock size
  - Flight altitude
  - Turbine operational status (operating vs. non-operating)
  - Weather conditions
- Documentation and evaluation of Near Miss Incidents, defined as:
  - Events where priority bird species or flocks of non-priority MSBs enter the rotor-swept zone of one or more turbines without collision
  - Such incidents may occur when shutdown measures cannot be implemented in time by field observers and/or turbine operators before birds enter the collision risk zone

#### – **Communication**

All team members will be provided with a mobile phone including internet connection and messaging (e.g. WhatsApp) phone application. The team in the field will be in contact during the monitoring period via mobile phones and a dedicated messaging group for immediate communication for any key issues to include for example: (i) follow up on the migrating flocks and individuals over the project area; (ii) avoid double count of same flocks/individuals and other as appropriate. It is highly recommended to use appropriate sets of Walkie-talkies and repeaters (subject to permits from Egyptian military) as reliable and efficient communication means for the long-term implementation of the BMP & SDOD to cover all VPs. This will resolve the most critical aspect in SDOD Program implementation and optimize the program efficiency. At least two sets of Walkie-talkies should be used in case of reliable mobile network in the coming seasons (one for field coordinator and one for SCADA operator). If the mobile network coverage is poor, additional units should be used for each monitoring VPs.

#### **The ATMP Program**

The ATMP Program consists of the SDOD and PSD Programs that will be conducted during the operational phase of the wind farm.

#### **Shutdown on Demand Criteria**

- *Threatened species*: some of the wind turbines should be shut down whenever a bird or birds of a threatened species (according to the last updated IUCN Red List of Threatened Species) are detected migrating through the wind farm area or heading towards it at collision risk flight altitudes (i.e. within the rotor-swept area).
- *Flocks with 10 or more large soaring birds (target species)*: some of the wind turbines should be shut down whenever flocks with 10 or more large soaring birds are detected migrating through the wind farm area or heading towards it at collision risk flight altitudes.
- *Imminent high risk of collision*: A single wind turbine or turbines should be shut down whenever there is an imminent high risk of collision of a large soaring bird (e.g. a bird approaching a turbine at a close distance).
- *Sand storms*: Wind turbines should be shut down during sandstorms whenever criteria 1 and/or 2 have been verified in the two hours that preceded the sandstorm.
- *Roosting/resting inside or near wind farm*: Whenever bird(s) of a threatened species or flocks with 10 or more soaring birds is detected roosting or attempting to roost inside or near the windfarm area ( $\leq 2000$  m); risky turbines should be shut down until the bird(s) depart the risk zone, or until the risk is assessed as low by the SDOD field coordinator.

#### **Predictive Shutdown (PSD) Criteria**

Based on the Adaptive Management process adopted for the implementation of the Avifauna Monitoring Program and the ATMP, and due to the outcomes of BMP & ATMP & PCFM during the previous seasons at several wind

farms, RCREEE decided after consultation with their Technical Committee delegated from RCREEE, EEAA, EETC and NREA to implement the Predictive Shutdown Program (PSD) for risky turbines in the whole GoS Region during bird migration seasons to mitigate collision mortality in wind farms. The predictive shutdown involved shutting down risky turbine (identified daily based on migration dynamics) when any single criterion of the following PSD criteria is met within the last 2-3 hours of bird monitoring:

- Observation of  $\geq 100$  MSB inside the windfarm boundaries (plus 500m buffer) flying  $\leq 500$ m above ground level.
- Observation of  $\geq 10$  MSB inside the windfarm boundaries (plus 500m buffer) flying at risk height of  $\leq 200$ m above ground level.
- Observation of  $\geq 1$  Globally Threatened MSB (IUCN red List) inside the windfarm boundaries (plus 500m buffer) flying at risk height of  $\leq 200$ m above ground level.
- Observation of  $\geq 10$  MSB or  $\geq 1$  Globally Threatened MSB outside the windfarm boundaries (including 500m buffer) flying at risk height of  $\leq 200$ m above ground level and/or roosting/resting during unstable weather conditions.

### Communication Protocols and Channels for the ATMP Program

The SDOD program should follow the following procedures:

- The ATMP Field Coordinator will coordinate the SDOD work and be the first line of communication and reporting to/with the SCADA operators.
- Once a potential collision risk event is identified, the field observers will evaluate the collision risk taking into account the species, flight altitude, speed, likely flight path and behaviour, distance from the bird to the turbine as per the Protocol and the time it takes to shut down turbines once the request is made. This information should be instantly communicated to the ATMP Field Coordinator.
- The ATMP Field Coordinator will be responsible for requesting the turbine(s) shutdown/restart after event evaluation and verification of the SDOD criteria. They will have the responsibility to decide whether some individual/ group or even all the turbines must be shut down and to decide when it is safe to turn them on again.
- The shutdown/restart requests will be either communicated to the SCADA operator by effective communication means (e.g. mobile phone or radios).
- To make the communication, coordination, and decision-making protocol easier, it is crucial to limit the shutdown/restart request and the event recording to the Field ATMP Coordinator.
- Communication will be handled in two levels:
  - Operational level: involves direct verbal communication between the Field ATMP Coordinator and the SCADA operator to request the turbine(s) shutdown/restart.
  - Management level: involves written communication from the SDOD Consultant to the Sponsor on a pre-set interval (preferably weekly) reporting progress of the SDOD program, and a written response from the Sponsor to confirm that records match with the SCADA logs
- Prepare a guidance on use of SDOD for the Sponsor including SDOD's Criteria, Procedures, and Communication Protocols as well as monthly SDOD event curtailment time duration during bird migration seasons.

The PSD program should follow the following procedures:

- The ATMP Field Coordinator will assess the daily migration activity and collision risk during the 8 hours of the SDOD program implementation during bird migration season. The ATMP Field Coordinator will identify the spatial and temporal extent of the shutdown request if applicable.
- The ATMP Field Coordinator will coordinate the Predictive Shutdown, if and when required, with the SCADA operator on a daily basis at least half an hour before the end of monitoring time.
- The documentation of the PSD implementation will be responsibility of the SCADA engineers as the ATMP team will leave the site when the PSD request will be implemented.
- The PSD program will cover most probably the high migration period during the spring and autumn seasons.



- The PSD plan will cover the daylight and/or dawn/dusk periods during the bird migration seasons when the field observers implementing the SDOD are not present on-site (i.e. after the planned hours of SOD program end time) and/or the field observers could not control risky WTG circuits during the high peak bird migration.
- The shutdown duration will be flexible and could extend to the early morning of the next day during the roosting cases.
- The targeted turbines for the shutdown will be flexible and identified daily based on the ATMP Field Coordinator's judgment.

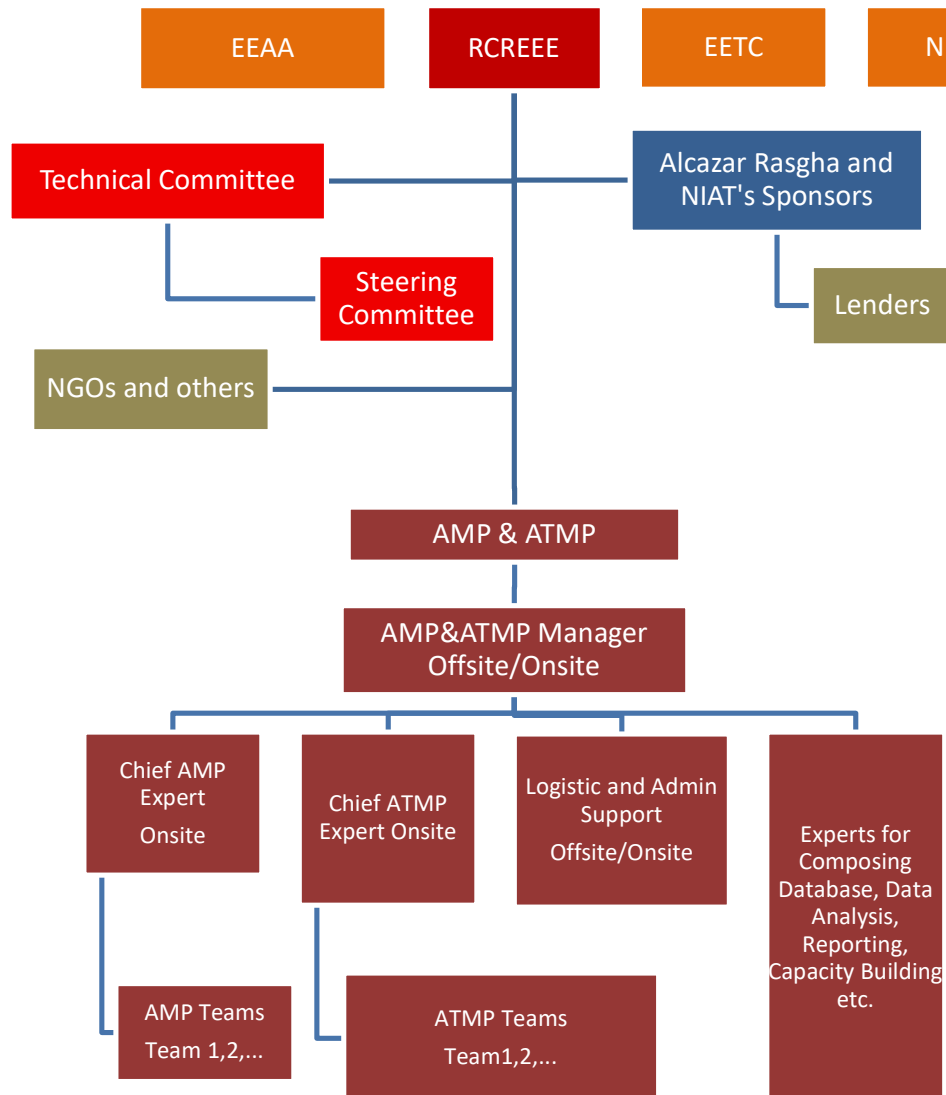


Figure 5: Scheme of main communication channels to implemented in the course of the AMP & ATMP (Colours represent responsibility: dark red – Responsible Entity for execution of the AMP and the ATMP; dark green – Other Responsible Entities; red – Technical/Steering Committee; and dark orange consultants; dark blue – Wind Farm Owner; light gray – all involved parties)

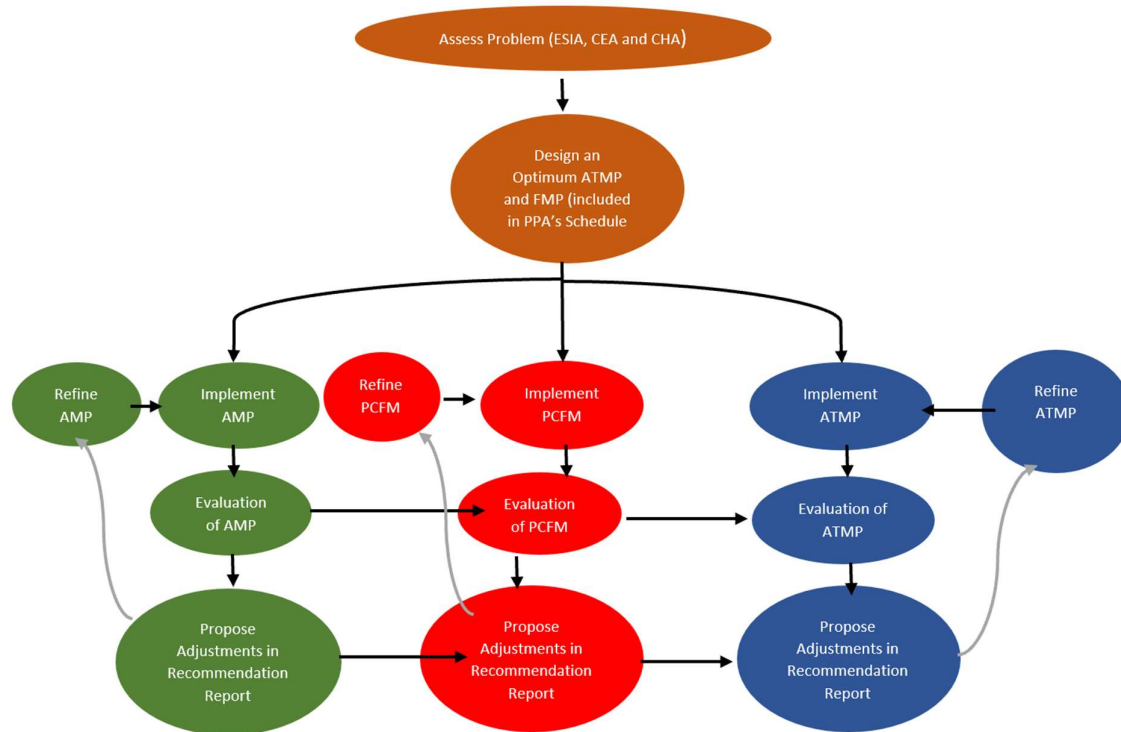
### Adaptive Management Process for the ATMP (Linkage between the ATMP components)

The ATMP-Program shall remain flexible and adopt evidence-based operational approach where shutdown procedures are continuously adjusted and improved over time based on monitoring results, observed bird behaviour, operational experience, and environmental outcomes. The monitoring of collisions is extremely important as an evaluation tool, i.e. to prove whether the proposed approach is working, whether shutdowns are effective, how the protocol can be optimized and whether the assumptions that form the basis of the approach are well-founded. The design and the scope of the post-construction ATMP protocol shall be updated and adjusted on seasonal or yearly basis.

The Project's consultants implementing the SDOD and the ATMP should provide monthly reports to RCREEE and

the Sponsor for review and documentation.

Based on the above reporting requirements, ATMP amendments could be undertaken at seasonal or annual basis depending on the findings of the ATMP implementation and/or based on the recommendations from the relevant entities.



## 8 APPENDIX 3 – POST CONSTRUCTION FATALITY MONITORING (PCFM) PROGRAM

Systematic fatality surveys (i.e. carcass searches) by trained experts have become the primary means of monitoring collision victims and estimating collision rates at wind power plants worldwide. Post Construction Fatality Monitoring will be undertaken by RCREEE during the operation phase, with carcass search surveys covering each turbine across the entire wind farm. The carcass search will demonstrate the effectiveness of mitigation measures such as turbine shutdown and allow an estimation of the annual number of bird and bat deaths caused by the turbines and associated OHTLs.

### Scope of the monitoring program

Obtaining unbiased fatality rates requires the following field activities to be conducted at the wind farm and along the OHTL during autumn and spring bird migration seasons (Spring will cover from 20<sup>th</sup> February to 20<sup>th</sup> May each subsequent spring, and 10<sup>th</sup> August to 5<sup>th</sup> November each subsequent autumn):

- A schedule of systematic fatality search surveys conducted; at a specified number of turbines and powerline sections, within defined search area limits (the search plot), using defined transect spacing within the search area (20m apart), within the area defined as ‘searchable’ within the search plot;
- Searchable efficiency bias correction experiments to estimate the % of fatalities missed by searchers; and
- Carcass persistence bias correction experiments to estimate fatalities removed by scavengers between searches.

When conducting systematic carcass searches experts walk along pre-defined transects under each turbine. All found carcasses (in this case a bird/bat or parts of a bird/bat) are recorded and carefully examined (any evidence of fatality, carcass complete or dismembered, type of injuries evident, scavenging evident, distance and direction to turbine, etc.). Estimates of fatality rates are biased concerning searcher efficiency. Furthermore, other factors such as the proportion of searched areas and carcass persistence should be taken into consideration when estimating fatality rates. When carcasses are located, observers will record the species name, distance from the turbine tower, direction to the nearest turbine, and predation evidence or other observations. Carcasses will be then used in carcass persistence trials. Note should be made of any tags, rings, or transmitters that might be on such birds. Carcass search surveys will also be undertaken along the associated Overhead Transmission Line (OHTL) during bird migration seasons. In general, the same approach on standardized carcass searches can be applied.

### PCFM Search Team – Roles and Responsibilities

The PCFM Search Team will consist of: Search Technicians, Team Leader/s and Wind Wildlife Expert. The specific responsibilities of these roles are detailed below.

- Search Technicians (ST). The Search Technicians are the people who perform the carcass searches. They perform fieldwork at the site on a full-time, daily basis. They must have the capacity to drive a field survey vehicle, and to perform rigorous fieldwork in harsh climatic conditions. ST must be able to follow all instructions/procedures related to the survey protocol, including data recording/documentation, and site safety requirements and personnel policies of the wind farm.
- Team Leader (TL). The Team Leader will be an external, independent environmental consultant/consultancy, most likely based in Egypt, who must possess the capacity to perform the following functions that will be assigned as responsibilities of the TL: 1) recruit, hire, manage, resource, and supervise the ST staff required to perform the search effort, 2) perform taxonomic identification of bird and bat specimens discovered during the searches, either through the use of in-house or subcontracted national taxonomic experts, 3) liaise effectively with the Sponsor, Operator and the Internationally-recognized Wind Wildlife Expert (WWE), and 4) fulfil the monthly reporting requirement (see under “reporting”) beginning with the start of monitoring, 5) manage the data throughout the

monitoring and reporting periods, and 6) with respect to the semi-annual reporting requirement (see under “reporting”), the TL will be expected to receive training from the WWE in year 1, so that the TL may assume responsibility for the semi-annual fatality rate analysis and reporting responsibilities in future years. Required qualifications include bachelor’s level or higher degree in ecology or a related scientific discipline from an accredited college or university (or relevant alternative experience); regional taxonomic expertise in birds and bats of Egypt, capacity to recruit, train, resource, and manage a staff of ST, capacity to perform quantitative and qualitative analysis and presentation of scientific data, including simple statistical analyses; and capacity to produce professional quality reports in English, including georeferenced map figures.

- Internationally-recognized Wind-Wildlife Expert/Consultancy (WWE). The WWE will be an external, independent expert who possesses a master’s degree or higher in ecology or a related scientific field in the design and implementation of PCFM programs at wind energy facilities, following GIIP and the typical requirements of Development Finance Institutions. Responsibilities of the WWE will include 1) prepare all necessary protocols and data forms required to guide and document the effort, 2) conduct a two-week site visit to the wind farm to provide direct training and supervision to the rest of the Team at the initiation of PCFM, 3) liaise effectively with the TL and with the Operator, and 4) perform the semi-annual data analysis and reporting requirements in year 1, while providing training and direct guidance/capacity building to the TL in such aspects, so that the TL may successfully assume responsibility for semi-annual data analysis and reporting requirements in year 2 and beyond.

## Methodology

### *General Estimator of Mortality (GenEst)*

The suggested approach uses the GenEst program to calculate fatality rates. This free to use, state-of-the-art estimator software combines the expertise from teams that developed earlier fatality estimators and is demonstrated to provide unbiased fatality rate estimates, improving on, and replacing all previous estimators. The software has been designed to be used by ecological managers and features a user-friendly interface and comprehensive and practical user manual.

In the suggested approach these activities generate data which is transferred from field data sheets to five (5) input files for analysis in GenEst. These files are:

- Carcass observations (CO) – containing details of all found fatalities during search surveys,
- Search schedule (SS) – containing dates when each turbine/powerline was searched,
- Searcher efficiency (SE) – containing results of searcher attempts to find carcasses placed to test searcher efficiency,
- Carcass persistence (CP) – containing results of the times when carcasses placed to test carcass persistence were last recorded present and first recorded absent,
- Density weighted proportion (DWP) – containing turbine/powerline specific figures giving the % of the total carcasses available to be found accounting for those that were not ‘available’ because they landed in unsearched areas either within or beyond the search plot.

These files are uploaded to the GenEst program and allow the analysis of fatality rate estimates to be calculated.

### *Technical Approach*

The PCFM protocols will be implemented by a team of observers (Search Team) who will be led by the Team Leader/s. The search team will require adequate numbers of staff to perform all searches required, allowing for working hour restrictions, breaks, holidays/illness, etc. The Team Leader/s will be responsible for the final, on site design and implementation of the PCFM program and will train the Search Technicians (including searcher efficiency (SP) and carcass persistence trials (CP)), schedule and coordinate fieldwork, manage bias correction trials, manage data and reporting. The Search Technicians will be responsible for the day to day searches, the completion

of trials, accurate data recording and inputting raw data.

During the testing and commissioning phase when the PCFM protocol is first implemented, the following steps will be taken:

- During the first 5 days, the WWE/Team Leader/s and the Search Technicians will inspect all turbines and mark out the search plots for each WTG.
- The WWE/Team Leaders will review all search plots of the WTGs to identify searchable and unsearchable areas, which will be crucial for estimating mortality using the GenEst model.
- Additionally, the WWE/Team Leader/s will guide the Search Technicians to test the feasibility of the proposed methodology on the ground, assess if any further inputs are needed, and ensure that the methodology is standardized for the upcoming season.

Prior to the next season/year searches taking place the Team Leader/s will re-visit all turbine locations to ensure the previously designated search plots are still applicable, if changes are required these will be completed and documented.

The Team Leader/s and Search Technicians will also carry out a clearing search at all turbines to ensure only new carcasses are included in any statistical modelling. If carcasses are found during the clearing searches, these should be recorded separately and if required and appropriate, saved for use in searcher efficiency and carcass persistence trials.

#### *Search Time and Routine*

The daily field work will be performed according to the following methodology:

- All WTGs will be searched on a weekly basis, conducting a total of four search cycles throughout a month.
- The suggested search rate average will be (3 turbines/day/searcher), yielding an average of 21 turbines per day. The average time required to conduct the search procedure/protocol at a single turbine is anticipated to be approximately 80-90 minutes for one Search Technician.
- The Team Leader/s will be following the implementation of the field work, data collection, daily follow-up routine for the team, collecting data revision and data storage into a database and testing the Search Efficiency.

#### **Overhead Transmission line (OHTL) search**

A systematic search transect by car will be conducted for the OHTL inside and outside the windfarm boundaries. The route will be divided into segments each measuring approximately 5 km. Within each 5 km segment at least 50% of the overall length will be searched – ideally using 500m search lengths separated by an equal distance. The search will be done at intervals of between 7 and 14 days depending upon search results during the search period. The transects will be carried out by walked transects, or from a slow-moving vehicle along set routes covering a plot measuring 50m either side of the OHTL centre line i.e., 100m total width. Search transects will be of 20m width either side of the walked/driven line as per the turbine searches.

#### **Search Plots and Visibility Classes**

Due to rough terrain, hazardous slopes or construction remains, some of the plot's areas could be out of reach and therefore, the unsearchable area will be mapped and calculated to be omitted from the total searched area as well as determine the search accuracy. Therefore, determining visibility classes of all wind turbines and OHTL search plots for the wind farm will be conducted, the total search area will be classified according to search feasibility and land topographic nature into High, Medium or Low visibility, or whichever suits the site terrain nature.

### *Searcher Efficiency (SE)*

Searcher efficiency is the probability that a searcher will spot a carcass in the searched area which is typically estimated through purposefully made-up field trials as a bias correction approach. Decoys of different size classes (Bats, large birds (>55cm body length), medium (30-55cm body length) and small (<30cm body length)) will be placed at different visibility classes (high, medium, low and very low) by the Team Leader/s unwitnessed by the Search Technicians.

Good practice is to use a minimum of 10 decoys per covariate (i.e. size class x visibility class x season) meaning a minimum of 40 samples per season will be used (assuming high visibility throughout the search areas). In addition, decoys that were not found on the first search should be left in place to test whether searchers find them on the next scheduled search.

Undetected decoys will then be calculated to give an estimate on Search Technicians' efficiency at each month of the seasons (spring and autumn). The decoys will be placed in the search plots on different dates along the search period.

### *Carcass Persistence (CP)*

Carcass persistence is the probability that a carcass spotted at time (0) will continue to persist for (t) days. During the trial, carcasses will be chosen to closely represent all targeted species of the wind farm. During the trial, the person in charge will record the exact time and location of placement and revisit each carcass periodically, recording the date and time of the visit and the presence or absence of the carcass.

Carcass persistence varies according to different characteristics such as carcass size, search season and nature of land cover. During the search, found carcasses will be marked and documented to be checked up periodically for removal rate.

### *Mortality Estimation*

Estimated mortality is calculated through GenEst once searchers' efficiency and carcass persistence models are set for each size class.

### *Detection probability & Density-Weighted Proportion (DWP)*

Detection probability varies with several factors including migratory bird species, carcass size class, searching season, topography (scale of seachable areas and visibility classes) and the search schedule since it tends to be higher in daily searches than weekly ones.

Furthermore, carcass arrival time can affect detection probability in that early spotted carcasses could be revisited frequently through the search period while those spotted near the end of the season won't be recorded as much. Therefore, to avoid misleading calculations, GenEst depends on complex models that yield carcass-specific detection probability for mortality estimation (Dalthorp et al 2018).

To produce unbiased fatality estimates, **it is important to account for carcasses that land in these unsearched and unsearchable areas of the fall zone**, especially if such areas cover a large proportion of the fall zone (e.g., in road and pad only search plots). Unsearched and unsearchable areas are accounted for by calculating the density weighted proportion (DWP; Huso and Dalthorp 2014) of the fall zone that is searched. The DWP allows fatality estimates to be adjusted to account for carcasses falling in unsearched and unsearchable areas.

### *Field data collection*

In order to standardise data collection and ensure all relevant information is recorded in the field the following forms will be completed during each period of carcass searching

### *Search schedule form:*

One of these forms should be filled out by the Search Technician performing the searches for each day of carcass searching. The following information will be recorded;

- Date
- Turbine Searched
- Search Technician name
- Start and end time + total time spent searching
- Carcasses found (species, sex and age class if possible)
- Carcass ID numbers of each
- Data name and path (file) of track-log

*Carcass Observation (CO) form:*

One of these forms should be filled out by the Search Technician for each carcass discovered during the searches. This form will contain all the following information collected for each carcass;

- Turbine number
- Date
- Time
- Carcass ID (e.g. X001)
- Distance from wind turbine
- Bearing from centre of turbine mast (degrees)
- Species (or group if unidentifiable), sex and age class (e.g., juvenile, sub-adult, adult)
- Carcass condition and estimated carcass age (e.g., whether the carcass has been found by scavengers, what state of rigor mortis, and an estimate of the number of days it has been present)
- Notes – to include measurements of wing, body length, forearm where applicable

In addition to the above, photographs should be taken of all fatalities with an emphasis on taking high quality informative photographs adequate to identify a fatality. These should be taken; *a) as the carcass is found, taken directly from above, b) turned over to show ground-facing side, c) from all angles to show features which might help with identification (e.g., all sides of head, open wings, tail, feet), d) showing any injuries, e) showing area immediately surrounding the carcass. All photographs should have a size reference (e.g., ruler) in frame at the same elevation as the carcass.*

*Searcher efficiency trial (SE) form:*

One of these forms should be filled out by the Team Leader/s for each day on which SE trials are performed. This form will contain the following information:

- Date of trial
- Turbine number
- Carcass types used (i.e., large bird, small bird, bat, or surrogates)
- Time carcass put out
- Placement of carcass (distance and bearing from centre of turbine mast)

- Name of Team Leader placing carcass
- Name of Search Technician taking part in trial – N.B. the searchers should not be aware they are in the trial
- Result of trial (i.e. found by searcher, not found by searcher but relocated later by team leader, not found by searcher and not relocated later by the team leader)

*Carcass persistence trial (CP) form:* One of these forms should be filled out by the Search Technician for each round of CP trials. This form will contain the following information:

- Date and time of original carcass placement
- Turbine number
- Carcass type used (i.e., large bird, small bird, bat or surrogate)
- Placement of carcass (distance and bearing from centre of turbine mast)
- Date and time of each subsequent visit to relocate carcasses
- Result of subsequent searches to relocate carcass (present/not present/status of decay, scavenging e.g. by insects)
- Freezer log form: One of these forms will be required for each freezer dedicated to bird/bat specimen and/or test carcass storage located at the facility. Information on this form should be recorded by whomever removes or adds any carcasses to/from the freezer. The purpose of this log is to maintain an up-to-date inventory of the carcasses contained within the freezer, including both carcasses discovered and collected during carcass searches, and other carcasses obtained otherwise for the purpose of use in bias-correction experiments. The log will also be used to document when specimens are removed, i.e. for use in bias correction experiments.

Materials necessary for conducting the surveys include the following:

- Bite-proof gloves for specimen handling
- Personal protective equipment (including but not restricted to hard-hat, boots, appropriate clothing for seasonal weather conditions).
- On-site freezer for specimen storage.
- Field data forms.
- Camera, scale ruler and GPS unit - for photographing and georeferencing carcasses found during the searches. In addition a laser range finder will help obtain accurate measurements in the field.
- Plastic bags, labels, waterproof writing implements for specimen collection and labelling.
- Ruler and callipers for measuring specimens.
- Written field protocol.
- Safety supplies.

#### *Weather data*

Weather condition parameters will include wind speed, wind direction, visibility and any other notes or special weather conditions (like sand storms, heavy rains etc...), will be documented at the start time for each carcass search.

Wind speed will be measured using a basic anemometer, while wind direction will be estimated using a compass,



and visibility will be visually determined with the aid of fixed reference land marks and structures, which includes four categories: 1) < 5 km, 2) 5-10 km, 3) 10-15 km and 4) > 15 km.

### *Data Management*

#### *Compiling, storing and data input in Genest*

- Data storing system will be established between the Team Leader/s and the Search Technicians for adequate daily data storage.
- The Search Technicians will report any drawbacks or encountered complications in data collection daily to the coordinate (Team Leader/s).
- The Team Leaders will double check the received data organize it and transfer it into digital spread sheets weekly.
- Formats of dates and variables constituting GenEst data sheets will be exactly as mentioned in the GenEst guidelines.

#### *Quality Assurance and Control*

- At all stages of monitoring, including field data collection, data entry, data analysis, and report preparation, the Team Leaders must implement QA/QC measures.
- Each Search Technician will check their data forms for completeness, accuracy, and legibility at the end of each survey day.
- The Team Leaders will verify data forms on a regular basis to ensure completeness and legibility, and any errors will be remedied.
- The individual making the modification will initial and date any changes to the data forms.
- Data will be extensively reviewed for issues.
- Any inaccuracies will be addressed by referring to the raw data forms and/or checking with the data collector(s).
- Any unusual data discovered, as well as any data suspected of being problematic, will be discussed with the Search Technicians and Team Leaders.
- Any modifications to the raw data will be documented.

### *Reporting*

Reporting will be supplied to the Project team on a regular basis, with biannual reports distributed to summarise the previous seasons findings, results of mortality monitoring and recommendations for any adaptation to methodology.

In addition to the formal reporting above monthly reports as required by the Sponsor will be sent detailing the relevant data.