Armutçuk Wind Power Plant (WPP) Project

Supplementary Biodiversity Surveys Final Report

May 2025

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Supplementary Biodiversity Surveys Final Report

May 2025

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Definitions and Abbreviations

Abbreviation	Definition
AoI	Area of Influence
AZE	Alliance for Zero Extinction
BAP	Biodiversity Action Plan
BERN	The Convention on the Conservation of European Wildlife and Natural Habitats
BMP	Biodiversity Management Plan
CHA	Critical Habitat Assessment
CITES	Convention for the International Trade in Endangered Species of Wild Fauna and Flora
CR	Critically Endangered
CRM	Collision Risk Model
DD	Data Deficient
DKMP	General Directorate of Nature Conservation and National Park
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EN	Endangered
ESIA	Environmental and Social Impact Assessment
ETL	Energy Transmission Line
EU	European Union
EUNIS	European Nature Information System
GIS	Geographic Information Systems
GN	Guidance Notes
IBA	Important Bird Area
IFC	International Finance Cooperation
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
LC	Least Concern
MoENR	Ministry of Energy and Natural Resources
NP	National Park
NT	Near Threatened
PBF	Priority Biodiversity Features
PCFM	Post-construction Fatality Monitoring
PR	Performance Requirement
PS	Performance Standard
Ramsar	Convention on Wetlands of International Importance Especially as Waterfowl Habitat
SP	Sampling Point for ground static acoustic bat surveys
T	Turbine
TRDB	Turkish Red Data Book
VES	Visual Encounter Survey

VP	Vantage Point
VU	Vulnerable
WPP	Wind Power Plant

Executive summary

Armutçuk Wind Power Plant (WPP) Project ("the Project") with 20 turbines and 84 MWm total installed power, is planned to be implemented by Enerjisa Üretim. As a result of the Environmental and Social Impact Assessment (ESIA) study conducted by the Consultant, biodiversity data gaps were identified for the Project's compliance with the applicable national and international standards. Supplementary biodiversity baseline collection was carried out by the Project Company in 2024. The draft final report presents flora, terrestrial fauna, bird and bat survey results and outcomes for the study period.

For the baseline collection of herpetofauna during the spring, and summer, seasons, fieldwork commenced in the early morning at daylight and continued until dusk to account for nocturnal species. With the exception of *Testudo graeca*, which is classified as Vulnerable (VU) by the IUCN and listed in CITES Annex-II, other herpetofauna species are classified as Least Concern (LC), indicating no significant extinction risk. There are no endemic herpetofauna species among the identified species.

For the baseline collection of terrestrial mammal species during the spring and summer seasons of 2024, a total of 20 fieldwork days were conducted. Among the mammal species identified in the Project Area of Influence, 5 species are listed in Annex II, 10 species in Annex III of the Bern Convention, and 3 species in Annex III, 2 species in Annex III and 2 species in Annes I of CITES. According to the IUCN Red List, no species in the area is classified as endangered, with 1 species categorized as Vulnerable (VU). The remaining species are classified as Least Concern (LC). Vulnerable species have been recorded as literature.

The flora field studies identified a total of 2 regional endemic (*Digitalis trojana* (VU) and *Cirsium balikesirense* (VU)) and 1 rare distribution but not endemic (*Cyclamen hederifolium* (VU)) plant species. The plant species have been recorded in areas such as turbine locations and site roads. Due to habitat similarities, their presence in the access road and ETL areas is also considered likely, despite the absence of direct observations. The seed of *Digitalis trojana* and *Cirsium balikesirense* are collected and delivered to Ankara Seed-Gen Bank. *Cyclamen hederifolium* is a species that is difficult to produce from seed and is usually protected by translocation. Since direct habitat loss will not occur due to Project footprint, translocation was not carried out. However, it is recommended to continue monitoring the population due to dust impact. The population of the species is in good condition in the areas where it is distributed in the region.

For the baseline collection of bird species, NatureScot VP surveys at turbines and ETL and breeding bird surveys via transect and point counts were carried out in spring, summer and autumn. Surveys revealed low spring migratory rates for 2024 survey period with moderate movement in autumn, and low overall collision risk estimations based on this year's results. ETL segment with higher collision hazard was not identified. There are no additional recommendations than the previously identified mitigation and monitoring requirements for the project.

For the baseline collection of bat species, NatureScot ground static acoustic surveys were carried out in spring, summer and autumn, in addition to transect surveys covering turbine areas. Surveys revealed seasonally elevated levels of bat activity and activity of threatened species M. schreibersii. Additional mitigation and monitoring approaches were recommended.

Introduction

1.1 Project Background

Enerjisa Üretim Santralleri Anonim Şirketi has been awarded to invest in the Çanakkale Connection Region on 30 May 2019 within the scope of “Renewable Energy Resource Areas (YEKA) Regulation” and “Allocation of Wind Energy Based Renewable Energy Resource Areas (YEKA) and Total Connection Capacities”[1]. Upon this award, a “YEKA Use Rights Agreement” was signed between Enerjisa Üretim Santralleri Anonim Şirketi and Ministry of Energy and Natural Resources (MoENR) on 09 March 2020. Subsequently, the "YEKA Use Rights Agreement" signed by Enerjisa Üretim Santralleri Anonim Şirketi for the Aydın Connection Region was transferred to Enerjisa Enerji Üretim Anonim Şirketi (“Enerjisa Üretim” or “the Project Company”) with the transfer agreements signed on 03 June 2021.

Armutçuk Wind Power Plant (WPP) Project (“the Project”) with 20 turbines and 84 MWm total installed power, is planned to be implemented by Enerjisa Üretim in Çanakkale Province, Yenice District, Armutçuk Neighbourhood and Balıkesir Province, Büyükşapçı Neighbourhood. The Project components consists of 20 turbines, a switchyard, Project roads (i.e., access and site roads), a 68.75 tonnes/hour capacity mobile crashing and screening facility (to be used as needed), as well as an energy transmission line (ETL) as a Project associate facility. The Project is part of a nine-project wind energy investment package initiated by Enerjisa Üretim which has a 750 MW total installed power from a total of 180 wind turbines located in Aegean and Marmara Regions of western Türkiye; aiming to evaluate and utilize the wind energy potential of the region and contribute to the national strategy and regional economy.

The Enerjisa YEKA Nine Wind Power Plants (WPPs) projects have undergone Environmental and Social Impact Assessment (ESIA) and Critical Habitat Assessment (CHA) studies, conducted by Mott MacDonald (“Consultant”), also including Biodiversity Management Plan (BMP) development. However, due to limitations identified in the baseline data during the ESIA studies, supplementary biodiversity field surveys were deemed necessary. Consequently, Enerjisa Üretim has commissioned Mott MacDonald Türkiye to develop the site-specific baseline collection methodologies and conduct field studies accordingly. Supplementary baseline studies were conducted for each WPP, as details are provided throughout this report, managed by expert teams using relevant methodologies

1.2 Scope of Study

As a result of the ESIA study conducted by the Consultant, biodiversity data gaps were identified for the Project’s compliance with the applicable national and international standards as presented in Section 2. Supplementary biodiversity collection methodologies for flora and fauna were subsequently developed by the Consultant and field surveys were scheduled in 2024 to address biodiversity data gaps which would (1) enhance the Project biodiversity baseline to provide reliable and robust results, (2) enable revisions of CHA and BMP, (3) provide clarifications with regards to implementation of mitigation hierarchy and (4) conduct operation phase monitoring for the Project. The supplementary biodiversity surveys cover the period between March and November, which represents three seasons, spring, summer, and autumn.

[1] Published in the Official Gazette Date/No: 07.11.2018/30588

2 Applicable Guidelines and Standards

2.1 National Requirements

The primary framework of the Turkish legislation for environmental legislation is the Environmental Law (Law No: 2872). National laws and regulations regarding protection of the habitats and species are listed in Table 2-1.

Table 2-1 National Legislation on Biodiversity

Legislation (Official Gazette Date/Number - Last Revision Date)	National Strategy Documents
Law on National Parks (11.08.1983/18132 - 09.07.2018)	National Plan on on-site Protection of Plant Genetic Diversity (1998)
Terrestrial Hunting Law (11.07.2003/25165 - 28.10.2020)	National Environmental Action Plan (1999)
Law on Animal Protection (01.07.2004/25509 - 13.12.2010)	National Forestry Program (2004)
Regulation on the Protection of Wetlands (04.04.2014/28962 - 23.06.2022)	Climate Change Action Plan (2012)
Regulation for Implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora (27.12.2001/24623 - 20.07.2019)	Turkish National Action Plan against Desertification (2015)
Regulation on Protection of Wildlife and Wildlife Development Areas (08.11.2004/25637)	National Rural Development Strategy (2015)
Law on Protection of Cultural and Natural Assets (23.07.1983/18113 - 15.06.2022)	National Biological Diversity Strategy and Action Plan (2019)
Regulation on Collection, Protection and Usage of Plant Genetic Resources (19.07.2012/28358)	
Law on Fisheries (04.04.1971/ 13799 - 17.02.2021)	
The Environmental Protection Agency for Special Areas (08.07.2011/ 27988)	
Environment Law (11.08.1983 / 18132 - 15.06.2022)	
Forestry Law (08.09.1956 / 9402 - 25.12.2021)	
Law on Pasture (28.02.1998 / 23272 - 18.01.2019)	
Law on Coastal Areas Management (17.04.1990 / 20495 - 28.10.2020)	

2.2 International Requirements

International agreements, conventions, and protocols regarding protection of the habitats and species are listed below:

- The Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention) (1981)
- The Convention on the Conservation of European Wildlife and Natural Habitats (BERN) (1984)
- United Nations Framework Convention on Climate Change (1994)
- The Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR) (1994)
- The UN Convention on Biological Diversity (1997) and Cartagena Protocol on Biosafety (2004)
- Kyoto Protocol (2009)
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1996)
- Paris Agreement (2016)

2.3 Project Standards

The Project Company intends to develop the Project in alignment with the applicable international and national standards, and the policy and requirements of the Lenders (i.e., EP IV, IFC and EBRD standards).

The international lender standards concerning biodiversity for the Project are represented by the IFC Performance Standards (PS6) and related Guidance Note (6), EBRD Performance Requirements (PR6) and Guidance Note (6) as well as Equator Principles IV (EP IV).

The impact assessment and critical habitat assessment are carried out in accordance with the following international requirements:

- IFC Performance Standards on Environmental and Social Sustainability,
- EBRD's Environmental and Social Policy and Performance Requirements
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species
- The Birds Directive (2009/147/EC)
- The Habitats Directive (92/43/EEC10)
- Post-construction Bird and Bat Fatality Monitoring for Onshore Wind Energy Facilities in Emerging Market Countries - Good Practice Handbook (2023)

The IFC PS6 objectives can be listed as:

- To protect and conserve biodiversity,
- To maintain the benefits from ecosystem services,
- To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities.

Similarly, the EBRD PR6 objectives are as defined below:

- Protect and conserve biodiversity using a precautionary approach,
- Adopt the mitigation hierarchy in the design and implementation of projects with the aim of achieving no net loss, and where appropriate, a net gain of biodiversity,
- Maintain ecosystem services, and
- Promote good international practice in the sustainable management and use of living natural resources.

3 Methodology

3.1 Flora

3.1.1 Flora Methodology

In order to reveal the flora inventory in the study area, the studies were carried out in three steps. These are 1-Desktop studies (Basic Preparation), 2-Field studies, 3-Survey (interview) studies. The flora studies have been specifically concentrated on the ETL and Access Road areas, with research and seed collection efforts directed towards the target plant species found within these designated areas.

- Station selection and literature review were conducted utilizing geographic information systems (GIS).
- As part of the GIS studies, stations for point and transect observations were initially established using satellite images as a preliminary step.
- Previous flora studies near the study area were examined within the scope of literature survey. The Project's well-studied National EIA for flora includes a flora study covering turbine locations.
- For the flora assessment, satellite maps were initially analysed as part of the field study preparations. Subsequently, fieldwork was conducted to survey the terrain and habitats within the designated area.
- Information on the distribution of species was obtained from literature sources and this information was used as a base for further analysis. For flora species, the literature sources given in Section 6.1 were reviewed.
- The synonyms of the species were also taken into consideration in the literature review.
- Within the scope of literature survey, nationally protected and internationally recognized areas were investigated, such as Kaz Mountains.

Field Studies:

- Field studies were conducted in areas that were not surveyed previously, specifically in areas where target species could potentially be observed. The flora studies, as a supplementary component, have been primarily concentrated on the ETL and access road areas, while turbine locations may be considered but are not the primary focus of the study.
- The first phase of fieldwork was carried out primarily to verify the quality of the stations identified in the desktop studies. If deemed necessary in the preliminary field work, adjustments were made to the stations. Natural and semi-natural habitats in the Project area and its immediate surroundings were taken into consideration in determining the stations.
- Surveys were carried out in 2024 during the vegetation period, with the objective of thoroughly assessing and documenting the various plant species present within the study area. The studies utilized the region's 1:25,000 scale topographic map, satellite images, GPS device, camera, a notebook, and various materials for collecting plant samples in the field, including transparent bags, a hoe, pruning shears, a plant press, and seed envelopes.
- The field studies were primarily conducted along 500-meter transect lines, representing different habitats within the Project’s footprint and area of influence.
- During the field studies, the third-level EUNIS habitat types of the study area along each transect line were also identified.

The below steps were followed in the identification process of plant species:

- During the identification of plant specimens, various sources were used, First of all Flora of Turkey and the East Aegean Islands, as well as the digital version of the Flora of Turkey (Tübives) and other references given in Section 6.1.
- Latin and Turkish names, family information, and taxonomic classification were based on the book "Türkiye Bitkileri Listesi (Damarlı Bitkiler) [List of Plants of Turkey (Vascular Plants)]" published by the Turkish Flora Research Association in 2012.
- Recent publications and newly added taxon records to the Flora of Turkey have also been reviewed, and the study Important Plant Areas of Turkey has been referenced as well.
- References have also been made to The Plant List, Plants of the World Online, and the International Plant Name Index (IPNI), and Bizimbitkiler.org.
- When determining the national IUCN threat categories of the identified species and subspecies, both endemic and non-endemic rare taxa, the primary reference used was the Red Data Book of Turkish Plants. For determining the global IUCN threat categories, the official website of the IUCN Red List was used as the main reference.

3.1.2 Field Schedule

The survey was conducted in June, July, August, September and October. Seed collection was conducted in the months of June, July, August, September. These activities were performed as part of the planned conservation and management efforts to ensure preservation of the target species.

3.1.3 Survey Locations

For the purpose of evaluating floristic diversity within the scope of the Project, the boundaries of the study area were first defined. The study area was determined by considering all components and aspects of the Project, including land preparation, excavation works, installation and construction, transportation, energy production activities, any solid/liquid waste, dust, air emissions, noise, electromagnetic impacts, and the environmental effects and spread distances of these emissions. (See Table 3-1 and Figure 3-1)

Table 3-1 Flora Survey Location (Point and Transects)

Survey Point			Transect			
Station No	Survey Point	Nearest Project Element	Transect No	Transect Start Location	Transect End Location	Nearest Project Element
1	39°38'55.48"N - 27°16'47.93"E	Access Road	1	39°38'46.47"N - 27°16'35.74"E	39°38'55.48"N - 27°16'47.93"E	Access Road
2	39°39'16.73"N - 27°16'21.83"E	Access Road	2	39°39'27.18"N - 27°16'27.36"E	39°39'15.72"N - 27°16'17.57"E	Access Road
3	39°39'43.10"N - 27°16'8.58"E	Access Road	3	39°39'36.77"N - 27°16'22.62"E	39°39'45.40"N - 27°16'0.65"E	Access Road
4	39°39'24.35"N - 27°15'23.61"E	Access Road	4	39°39'26.38"N - 27°15'27.09"E	39°39'21.28"N - 27°15'30.41"E	Access Road
5	39°39'44.34"N - 27°15'20.83"E	Access Road	5	39°39'45.45"N - 27°15'30.98"E	39°39'52.63"N - 27°15'10.97"E	Access Road
6	39°39'58.27"N - 27°15'30.16"E	Access Road	6	39°39'58.01"N - 27°15'34.90"E	39°40'4.31"N - 27°15'35.29"E	Access Road

7	39°40'5.69"N - 27°15'18.47"E	ETL - Switch Yard	7	39°40'5.69"N - 27°15'18.47"E	39°40'5.76"N - 27°15'34.70"E	ETL - Switch Yard
8	39°40'9.25"N - 27°15'37.04"E	ETL	8	39°40'10.27"N - 27°15'33.97"E	39°40'18.41"N - 27°15'46.41"E	ETL
9	39°40'17.87"N - 27°15'54.87"E	ETL	9	39°40'14.00"N - 27°15'49.48"E	39°40'24.65"N - 27°16'9.96"E	ETL
10	39°40'23.17"N - 27°16'15.33"E	ETL	10	39°40'29.22"N - 27°16'18.02"E	39°40'14.86"N - 27°16'18.83"E	ETL
11	39°40'29.45"N - 27°16'47.17"E	ETL	11	39°40'28.64"N - 27°16'44.36"E	39°40'25.20"N - 27°17'11.53"E	ETL
12	39°40'16.17"N - 27°17'45.76"E	ETL	12	39°40'21.92"N - 27°17'47.81"E	39°40'11.80"N - 27°17'41.65"E	ETL
13	39°40'19.16"N - 27°18'22.12"E	ETL	13	39°40'21.63"N - 27°18'11.56"E	39°40'14.36"N - 27°18'20.14"E	ETL
14	39°40'9.33"N - 27°18'33.37"E	ETL	14	39°40'15.91"N - 27°18'36.79"E	39°40'9.21"N - 27°18'31.90"E	ETL
15	39°41'23.69"N - 27°15'6.54"E	Target Flora Species - T8	15	39°41'23.69"N - 27°15'6.54"E	39°41'23.70"N - 27°15'16.45"E	Target Flora Species - T8
16	39°40'58.14"N - 27°15'18.16"E	Target Flora Species - T10	16	39°40'54.51"N - 27°15'26.30"E	39°41'3.48"N - 27°15'21.81"E	Target Flora Species - T10
17	39°40'32.12"N - 27°15'7.03"E	Target Flora Species - T13	17	39°40'36.31"N - 27°15'9.79"E	39°40'22.72"N - 27°15'3.51"E	Target Flora Species - T13 - T18
18	39°40'17.99"N - 27°14'59.42"E	Target Flora Species - T18	18	39°40'17.99"N - 27°14'59.42"E	39°40'16.54"N - 27°15'13.55"E	Target Flora Species - T18
19	39°40'2.31"N - 27°14'4.76"E	Target Flora Species - T14	19	39°40'0.42"N - 27°14'1.92"E	39°40'0.22"N - 27°14'12.69"E	Target Flora Species - T14
20	39°40'55.69"N - 27°13'52.39"E	Target Flora Species - T4	20	39°40'50.79"N - 27°13'48.77"E	39°41'0.19"N - 27°13'54.24"E	Target Flora Species - T4
21	39°42'27.17"N - 27°12'6.44"E	Target Flora Species	21	39°42'30.34"N - 27°12'15.13"E	39°42'12.88"N - 27°11'57.82"E	Target Flora Species

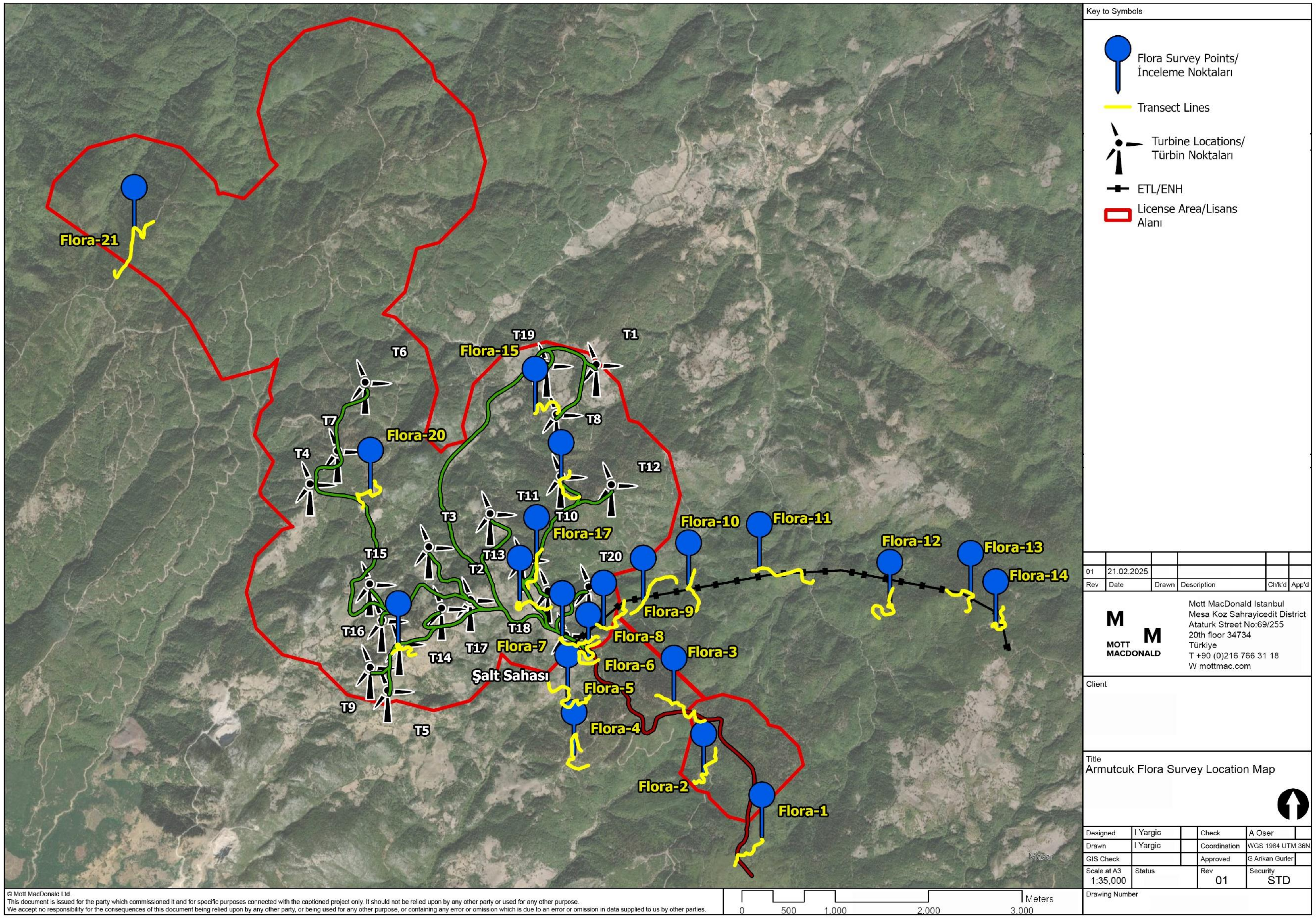

Figure 3-1 Flora Survey Location Map

3.2 Terrestrial Mammal

3.2.1 Terrestrial Mammal Methodology

In order to reveal the mammals inventory in the study area, the studies were carried out in three steps. These are 1-Desktop studies (Basic Preparation), 2-Field studies, 3-Survey (interview) studies. The mammal studies, as a supplementary component, have been specifically concentrated on the ETL and Access Road areas, with research efforts focused on identifying suitable locations for camera traps and transects, while turbine locations may be considered but are not the primary focus of the study.

Desktop Studies:

- Station selection and literature review were conducted utilizing GIS.
- As part of the GIS studies, point and transect locations were initially determined using satellite imagery for preliminary preparation.
- Previous mammals studies near the study area were examined within the scope of literature review.
- For mammals, firstly, satellite maps were analysed within the scope of field preparation studies.
- As part of the field preparation for terrestrial mammal, satellite maps were initially analysed. Subsequently, fieldwork was conducted to assess the status of the species and their relationship with the habitat. The precise locations of the stations were determined during the fieldwork.
- Information on the distribution of species was obtained from literature sources and this information was used as a base. The literature sources given in Section 6.2 were reviewed.
- The synonyms of the species were also taken into consideration in the literature review.
- Within the scope of literature reviews, nationally protected and internationally recognized areas were investigated and surveyed.

Field Studies:

- Field studies were conducted in areas that were not surveyed previously. The terrestrial mammal studies, as a supplementary component, have been specifically concentrated on the, ETL and access road area. while turbine locations may be considered but are not the primary focus of the study.
- The first phase of field studies for terrestrial mammals aimed to assess the suitability of camera trap and transect locations identified in the desktop studies. Stations were relocated, if necessary, with consideration given to natural and semi-natural habitats in and around the Project area.
- Mammal field studies was conducted in two main parts. Direct observation (camera trap) and Indirect observation (Footprints, faeces, and body hair).
- In the field studies habitats suitable for mammals were identified and observations were made for a total of 20 days according to the size of the habitat.
- Paths that could be the passage routes of medium and large mammals etc. were checked for camera trap installation. Camera traps were installed at points where animal signs (tracks, feces etc.) were seen.
- Indirect observation was made on the existing roads and footpaths within the Area of Influence.
- Camera traps remained in the field for 15 consecutive days at each survey point in April 2024 and 5 consecutive days in May 2024.

3.2.2 Field Schedule

A total of 20 days of survey was conducted in 2024 during the active season April and May) for mammals to thoroughly assess and document the mammal species present within the study area. The field survey was strategically planned to align with the period of increased mammal activity, ensuring that observation of the mammal species, including both common and rare species, could be accurately recorded. This timing facilitated the identification of potential habitats and the collection of relevant data regarding species distribution and behaviour.

3.2.3 Survey Locations

For the purpose of evaluating terrestrial mammals diversity within the scope of the Project, the boundaries of the study area were first defined. The study area was determined by considering all components and aspects of the Project, including land preparation, excavation works, installation and construction, transportation, energy production activities, any solid/liquid waste, dust, air emissions, noise, electromagnetic impacts, and the environmental effects and spread distances of any emissions.(See Table 3-2 and Figure 3-2)

Table 3-2 Terrestrial Mammals Survey Locations (Camera Trap and Transect)

Camera Trap			Transect			
Station No	Camera Trap Point	Nearest Project Element	Transect No	Transect Start Location	Transect End Location	Nearest Project Element
1	39°38'50.23"N - 27°16'32.51"E	Access Road	1	39°38'40.97"N - 27°16'32.52"E	39°39'8.40"N - 27°16'43.41"E	Access Road
2	39°39'20.60"N - 27°16'20.34"E	Access Road	2	39°39'8.73"N - 27°16'22.08"E	39°39'36.81"N - 27°16'22.74"E	Access Road
3	39°39'36.27"N - 27°15'54.61"E	Access Road	3	39°39'39.14"N - 27°16'5.48"E	39°39'45.48"N - 27°15'48.27"E	Access Road
4	39°40'1.81"N - 27°16'3.16"E	Access Road	4	39°40'7.96"N - 27°16'25.86"E	39°40'9.51"N - 27°15'48.25"E	Access Road
5	39°40'2.74"N - 27°15'36.26"E	Access Road	5	39°40'8.84"N - 27°15'40.46"E	39°39'48.76"N - 27°15'24.72"E	Access Road
6	39°40'8.04"N - 27°15'29.67"E	ETL - Switch Yard	6	39°40'4.94"N - 27°15'24.14"E	39°40'14.71"N - 27°15'34.89"E	ETL - Switch Yard - T20
7	39°40'20.32"N - 27°15'56.73"E	ETL	7	39°40'14.00"N - 27°15'49.48"E	39°40'24.65"N - 27°16'9.96"E	ETL
8	39°40'23.16"N - 27°16'15.34"E	ETL	8	39°40'29.22"N - 27°16'18.02"E	39°40'14.86"N - 27°16'18.83"E	ETL
9	39°40'22.22"N - 27°16'38.01"E	ETL	9	39°40'12.26"N - 27°16'32.74"E	39°40'27.56"N - 27°16'54.45"E	ETL
10	39°40'24.85"N - 27°17'48.07"E	ETL	10	39°40'42.71"N - 27°17'57.20"E	39°40'13.16"N - 27°17'46.89"E	ETL
11	39°40'19.12"N - 27°18'22.19"E	ETL	11	39°40'19.35"N - 27°18'7.05"E	39°40'12.77"N - 27°18'19.39"E	ETL

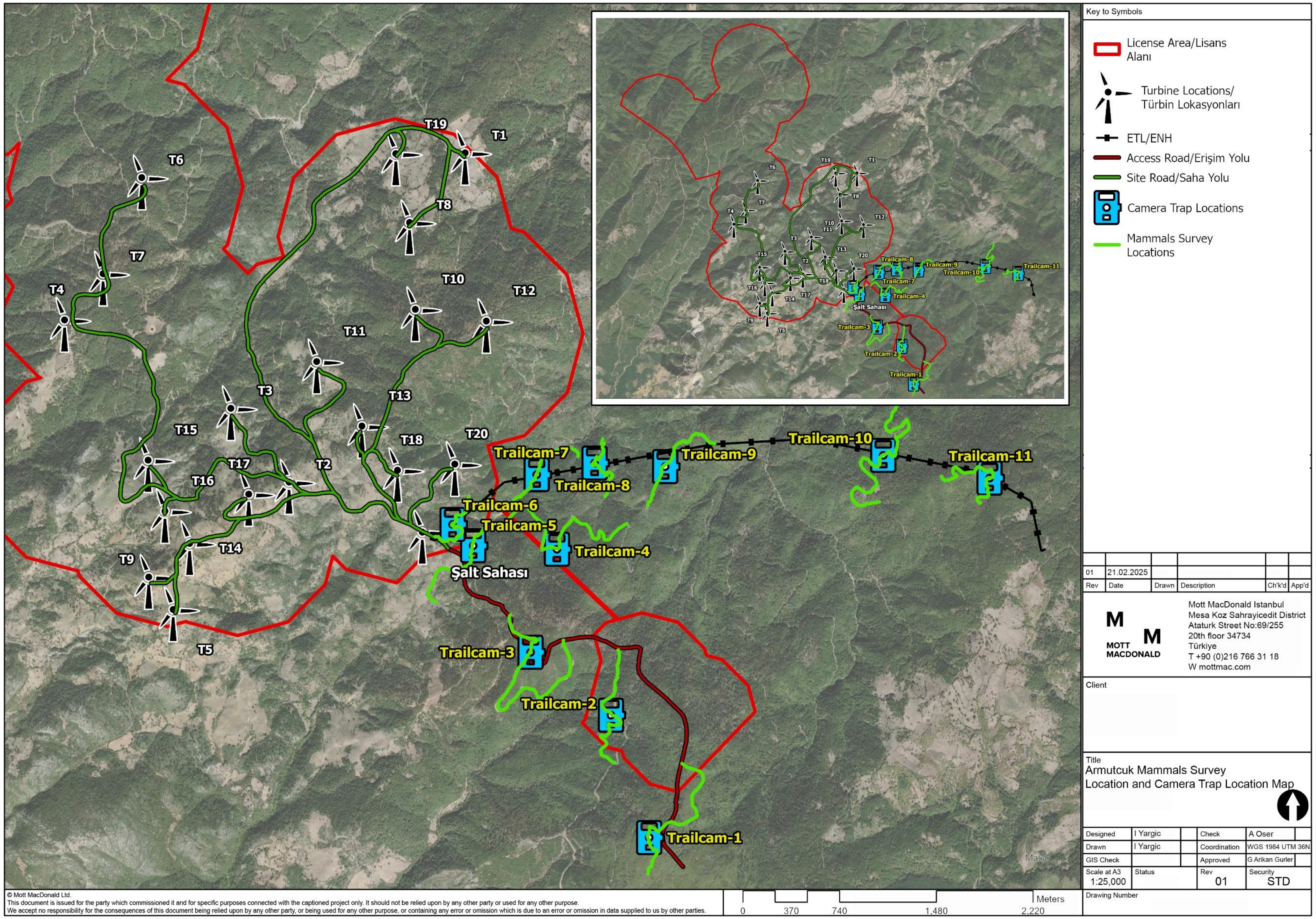

Figure 3-2 Terrestrial Mammal Camera Trap and Transect Survey Locations

3.3 Herpetofauna

3.3.1 Herpetofauna Methodology

In order to reveal the herpetofauna inventory in the study area, the studies were carried out in three steps. These are 1-Desktop studies (Basic Preparation), 2-Field studies, 3-Survey (interview) studies. The herpetofauna studies, as a supplementary component, have been specifically concentrated on the ETL and Access areas, with research efforts focused on identifying suitable locations for sampling points and transects, while turbine locations may be considered but are not the primary focus of the study.

- Station selection and literature review were conducted utilizing GIS.
- As part of the GIS studies, point and transect locations were initially determined using satellite imagery for preliminary preparation.
- Previous herpetofauna studies near the study area were examined within the scope of literature review.
- As part of the field preparation for herpetofauna, satellite maps were initially analysed. Subsequently, fieldwork was conducted to assess the status of the species and their relationship with the habitat. The precise locations of the stations were determined during the fieldwork.
- Information on the distribution of species was obtained from literature reviews and this information was used as a base. The literature sources given in section 6.3 were reviewed.
- The synonyms of the species were also taken into consideration in the literature review.
- Within the scope of literature reviews, nationally protected and internationally recognized areas were investigated and surveyed.

Field Studies:

- Field studies were conducted in areas that were not surveyed previously. The herpetofauna studies, as a supplementary component, have been specifically concentrated on the, ETL and access road area. while turbine locations may be considered but are not the primary focus of the study.
- The first phase of field studies for herpetofauna aimed to assess the suitability of point and transect locations identified in the desktop studies. Stations were relocated, if necessary, with consideration given to natural and semi-natural habitats in and around the Project area.
- In the following studies, habitats suitable for amphibians and reptiles were identified and observations were made for a total of 4 days according to the size of the habitat. Fieldwork started in the morning at daylight and continued until dusk for nocturnal species.
- Observations were conducted at total 14 stations and 14 transects for varying periods of time depending on the size of the habitat.
- In order to identify amphibians and reptiles, water sources, areas close to water sources, under stones and rocks, rock crevices and cracks, tree hollows, etc. were checked in the field work carried out in and around the study area.
- During the observations, 'Visual Encounter Survey (VES)' and Call Survey were used to determine the presence of amphibians and reptile species.

3.3.2 Survey Locations

For the purpose of evaluating herpetofauna diversity within the scope of the Project, the boundaries of the study area were first defined. The study area was determined by considering all components and aspects of the Project, including land preparation, excavation works, installation and construction, transportation, energy production activities, any solid/liquid waste, dust, air emissions, noise, electromagnetic impacts, and the environmental effects and spread distances of any emissions. (See Table 3-3 and Figure 3-3)

Table 3-3 Herpetofauna Survey Locations

Survey Point			Transect			
Station No	Survey Point	Nearest Project Element	Transect No	Transect Start Location	Transect End Location	Nearest Project Element
1	39°38'55.48"N - 27°16'47.93"E	Access Road	1	39°38'46.42"N - 27°16'35.78"E	39°39'8.49"N - 27°16'42.88"E	Access Road
2	39°39'16.73"N - 27°16'21.83"E	Access Road	2	39°39'27.18"N - 27°16'27.36"E	39°39'15.72"N - 27°16'17.57"E	Access Road
3	39°39'43.10"N - 27°16'8.58"E	Access Road	3	39°39'36.77"N - 27°16'22.62"E	39°39'45.40"N - 27°16'0.65"E	Access Road
4	39°39'24.35"N - 27°15'23.61"E	Access Road	4	39°39'26.38"N - 27°15'27.09"E	39°39'21.28"N - 27°15'30.41"E	Access Road
5	39°39'44.34"N - 27°15'20.83"E	Access Road	5	39°39'45.45"N - 27°15'30.98"E	39°39'52.63"N - 27°15'10.97"E	Access Road
6	39°39'58.27"N - 27°15'30.16"E	Access Road	6	39°39'52.87"N - 27°15'35.10"E	39°40'5.31"N - 27°15'36.90"E	Access Road
7	39°39'38.27"N - 27°15'45.91"E	Access Road	7	39°39'39.74"N - 27°15'48.90"E	39°39'49.46"N - 27°15'41.57"E	Access Road
8	39°40'5.69"N - 27°15'18.47"E	ETL - Switch Yard	8	39°40'5.69"N - 27°15'18.47"E	39°40'5.76"N - 27°15'34.70"E	ETL - Switch Yard
9	39°40'18.70"N - 27°15'46.41"E	ETL	9	39°40'10.27"N - 27°15'33.97"E	39°40'18.41"N - 27°15'46.41"E	ETL
10	39°40'28.39"N - 27°16'3.19"E	ETL	10	39°40'26.88"N - 27°15'53.61"E	39°40'35.89"N - 27°16'4.57"E	ETL
11	39°40'29.45"N - 27°16'47.17"E	ETL	11	39°40'28.64"N - 27°16'44.36"E	39°40'25.20"N - 27°17'11.53"E	ETL
12	39°40'16.17"N - 27°17'45.76"E	ETL	12	39°40'21.92"N - 27°17'47.81"E	39°40'11.80"N - 27°17'41.65"E	ETL
13	39°40'19.16"N - 27°18'22.12"E	ETL	13	39°40'21.63"N - 27°18'11.56"E	39°40'14.36"N - 27°18'20.14"E	ETL
14	39°40'9.33"N - 27°18'33.37"E	ETL	14	39°40'15.91"N - 27°18'36.79"E	39°40'9.21"N - 27°18'31.90"E	ETL

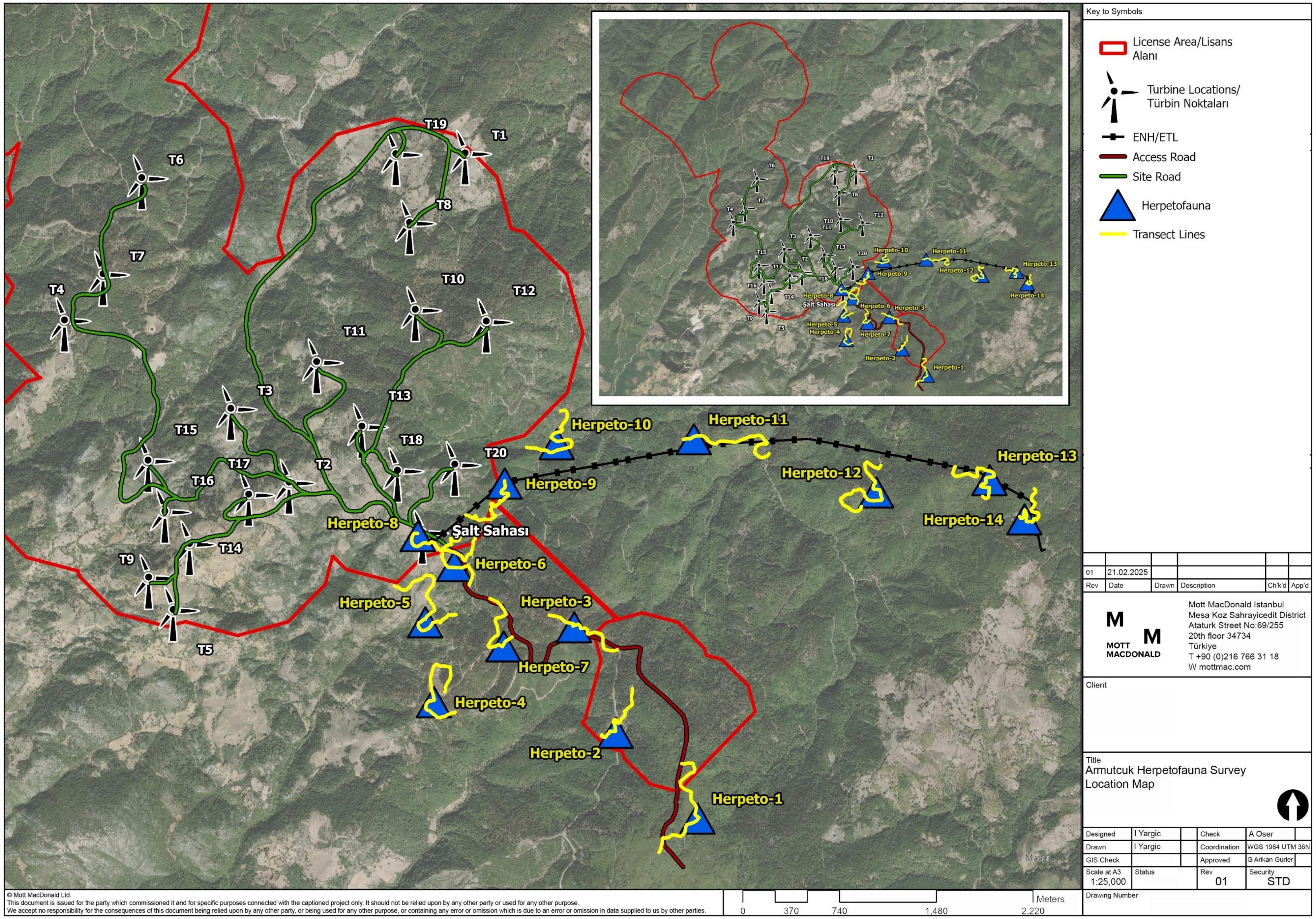

Figure 3-3 Transect and Point Survey Locations of Herpetofauna

3.4 Bird

As previously presented in the standalone methodology reports[2], studies on birds were carried out on 3 main topics: Turbine Vantage Point (VP) survey, ETL VP survey, and Breeding Bird Survey.

No major changes to bird methodology were made. On the other hand, a short summary of minor changes to established methodologies based on field ground truthing are summarised below, and discussed in further detail under Section 3.4.1, 3.4.2 and 3.4.4;

- Ground truthing of the VP and VP ETL resulted in changes to nearly all VP and VP ETL locations. Visual coverage was not impeded, and the changes provided ample coverage of the turbines and the ETL (see Section 3.4.1 and Section 3.4.2).
- VPs were renamed (numeration) for field surveyor convenience (see Section 3.4.1, and Section 3.4.2).
- Spring season for the Project region was considered as extending to late June as confirmed by the local ornithology experts. (see Section 3.4.4).

3.4.1 Vantage Point Methodology

Bird survey is based on a vantage point survey, hereafter VP, on high ground methodology both for migratory and breeding/resident species as defined by NatureScot (formerly known as SNH) guidelines, which are widely used for ecological impact assessment studies on wind farms.

VP involves conducting observations from a fixed location, from where the whole Project area can be seen and all the birds flying through the wind farm airspace can be detected. A minimum of 36 hours of observations are required for each season.

The appropriate time of observations is determined as when target species are active which is between 09:00 - 17:00, though changing daylight conditions between seasons are also considered when scheduling observations. The observer scans the area within the main viewing angle every 5 minutes, using the maximum angle if a bird contact moves outside of the main angle. When a bird is detected, the species is identified, total number of birds is noted, minimum and maximum flight height during the course is estimated, first and last time of the sighting is noted. A standard field recording sheet was used (see Appendix 6.9).

The observer pays particular attention to the flight height of the birds. The height levels of a wind turbine can be marked as: (a) below rotor height (<42 m), (b) at rotor height (42-180 m), (c) above rotor height (>180 m). When the birds possibly fly near the turbines, the flight line cross the location of the turbine. On maps specifically designed for each VP, the flight path of each bird is drawn.

Vantage Point Field Schedule

During spring of 2024, a total of 100 hours of surveys were conducted across three vantage points (VP1, VP2, and VP3) as presented in Table 3-4. Week number of the year are denoted with Monday as first day. Spring surveys started on 14 April 2024 and continued to 30 June 2024. On average, approximately 33 hours and 20 minutes of surveys were conducted per vantage point, which is less than the 36 hours recommended by NatureScot for a single season. Several factors contributed to this situation. Firstly, the access roads had very bad conditions. Although the team allocated sufficient days to cover the targeted survey hours, they faced significant challenges. The roads were not ready at the time of the surveys, requiring the vehicle to cross rivers to reach the identified vantage points. Consequently, the team could only conduct

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[2] Armutçuk WPP Biodiversity Monitoring Methodology. Mott MacDonald. Issue date 28 March 2024.

surveys in the afternoons. Secondly, the forest cover and topography were difficult. On the first two days, the team had to spend time looking for more appropriate locations for vantage points as those identified using Geographical Information System software were not suitable for full visual coverage. Third, the weather conditions are harsher at the site. The Project is located near the mountainous regions of the Kaz Mountains which can present harsh weather conditions well into June-July. Even on July 4, the team had to abandon the survey locations due to severe rain and gale storms. Same issues also applied for VP ETL observations.

Table 3-4 VP survey effort and dates in spring.

Week	First Day	VP1	VP2	VP3	Total (h)
W15	08/04	6:28	-	-	6:28
W16	15/04	6:21	4:58	4:54	16:13
W20	13/05	6:22	5:30	6:57	18:49
W21	20/05	8:19	7:04	6:32	21:55
W26	24/06	6:29	18:05	12:01	36:35
Total	-	33:59	35:37	30:24	100:00

During summer 2024, a total of 195 hours and 10 minutes of surveys were conducted across two vantage points (VP1, VP2 and VP3) as presented in Table 3-5. Week number of the year are denoted with Monday as first day. The surveys started in at the beginning of July and continued until the end of August. On average, approximately 65 hours and 4 minutes of surveys were conducted per vantage point.

Table 3-5 VP survey effort and dates in summer.

Week	First Day	VP1	VP2	VP3	Total (h)
W27	01/07	7:45	8:39	9:07	25:31
W28	08/07	6:10	6:03	12:13	24:26
W29	15/07	14:39	12:48	13:13	40:40
W30	22/07	6:10	18:01	12:05	36:16
W32	05/08	12:31	6:05	6:00	24:36
W33	12/08	16:41	13:14	13:46	43:41
Total	-	63:56	64:50	66:24	195:10

During autumn 2024, a total of 120 hours and 47 minutes of surveys were conducted across two vantage points (VP1, VP2 and VP3) as presented in Table 3-6. Week number of the year are denoted with Monday as first day. The surveys started the beginning of September and continued until mid-November. On average, approximately 40 hours and 16 minutes of surveys were conducted per vantage point. Extended coverage was allocated for (1) missed survey time in spring and (2) for Kaz Mountains raptors and breeding species.

Table 3-6 VP survey effort and dates in autumn.

Week	First Day	VP1	VP2	VP3	Total (h)
W36	02/09	8:03	6:38	6:52	21:33
W37	09/09	8:03	6:32	6:48	21:23
W41	07/10	16:15	12:20	12:50	41:25
W43	21/10	-	6:03	6:12	12:15
W45	04/11	6:06	12:02	6:03	24:11
Total	-	38:27	43:35	38:45	120:47

VP Locations

3 VPs are used for the best visual coverage of the turbine areas. Locations of the VPs are shown on Figure 3-4 and coordinates of the VPs are provided in Table 3-7.

Table 3-7 Locations of the VPs (WGS 84 UTM 35N)

VP	Easting	Northing
VP1	518931	4393321
VP2	521504	4391576
VP3	521919	4392473

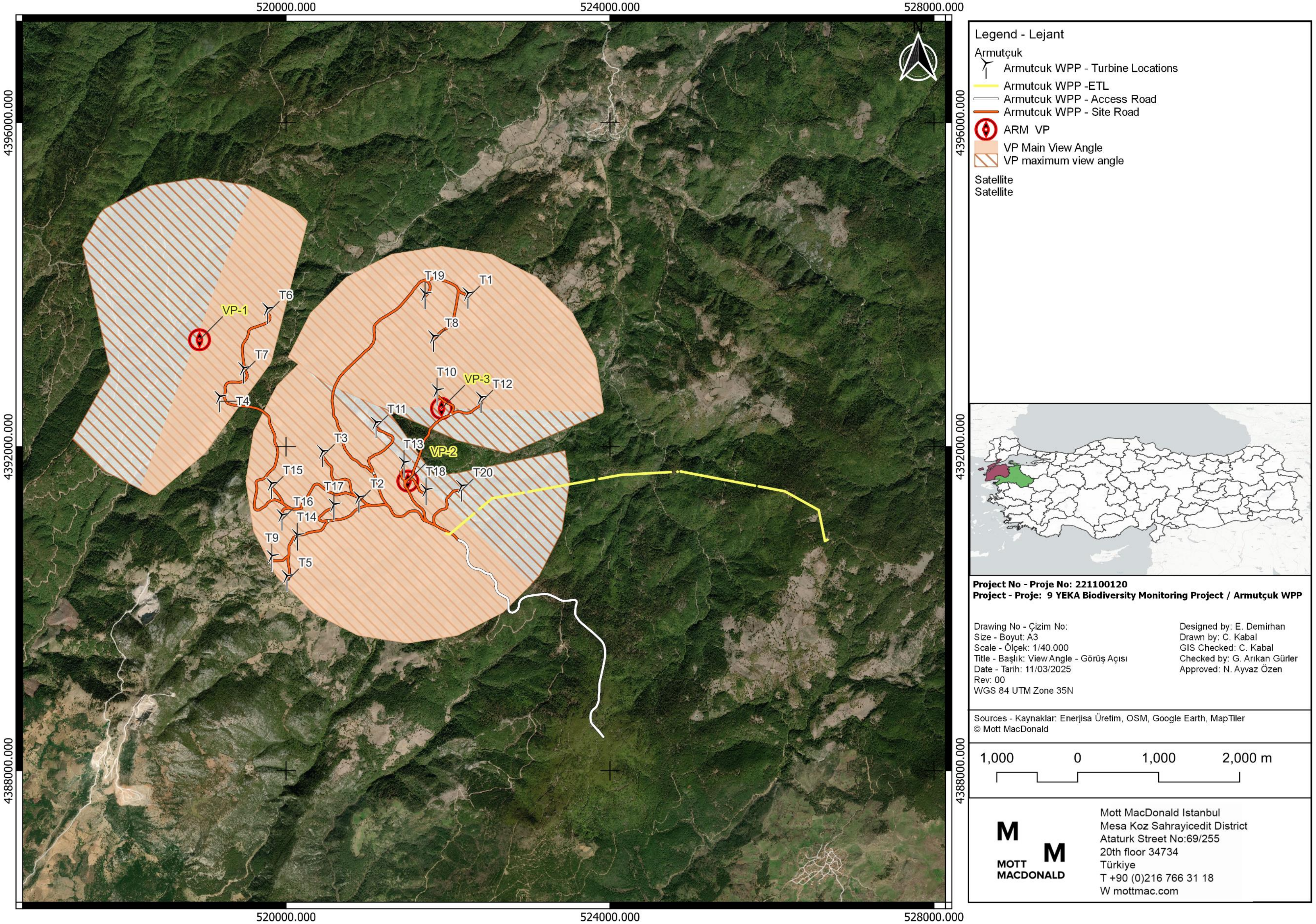

Figure 3-4 Locations of the VPs

3.4.2 ETL Observations

The impact of the wind farm is not complete without considering the related and connected infrastructure. The transmission lines are known to cause death to birds by physical injuries and electrocution. The isolation of the pylons and the installation of the bird diverters are important.

ETL monitoring provides valuable insights into the bird species present at the ETL route and potential environmental considerations related to the observed habitats. In order to assess the potential impact of ETL on the areas it will traverse post-construction, 2 vantage points (VP ETLs) were thoughtfully selected, and observations were conducted at these points (Figure 3-5). An observer was present at the selected VP ETL and scanned the area each 5 minutes at the maximum possible view angle. When a bird is detected, the species is identified, and the flight height of the bird is recorded as above or below the ETL.

To analyse bird passage rates, the number of bird passages per hour was calculated for each vantage point (TLs) along the ETL. The average passage rate was then determined for three seasons. ETL segments were classified into low, medium, or high-risk categories based on passage rates of target species:

- Low risk: Up to 0.35 bird passages/hour (average value: 0.25 bird passages/hour)
- Medium risk: Between 0.35 and 0.70 bird passages/hour (average value: 0.50 bird passages/hour)
- High risk: Above 0.70 bird passages/hour

These threshold values were established by comparing data from the 9 WPP projects. Current guidelines do not provide explicit thresholds for risk levels; therefore, these classifications were determined based on an arbitrary but consistent decision-making process informed by the comparative dataset.

ETL Observation Field Schedule

A total of 61 hours and 46 minutes of survey were conducted across two transmission line points (VPs ETL1, ETL2) between 15 April 2024 and 30 June 2024. On average, approximately 31 hr of survey was conducted per vantage point (VP ETL) as shown in Table 3-8.

Table 3-8 ETL survey effort and dates in spring

Week	First Day	VP ETL1	VP ETL2	Total
W16	15/04	7:06	6:04	13:10
W18	29/04	5:12	6:04	11:16
W20	13/05	6:53	6:23	13:16
W26	24/06	12:01	12:03	24:04
Total	-	31:12	30:34	61:46

A total of 154 hours and 14 minutes of surveys were conducted during the summer of 2024, starting on July 1, and finishing on August 31. The surveys were carried out at two transmission line points (VPs ETL1, ETL2). On average, approximately 77 hr and 7 minutes of survey was conducted per vantage point (VP ETL) as shown in Table 3-9.

Table 3-9 ETL survey effort and dates in summer

Week	First Day	VP ETL1	VP ETL2	Total
W27	01/07	15:37	12:49	28:26
W28	08/07	12:01	12:03	24:04
W29	15/07	14:26	13:12	27:38

Week	First Day	VP ETL1	VP ETL2	Total
W30	22/07	12:03	12:03	24:06
W32	05/08	6:03	18:01	24:04
W33	12/08	13:40	12:16	25:56
Total	-	73:50	80:24	154:14

A total of 78 hours and 17 minutes of surveys were conducted during the autumn of 2024, starting on September 1st, and finishing on 15 November. The surveys were carried out at three transmission line points (VPs ETL1, ETL2). On average, approximately 39 hours and 9 minutes of survey was conducted per vantage point (VP ETL) as shown in Table 3-10.

Table 3-10 ETL survey effort and dates in autumn

Week	First Day	VP ETL1	VP ETL2	Total
W37	09/09	15:05	12:50	27:55
W41	07/10	13:51	12:12	26:03
W45	04/11	12:04	12:15	24:19
Total	-	41:00	37:17	78:17

ETL Observation Locations

2 VPs are used for the best visual coverage of the turbine areas. Locations of the ETL VPs are shown on Figure 3-5. Coordinates of the ETL VPs are provided in Table 3-11.

Table 3-11 Locations of the VPs (WGS 84 UTM 35N)

VP	Easting	Northing
VP ETL1	522230	4390791
VP ETL2	525065	4392299

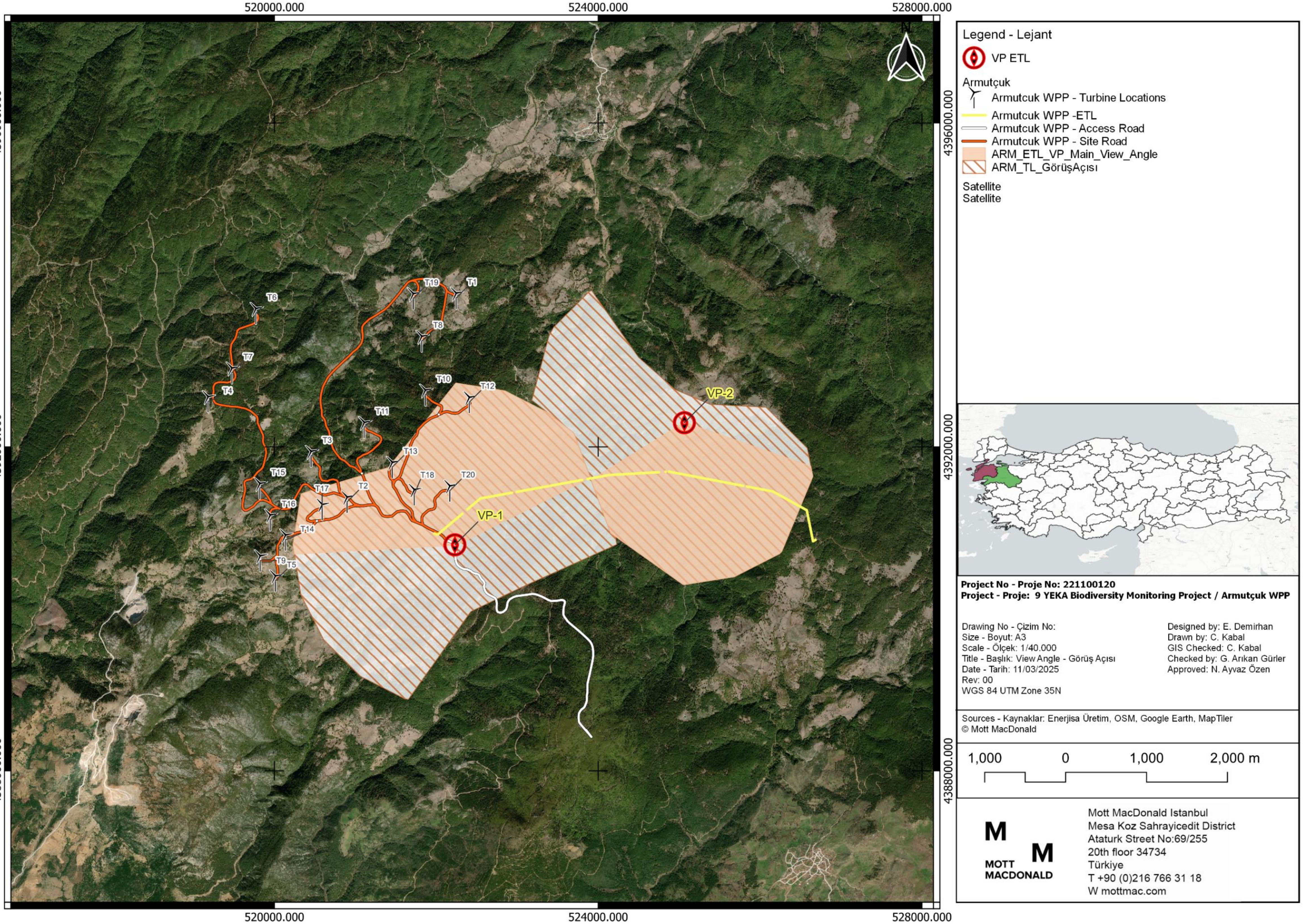

Figure 3-5 Locations of the ETL VPs

3.4.3 Collision Risk Methodology

NatureScot Guidance note describes a methodology for assessing the full impact of wind farms on ornithological interests which includes a two-stage process for the assessment of collision risk (NatureScot 2000). Stage (1) involves the calculation of the number of birds that fly through the rotors, which itself consists of two separate approaches, modified in order to calculate (a) resident bird numbers and (b) migratory bird numbers. Stage (2) involves the calculation of the probability of a bird being hit by a rotor when flying through. Avoidance rates in both approaches are accounted for according to NatureScot (2018), which for raptors is specified as 98% (see Appendix 6.4).

For the purposes of this analysis, a resident bird is defined as individuals of either resident species or migrant species that spend more time at the Project site than simply passing by. In other words, any bird that spent more time for feeding, resting, hunting was regarded as resident. A migrant bird was defined as birds that only pass through the area once in a certain direction, typically in order to migrate.

Approach 1: Regular Flights through a Wind Farm

The first approach was designed for cases in which a bird population makes regular flights through the wind farm, possibly in a reasonably defined direction. This is usually applied for species that exhibit regular flights between the feeding and sleeping (roosting) areas, such as wintering geese, gulls and cranes.

In this analysis, approach 1 was modified to be applicable to migrant birds. This approach was utilized to estimate the mortality of birds that only fly through and not sleep (roost), feed or exhibit other behaviour that causes the bird to spend time in the area.

Calculation of the collision risk for the birds during regular flights according to NatureScot is:

1. Identify a 'risk window' i.e. a window of width equal to the width of the wind farm across the general flight direction of the birds, and of height equal to the maximum height of the highest turbine. The cross-sectional area W = width x height.
2. Estimate the number of birds flying through this risk window per annum, i.e. flock size x frequency of flight. Make allowance in the flock size for occasions on which birds which may fly higher than this risk window and for the fact that the risk window may only straddle a proportion of the overall flight corridor used by the birds.
3. Calculate the area A presented by the wind farm rotors. Assume the rotors are aligned in the plane of the risk window as, to a first approximation, any reduction in cross-sectional area because the rotors are at an oblique angle is offset by the increased risk to birds which have to make a longer transit through the rotors. Where rotors overlap when viewed in cross-section, allow for the full cross-sectional area of separate rotors as the risk to birds is doubled if passing through two successive rotors: A = N x πR2 where N is the number of rotors and R is the rotor radius
4. Express the total rotor area as a proportion A / W of the risk window.
5. Number of birds passing through rotors = number of birds through risk window x proportion occupied by rotors = n x (A / W)

3.4.3.1 Approach 2: Birds using the Wind Farm Airspace

The second approach was designed for birds such as raptors which occupy a recognised territory, and there is a certain level of understanding of the likely distribution of flights within that territory.

In this analysis, Approach 2 was adapted to estimate the mortality of resident birds, i.e. birds that spend a certain amount of time hunting, territory defence, displaying and nesting in the area.

Calculation of the collision risk for the birds using the airspace of the wind farm following NatureScot (2000) is:

1. Identify a 'flight risk volume' Vw which is the area of the wind farm multiplied by the height of the turbines.
2. Calculate the combined volume swept out by the wind farm rotors Vr = N x πR2 x (d + l) where N is the number of wind turbines, d is the depth of the rotor back to front, and l is the length of the bird.
3. Estimate the bird occupancy n within the flight risk volume. This is the number of birds present multiplied by the time spent flying in the flight risk volume, within the period (usually one year) for which the collision estimate is being made.

For good results the data available should be based on actual observations within the area of the wind farm alone (provided the observation is done without disturbance), and the best results will be based on observational data about flight heights, such as will enable informed estimate of the proportion of flights at a level which may collide with the wind farm rotors. However, in the absence of such data, an estimate can be made knowing only the number of birds, and proportion of time flying, within the bird's territory, and using some knowledge of flight behaviour to gauge the proportion of flights at a height to be at risk.

4. The bird occupancy of the volume swept by the rotors is then

n x (Vr / Vw) bird-secs.

5. Calculate the time taken for a bird to make a transit through the rotor and completely clear the rotors:

t = (d + l) / v where v m/sec is the speed of the bird through the rotor

6. To calculate the number of bird transits through the rotors, divide the total occupancy of the volume swept by the rotors in bird-secs by the transit time t:

Number of birds passing through rotors = n x (Vr / Vw) / t

3.4.4 Breeding Bird Methodology

In the region, the breeding season for most bird species is between March and July, according to the Turkish Breeding Bird Atlas (which was incorporated into European Breeding Bird Atlas[3]). Breeding bird surveys were conducted for early and late breeding seasons at the Wind Farm. These surveys utilized both line transect (VPs) and points counts (VP ETLs) methods. For the line transect method, transects were selected adjacent to vantage points. Observers walked along these transect lines, recording each potential breeding bird observed, along with the species and the highest level of breeding code for each bird species as given in Table 3-12. For the point count method, observers recorded each potential breeding bird observed at VP and VP ETL points during bird monitoring surveys, along with the species and the highest level of breeding code for each bird species.

Table 3-12 Breeding bird survey atlas codes.

Breeding categories and Atlas codes
A Possible breeding

[3] https://ebba2.info/

1 Species observed in breeding season in possible nesting habitat
2 Singing male(s) present (or breeding calls heard) in breeding season
B Probable breeding
3 Pair observed in suitable nesting habitat in breeding season
4 Permanent territory presumed through registration of territorial behaviour (song, etc.) on at least two different days a week or more apart at same place
5 Courtship and display
6 Visiting probable nest site
7 Agitated behaviour or anxiety calls from adults
8 Breed patch on adult examined in the hand
9 Nest building or excavating of nest hole
C Confirmed breeding
10 Distraction display or injury feigning
11 Used nest or eggshells found (occupied or laid within period of survey)
12 Recently fledged young (nidicolous species) or downy young (nidifugous species)
13 Adults entering or leaving nest site in circumstances indicating occupied nest (including high nests or nest holes, the contents of which cannot be seen) or adult seen incubating
14 Adult carrying a faecal sac or food for young
15 Nests containing eggs
16 Nests with young seen or heard

Breeding Bird Field Schedule and Locations

During the breeding bird surveys, a total of 5 transect walks were conducted in April and June (Table 3-13). The walks lasted an average of 58.6 minutes and covered 1.2 km (Figure 3-6). Most walks were conducted at around 09:00 in the morning.

In addition, bird sighting data collated from all VPs and VP ETLs between March and June were used for additional data points on breeding birds.

Table 3-13 Breeding bird survey dates and nearest VPs.

Transect Location	Date	Month	Time	Duration (min)	Distance (km)
ARM-VP1	15.04.2024	Apr	10:08:00	62	1
ARM-VP2	15.04.2024	Apr	10:55:00	40	1
ARM-VP3	15.04.2024	Apr	10:59:00	80	1
ARM-TL2	17.04.2024	Apr	09:44:00	65	1
ARM-TL1	17.04.2024	Apr	10:22:00	64	1
ARM-VP1	19.05.2024	May	09:40:00	77	1
ARM-VP2	19.05.2024	May	10:32:00	60	2
ARM-VP3	20.05.2024	May	09:45:00	60	1

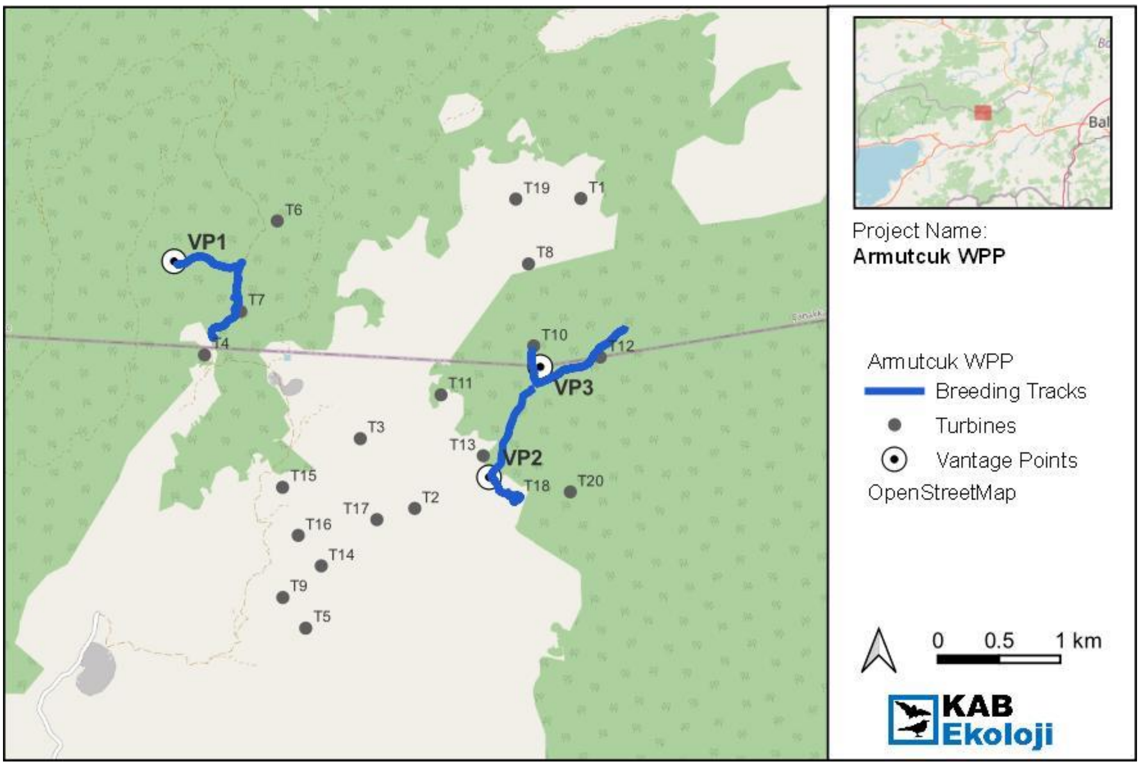

Figure 3-6 Line transects used for breeding surveys at the project site

3.5 Bat

No major changes to the established bat methodology were made and there are no minor ones to mention.

Device failures of unknown causes occurred and resulted in minor data losses. Despite device recording failures which were intermittent and unpredictable, enough nights of data were collected for analysis due to NatureScot methodology's high consecutive recording requirements. Detector recording success for spring can be seen in Table 4-37, summer in Table 4-42 and autumn in Table 4-48. Failures resulted in no recordings and show up as blank in table cells for the device.

3.5.1 Ground Static and Mobile Acoustic Survey Methodology

Ground static bat surveys followed NatureScot guidelines which prescribe the following:

- At sites where the proposed turbine locations are known, static detectors should be placed to provide a representative sample of bat activity at or close to these points.
- Detectors should be placed at all known turbine locations at wind farms containing less than ten proposed turbines.
- Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments.
- At key-holed woodland/plantation sites (and other proposals involving extensive habitat alteration), pre-application survey data may not represent the situation post-construction, as the habitat available for bats will change following construction. Automated survey locations should therefore also include open areas including existing nearby rides/clearings in the forestry, to provide an indication of how bats may adapt to and use the new habitat created through turbine construction.
- Ideally, surveys should aim for 10 consecutive nights, but in practice weather conditions may preclude this particularly early or late in the year and in more northerly latitudes.

Static and transect acoustic surveys were conducted in order to assess bat activity in the Project site. For static surveys, 13 full spectrum bat detectors (Wildlife Acoustic Song Meter Mini Bat 2 AA) used at each selected sampling point for ten nights. For transect surveys, surveyors travelled slowly along a designated route within the project site, using a full-spectrum bat detector (Wildlife Acoustics Song Meter Mini Bat 2 AA) to record bat activity. Additionally, geo-tracking was conducted using a mobile phone application (Figure 3-7). Transect surveys were carried out after sundown on the same nights as the static surveys. The detectors were triggered by bat calls. The detectors were located at around 1 m above the ground.

3.5.2 Acoustic Analysis Methodology

Bat recordings obtained from bat detectors were analysed using BatExplorer and Kaleidoscope Pro (produced by Wildlife Acoustics) and species identifications were done by following established scientific literature and industry best practice (Appendix 6.5). Echolocation signal characteristics including signal shape, peak frequency of maximum energy, signal slope, pulse duration, start frequency, end frequency, pulse bandwidth, inter-pulse interval and power spectra are compared to published signal characteristics for local bat species. As the call parameters of some species overlap, in such cases definitive species identification is difficult and their identifications were reported as “possible.” Feeding buzzes and social calls were also noted.

Since Auto-ID yields mixed results in sound identification, i.e. performs very well for some species, or shows biases for some over others, or sometimes identifies species which are not even distributed in a particular region, manual analysis was performed in a sampling type approach in order to account for Auto-ID corrections. For each consecutive ten nights of recording, two nights with the highest number of recordings were identified via filters. These nights were then prioritized for detailed manual analysis. Additionally, it was also ensured that the nights selected represented all the bat species identified through Auto-ID. If the two nights with the highest bat activity did not capture all species for some SPs, additional nights were added into the manual analysis set for a more complete representation.

Myotis genus identifications remain some of the most challenging species to differentiate in Turkiye, and experts are often not comfortable providing species level identifications. A through Myotis analysis is very time intensive, with a small percentage of recordings allowing for further species analysis, and even in that case, most efforts can usually narrow it down to 2-3 species clusters, again not resulting in confident species IDs. If Myotis species IDs are of specific concern, targeted methodologies and approaches would be necessary. Usually for Myotis, a mixture of sound and morphology is preferred for species identification, which in some cases may not even be sufficient, and genetic evidence may be necessary. Bat experts often indicate Myotis at genus level and this has become common practice since Myotis species are not defined in literature or carcass studies as especially collision prone at WPPs.

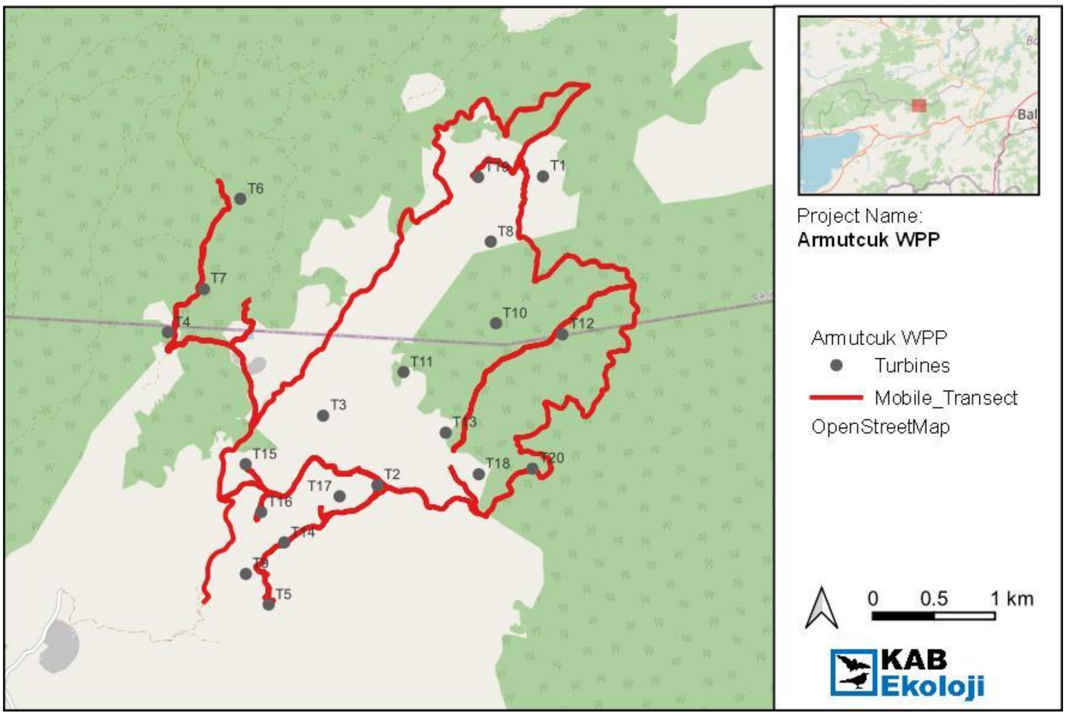

Figure 3-7 Transect survey route at the project.

3.5.3 Field Schedule

A set of static and transect acoustic bat surveys were conducted (Table 3-14). Weather conditions during surveys are given in Table 3-15.

Table 3-14 Acoustic bat surveys for 2024 spring, summer, and autumn season.

Survey Season	Start Date	Finish Date	Number of Nights
Spring Static Surveys	24 May	2 June	10 nights
Spring Transect Survey 1	25 May	25 May	1 night

Survey Season	Start Date	Finish Date	Number of Nights
Spring Transect Survey 2	2 June	2 June	1 night
Summer Static Surveys	31 August	10 September	10 nights
Summer Transect Survey 1	4 September	4 September	1 night
Summer Transect Survey 2	5 September	5 September	1 night
Autumn Static Surveys	28 September	12 October	10 nights
Autumn Transect Survey 1	11 October	11 October	1 night
Autumn Transect Survey 2	12 October	12 October	1 night

Table 3-15 Weather conditions during the surveys.

Date	Temperature (°C)	Wind Speed (m/s)	Cloud cover %	Precipitation (mm)
2024-05-24	14	1	70	0
2024-05-25	15	1	0	0
2024-05-26	14	4	20	0
2024-05-27	12	6	10	0
2024-05-28	13	2	60	0
2024-05-29	14	1	0	0
2024-05-30	15	1	0	0
2024-05-31	16	1	20	0
2024-06-01	16	2	0	0
2024-06-02	19	1	0	0
2024-08-31	21	1	20	0
2024-09-01	19	1	30	0
2024-09-02	20	1	30	0.6
2024-09-03	20	1	0	0
2024-09-04	22	1	0	0
2024-09-05	22	2	0	0
2024-09-06	22	1	0	0
2024-09-07	22	1	0	0
2024-09-08	19	1	70	0
2024-09-09	18	2	20	0
2024-09-10	20	1	70	0
2024-09-11	19	1	20	0.1
2024-09-28	17	2	0	0
2024-09-29	19	1	0	0
2024-09-30	18	2	100	1
2024-10-01	12	1	20	0
2024-10-02	12	3	0	0
2024-10-03	13	1	0	0
2024-10-04	15	2	0	0
2024-10-05	17	2	0	0
2024-10-06	20	1	90	0
2024-10-07	17	6	30	0.4
2024-10-08	17	2	40	0
2024-10-09	15	1	0	0
2024-10-10	17	2	10	0

Date	Temperature (°C)	Wind Speed (m/s)	Cloud cover %	Precipitation (mm)
2024-10-11	16	1	10	0
2024-10-12	19	2	90	0

3.5.4 Survey Locations

Ground static bat detector locations (Sampling Point, SP) are provided in Table 3-16 and shown on Figure 3-8.

Table 3-16 Ground static bat detector locations (WGS84 UTM35N)

SP	Easting	Northing	Nearest Turbine
SP1	519868	4391507	T15
SP2	520071	4390347	T5
SP3	520113	4390847	T14
SP4	519919	4391104	T16
SP5	520482	4391872	T3
SP6	520912	4391325	T2
SP7	521738	4391413	T18
SP8	522191	4391459	T20
SP9	522309	4392533	T12
SP10	521455	4391751	T13
SP11	521797	4393326	T8
SP12	521728	4393833	T19
SP13	519225	4392322	T4

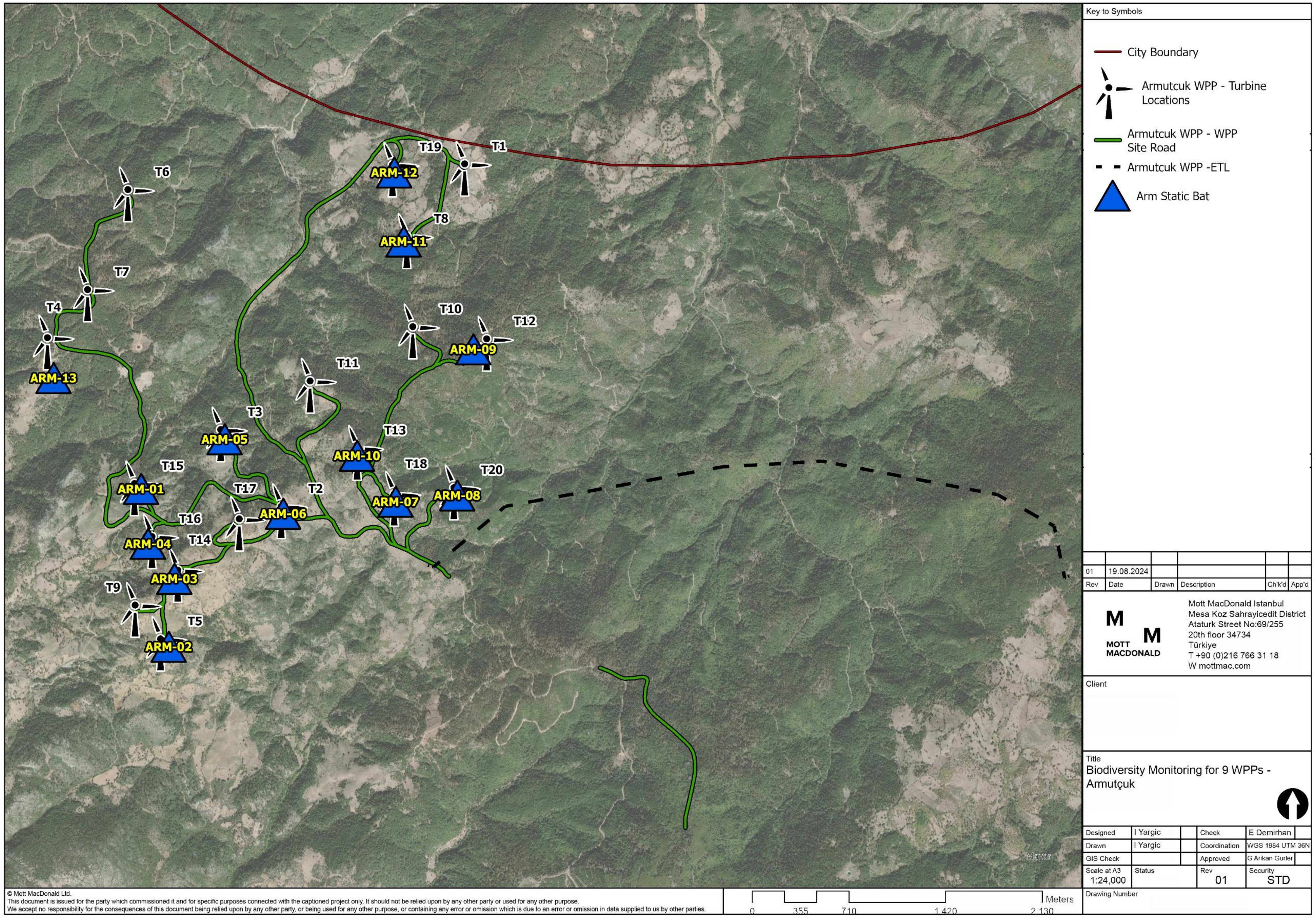

Figure 3-8 Ground static bat detector locations

4 Results

4.1 Flora

4.1.1 Kaz Mountains Key Biodiversity Area

Armutçuk WPP, including its access roads, switchyard and ETL, is located within Kaz Mountains Key Biodiversity Area (KBA), which consists of woodland (mainly *Pinus* sp, also *Quercus* and *Fagus*), garigue and maquis, some olive stands, running and standing freshwater features. Additionally, KBA hosts one of the three populations of Abies species which is named Trojan fir (*Abies nordmanniana equi-trojana*).[4]

Table 4-1lists the plant species identified within the Kaz Mountains KBA. During the field survey conducted within the Project area KBA associated flora species not observed.

Table 4-1 KBA Flora Species

Family	Species	Observation Status
POACEAE	*Festuca ustulata (Hack. ex St.-Yves) Markgr.-Dann.*	Not observed
	Bromus sipyleus Boiss.	Not observed
IRIDACEAE	*Crocus candidus* E.D.Clarke	Not observed
AMARYLLIDACEAE	*Allium kurtzianum Asch. & Sint. ex Kollmann*	Not observed
ASPARAGACEAE	*Muscari latifolium J.Kirk*	Not observed
PINACEAE	*Abies nordmanniana equi-trojana*	Not observed

4.1.2 Habitat Types

The recorded habitats are listed in the Table 4-2 below and shown in Figure 4-1, along with their wide distribution areas within the study area. The amount of habitat lost due to access road, site roads, turbine footprints and switchyard area are given in Table 4-3 through Table 4-7.

Table 4-2 Habitat Types of the Project AoI

Broad habitat type	EUNIS Habitat Type	Extend within Project AoI (ha)	Percentage (%)
Woodland	G3.5 Pinus nigra woodland	9066.5835	85.39%
	G4.B Mixed mediterranean pine - thermophilous oak woodland	775.0972946	7.30%
	G5.5 Small mixed broadleaved and coniferous anthropogenic woodlands	169.5012645	1.60%
Agricultural	I1.3 Arable land with unmixed crops grown by low-intensity agricultural methods	606.8865647	5.72%

Table 4-3 Habitat Loss on Access Roads

EUNIS	Area (ha)	Percentage
G3.5 Pinus nigra woodland	3.11	0.0343%
G4.B Mixed mediterranean pine - thermophilous oak woodland	0.00	0.0001%

[4] https://www.keybiodiversityareas.org/site/factsheet/24048

G5.5 Small mixed broadleaved and coniferous anthropogenic woodlands	0.01	0.0051%
I1.3 Arable land with unmixed crops grown by low-intensity agricultural methods	0.00	0.0000%
Total	3.12	0.0%

Table 4-4 Habitat Loss on Site Roads

EUNIS	Area (ha)	Percentage
G3.5 Pinus nigra woodland	19.17	0.2114%
G4.B Mixed mediterranean pine - thermophilous oak woodland	0.06	0.0084%
G5.5 Small mixed broadleaved and coniferous anthropogenic woodlands	1.00	0.5890%
I1.3 Arable land with unmixed crops grown by low-intensity agricultural methods	4.75	0.7832%
Total	24.98	

Table 4-5 Habitat Loss on Turbine Footprint

EUNIS	Area (ha)	Percentage
G3.5 Pinus nigra woodland	19.06	0.2103%
G4.B Mixed mediterranean pine - thermophilous oak woodland	0.08	0.0109%
G5.5 Small mixed broadleaved and coniferous anthropogenic woodlands	2.35	1.3852%
I1.3 Arable land with unmixed crops grown by low-intensity agricultural methods	8.79	1.4479%
Total	30.28	

Table 4-6 Habitat Loss on Switchyard Area

EUNIS	Area	Percentage
G3.5 Pinus nigra woodland	0.01	0.0001%
G4.B Mixed mediterranean pine - thermophilous oak woodland	0.10	0.0129%
G5.5 Small mixed broadleaved and coniferous anthropogenic woodlands	1.43	0.8422%
I1.3 Arable land with unmixed crops grown by low-intensity agricultural methods	0.00	0.0000%
Total	1.53	

Table 4-7 Habitat Loss on ETL

EUNIS	Area (ha)	Percentage
G3.5 Pinus nigra woodland	40.68046	0.449%
G4.B Mixed mediterranean pine - thermophilous oak woodland	12.18255	1.572%
G5.5 Small mixed broadleaved and coniferous anthropogenic woodlands	0.808404	0.477%
Total	53.67141	

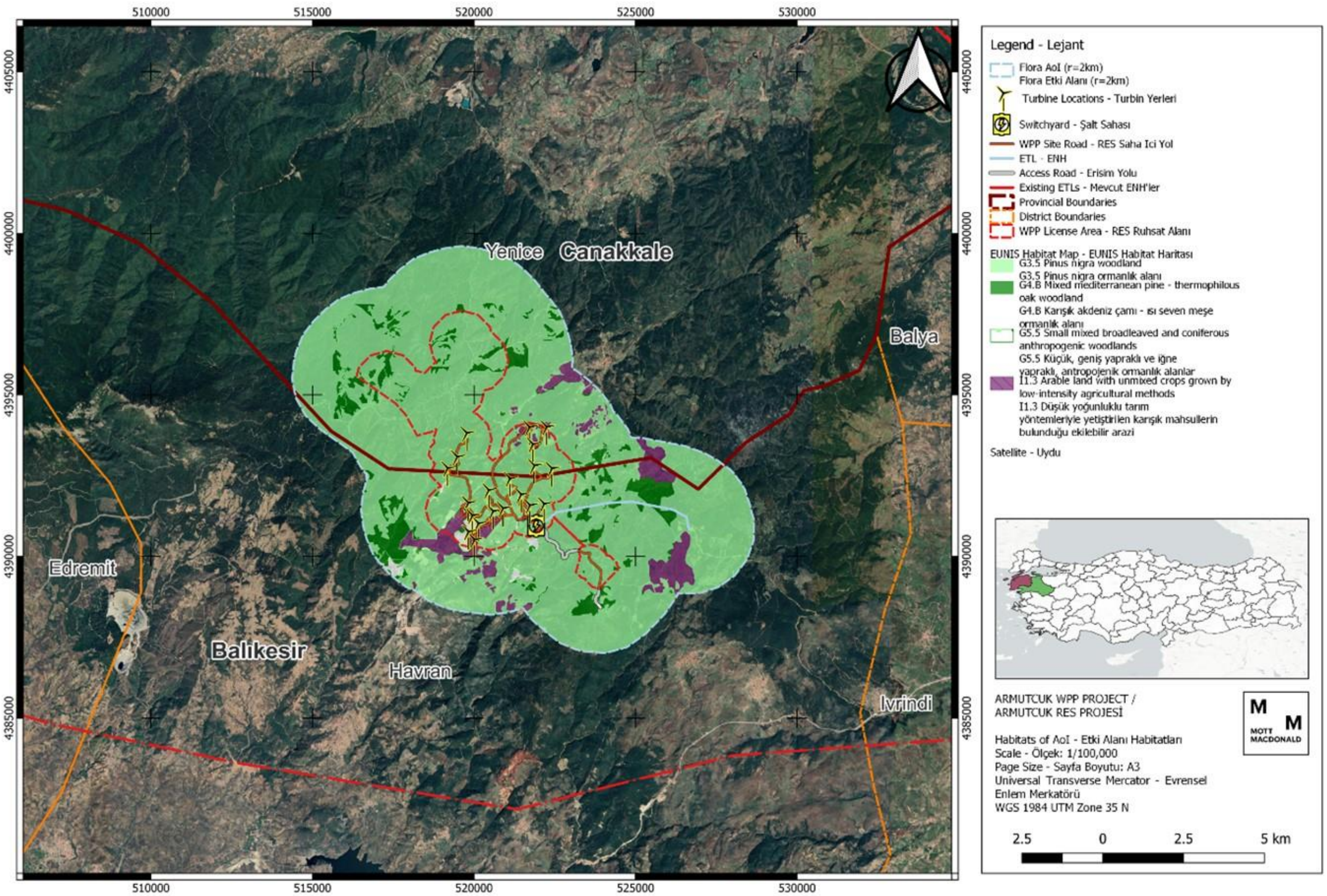

Figure 4-1 EUNIS Habitat Classification of Ihlmaur WPP Area of Influence

4.1.3 Floristic Analyses

As a result of the field studies, 173 plant taxa at the species and subspecies level from 45 families were identified in the Project area. The list of the plant taxa identified in the Project area and its surroundings is provided in Table 4-8.

Table 4-8 Plant Taxa and Threatened Categories Identified in the Project Area of Influence

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat				Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	1	2	3	4	5
HYPOLEPIDACEAE	1	*Pteridium aquilinum* (L.) Kuhn	Widespread								X					X			X
ASPLENIACEAE	2	*Ceterach officinarum* DC.	Widespread								X	X				X			
	3	*Asplenium trichomanes* L.	Widespread								X	X				X			
ASPIDIACEAE	4	*Dryopteris pallida* (Bory) Fomin	Widespread								X	X				X			
PINACEAE	5	*Pinus nigra* J.F. Arnold subsp. *pallasiana* (Lamb.) Holmboe var. *pallasiana*	Widespread								X	X							X
CUPRESSACEAE	6	*Juniperus oxycedrus* L. subsp. *oxycedrus*	Widespread								X	X				X			
RANUNCULACEAE	7	*Ranunculus arvensis* L.	Mediterranean								X				X				
	8	*Ranunculus ficaria* L. subsp. *ficariiformis* Rouy & Fouc	Widespread								X					X			
	9	*Ceratocephalus falcatus* (L.) Pers.	Widespread								X					X			
	10	*Clematis vitalba* L.	Widespread									X				X			
PAPAVERACEAE	11	*Papaver rhoeas* L.	Widespread								X					X			
BRASSICACEAE	12	*Thlaspi perfolatum* L.	Widespread								X					X			
	13	*Alyssum minutum* (L.) Rothm.var. *minutum*	Widespread								X					X			
	14	*Alyssum murale* Waldst. & Kit. var. *murale*	Widespread								X				X				
	15	*Arabis turrita* L.	Widespread								X					X			
	16	*Capsella bursa-pastoris* (L.) Medik.	Widespread								X					X			
	17	*Alliaria petiolata* (Bieb.) Cavara & Grande	Widespread								X					X			
	18	*Erysimum crassipes* Fisch. & Mey.	Widespread								X				X				
	19	*Erysimum cuspidatum* (Bieb.) DC.	Widespread								X				X				
	20	*Erophila verna* (L.) Chevall. subsp. *verna*	Widespread								X					X			
CISTACEAE	21	*Cistus salviifolius* L.	Widespread								X							X	
	22	*Cistus creticus* L.	Widespread								X						X		
VIOLACEAE	23	*Viola sieheana* Becker	Widespread								X					X			
	24	*Viola parvula* Tineo	Widespread								X					X			
CARYOPHYLLACEAE	25	*Minuartia hamata* (Hausskn.) Mattf.	Widespread								X				X				
	26	*Holosteum umbellatum* L. var. *umbellatum*	Widespread								X					X			
	27	*Velezia rigida* L.	Mediterranean								X					X			
	28	*Silene italica* (L.) Pers.	Widespread								X					X			

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat				Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	1	2	3	4	5
	29	*Silene vulgaris (*Moenc) Garcke var. *vulgaris*	Widespread								X					X			
	30	*Silene compacta* Fischer	Widespread								X					X			
	31	*Silene dichotoma* Ehrh	Mediterranean								X				X				
ILLECEBRACEAE	32	*Herniaria glabra* L.	Widespread								X				X				
	33	*Scleranthus annuus* L. subsp. *annuus*	Widespread								X					X			
HYPERICACEAE	34	*Hypericum atomarium* Boiss.	Mediterranean								X					X			
MALVACEAE	35	*Malva sylvestris* L.	Widespread								X					X			
GERANIACEAE	36	*Erodium cicutarium* (L.) L. Herit subsp. *cicutarium*	Widespread								X				X				
POLYGONACEAE	37	*Rumex acetosella* L.	Widespread								X				X				
	38	*Rumex scutatus* L.	Widespread								X					X			
	39	*Rumex tuberosus* L. subsp. *tuberosus*	Widespread								X					X			
ANACARDIACEAE	40	*Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engler	Mediterranean								X					X			
FABACEAE	41	*Genista lydia* Boiss. var. *lydia*	Widespread								X					X			
	42	*Adenocarpus complicatus* (L.) Gay	Widespread								X					X			
	43	*Trigonella spicata* Sibth.&Sm.	Mediterranean								X				X				
	44	*Vicia cracca* L. subsp. *stenophylla* Vel.	Widespread								X					X			
	45	*Vicia sativa* L. subsp. *sativa*	Widespread								X					X			
	46	*Trifolium stellatum* L. var. *stellatum*	Widespread								X					X			
	47	*Trifolium campestre* Schreb.	Widespread								X					X			
	48	*Trifolium arvense* L. subsp. *arvense*	Widespread								X					X			
	49	*Trifolium physodes* Stev. var. *physodes*	Mediterranean								X					X			
	50	*Trifolium pratense* L. var. *pratense*	Widespread								X					X			
	51	*Coronilla varia* L. subsp. *varia*	Widespread								X	X				X			
	52	*Lathyrus laxiflorus* (Desf.) O.Kuntze subsp. *laxiflorus*	Widespread								X	X				X			
	53	*Medicago sativa* L.	Widespread								X	X				X			
ROSACEAE	54	*Agrimona eupatoria* L.	Widespread								X					X			
	55	*Rubus idaeus* L.	Widespread								X					X			
	56	*Rubus sanctus* Schreber	Widespread								X					X			
	57	*Potentilla recta* L.	Widespread								X				X				
	58	*Potentilla micrantha* Ramond ex DC.	Widespread								X					X			
	59	*Fragaria vesca* L.	Widespread								X	X				X			
	60	*Sorbus torminalis* (L.) Crantz var. *torminalis*	Euro-Siberia								X					X			
	61	*Sanguisorba minor* Scop. subsp. *muricata* (Spach)Brig	Widespread								X				X				

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat				Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	1	2	3	4	5
	62	*Malus sylvestris* Miller subsp. *orientalis* (A. Uglitzkich) Browicz var. *orientalis*	Widespread								X				X				
	63	*Crataegus monogyna* Jacq. subsp. *monogyna*	Widespread								X					X			
	64	*Prunus divaricata* Ledeb. subsp. *divaricata*	Widespread								X					X			
	65	*Rosa canina* L.	Widespread								X				X				
APIACEAE	66	*Oenanthe pimpinelloides* L.	Widespread								X					X			
	67	*Laser trilobum* (L.) Borkh.	Widespread								X					X			
	68	*Torilis leptophylla* (L.) Reichb.	Widespread								X				X				
	69	*Scandix iberica* Bieb.	Widespread								X				X				
	70	*Daucus carota* L.	Widespread								X					X			
CRASSULACEAE	71	*Sedum album* L	Widespread									X				X			
	72	*Sedum pallidum* Bieb. var. *pallidum*	Widespread									X				X			
ARALIACEAE	73	*Hedera helix* L.	Widespread									X				X			
CAPRIFOLIACEAE	74	*Sambucus ebulus* L.	Avrupa-Sibirya													X			
	75	*Lonicera caprifolium* L.	Widespread								X					X			
DIPSACACEAE	76	*Scabiosa argentea* L.	Widespread								X					X			
ASTERACEAE	77	*Senecio vernalis* Waldst. et Kit	Widespread								X					X			
	78	*Doronicum orientale* Hoffm.	Widespread								X						X		
	79	*Inula viscosa* (L.) Aiton	Mediterranean								X					X			
	80	*Anthemis cretica* L. subsp. *anatolica* (Boiss.) Grierson	Widespread								X					X			
	81	*Anthemis tinctoria* L. var. *pallida* DC.	Widespread								X					X			
	82	*Bellis perennis* L.	Euro-Siberia								X	X				X			
	83	*Picnomon acarna* (L.) Cass.	Mediterranean								X					X			
	84	*Achillea coarctata* Poir.	Widespread								X					X			
	85	*Carduus pycnocephalus* L.	Widespread								X					X			
	86	*Carduus nutans* L. *sensu lato*	Widespread								X					X			
	87	*Logfia arvensis* (L.) Holub.	Widespread								X				X				
	88	*Lapsana communis* L.	Widespread								X				X				
	89	*Cirsium vulgare* (Savi) Ten.	Widespread								X				X				
	90	***Cirsium balikesirense* Yıldız, Arabacı & Dirmenci**	**Mediterranean**	**X**		**VU**					**X**				**X**				
	91	*Chondrilla juncea* L. var. *juncea*	Widespread								X				X				
	92	*Lactuca serriola* L.	Widespread								X				X				
	93	*Leontodon tuberosus* L.	Mediterranean								X				X				
	94	*Tragopogon longirostris* Bisch. ex Schultz Bip. var. *abbreviatus* Boiss.	Widespread								X				X				

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat				Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	1	2	3	4	5
	95	*Sonchus asper* (L.) Hill subsp. *glaucescens* (Jordon) Ball	Widespread								X					X			
	96	*Crepis sancta* (L.) Babcock	Widespread								X				X				
	97	*Pilosella hoppeana* (Schultes) C.H.& F.W Schultz	Widespread								X					X			
	98	*Pilosella piloselloides* (Vill.) Sojak subsp. *piloselloides*	Widespread								X					X			
	99	*Taraxacum buttleri* van Soest	Widespread								X					X			
ERICACEAE	100	*Rhododendron luteum* Sweet	Euro-Siberia									X				X			
	101	*Erica arborea* L.	Widespread								X						X		
PRIMULACEAE	102	*Androsace maxima* L.	Widespread								X					X			
	103	*Primula vulgaris* Huds. subsp. *vulgaris*	Euro-Siberia								X					X			
	104	*Primula vulgaris* Huds. subsp. *sibthorpii* (Hoffmanns.) W.W.Sm. & Forrest	Euro-Siberia								X					X			
	105	***Cyclamen hederifolium* Aiton**	**Mediterranean**			**VU**			**X**		**X**					**X**			
OLEACEAE	106	*Jasminum fruticans* L.	Mediterranean								X					X			
	107	*Phillyrea latifolia* L.	Mediterranean								X					X			
BORAGINACEAE	108	*Echium italicum* L.	Mediterranean								X					X			
	109	*Myosotis lithospermifolia* (Willd.) Hornem.	Widespread								X					X			
	110	*Buglossoides arvensis* (L.) Johnston	Mediterranean								X					X			
	111	*Anchusa undulata* L. subsp. *hybrida* (Ten.) Coutinho	Mediterranean								X					X			
SCROPHULARIACEAE	112	*Veronica chamaedrys* L.	Avrupa-Sibirya								X					X			
	113	***Digitalis trojana* Ivan**	**Mediterranean**	**X**		**VU**					**X**					**X**			
	114	*Parentucellia latifolia* (L.) Caruel subsp. *latifolia*	Mediterranean								X					X			
LAMIACEAE	115	*Ajuga chamaepitys* (L.) Schreber subsp. *chia* (Schreber) Arcangeli var. *chia*	Widespread								X				X				
	116	*Lamium amplexicaule* L.	Widespread								X					X			
	117	*Lamium purpureum* L. var. *purpureum*	Widespread								X					X			
	118	*Lamium garganicum* L. subsp. *reniforme* (Montbret & Aucher ex Bentham) R. Mill	Widespread								X					X			
	119	*Acinos rotundifolius* Pers.	Widespread								X					X			
	120	*Prunella vulgaris* L.	Euro-Siberia								X					X			
	121	*Clinopodium vulgare* L. subsp. *vulgare*	Widespread								X					X			
	122	*Origanum vulgare* L. subsp. *hirtum* (Link) Ietswarrt	Mediterranean								X					X			
	123	*Ziziphora tenuior L.*	Irano-Turanian													X			

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat				Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	1	2	3	4	5
	124	*Teucrium chamaedrys* L. subsp. *chamaedrys*	Euro-Siberia								X						X		
	125	*Teucrium polium* L.	Widespread								X					X			
	126	*Salvia virgata* Jacq.	Irano-Turanian								X					X			
	127	*Salvia tomentosa* Miller	Widespread								X					X			
	128	*Thymus zygioides* Griseb. var. *zygioides*	Mediterranean								X					X			
BETULACEAE	129	*Alnus glutinosa* (L.) Gaertner subsp. *glutinosa*	Euro-Siberia									X				X			
URTICACEAE	130	*Urtica dioica* L.	Avrupa-Sibirya								X	X				X			
FAGACEAE	131	*Castanea sativa* Miller	Euro-Siberia								X	X					X		
	132	*Quercus cerris* L. var. *cerris*	Widespread								X							X	
	133	*Quercus frainetto* Ten.	Euro-Siberia								X						X		
	134	*Quercus petraea* (Mattuschka) Liebl. subsp. *iberica* (Steven ex Bieb.) Krassiln.	Widespread								X							X	
CORYLLACEAE	135	*Coryllus avellana* L. var. *avellana*	Euro-Siberia									X				X			
	136	*Carpinus betulus* L.	Euro-Siberia									X				X			
PLATANACEAE	137	*Platanus orientalis* L.	Widespread									X					X		
ARISTOLOCHIACEAE	138	*Aristolochia clematitis* L.	Euro-Siberia								X					X			
EUPHORBIACEAE	139	*Euphobia amygdaloides* L. var. *amygdaloides*	Euro-Siberia								X					X			
	140	*Euphorbia myrsinites* L.	Widespread								X					X			
RUBIACEAE	141	*Galium fissurense* Ehrend.& Schönb. - Tem.	Irano-Turanian								X					X			
	142	*Galium odoratum* (L.) Scop.	Euro-Siberia								X					X			
	143	*Galium album* Miller subsp. *prusense* (C. Koch) Ehrend. & Krendl	Widespread								X					X			
	144	*Asperula involucrata* Wahlenb.	Euro-Siberia								X				X	X			
LILIACEAE	145	*Allium scorodoprasum* L. subsp. *rotundum* (L.) Stern.	Mediterranean								X					X			
	146	*Allium paniculatum* L. subsp. *paniculatum*	Mediterranean								X					X			
	147	*Allium sphaerocephalaon* L. subsp. *sphaerocephalon*	Euro-Siberia								X					X			
	148	*Asparagus aphyllus* L. subsp. *orientalis* (baker) P.H. Davis	Mediterranean								X					X			
	149	*Colchicum boissieri* Orph.	Mediterranean								X					X			
	150	*Ornithogalum comosum* L.	Widespread								X					X			
	151	*Muscari armeniacum* Leichtlin ex Baker	Widespread								X					X			

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat				Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	1	2	3	4	5
IRIDACEAE	152	*Crocus pulchellus* Herbert	Mediterranean								X	X					X		
	153	*Crocus cancellatus* Herbert subsp. *mazziaricus* (Herbert) Mathew	Mediterranean								X					X			
ORCHIDACEAE	154	*Cephalanthera rubra* (L.) L.C.M. Richard	Widespread								X					X			
	155	*Limodorum abortivum* (L.) Swartz	Widespread								X					X			
JUNCACEAE	156	*Luzula forsteri* (Sm.) DC.	Euro-Siberia								X					X			
CYPERACEAE	157	*Carex distachya* Desf. var. *distachya*	Mediterranean								X					X			
POACEAE	158	*Poa bulbosa* L.	Widespread								X					X			
	159	*Poa trivialis* L.	Widespread								X				X				
	160	*Lolium perenne* L.	Widespread								X					X			
	161	*Bromus japonicus* Thunb. subsp. *japonicus*	Widespread								X					X			
	162	*Brachypodium sylvaticum* (Hudson) P. Beauv.	Euro-Siberia								X					X			
	163	*Piptatherum coerulescens* (Desf.) P. Beauv.	Widespread								X					X			
	164	*Apera intermedia* Hackel	Irano-Turanian													X			
	165	*Aegilops biuncialis* Vis.	Irano-Turanian								X					X			
	166	*Avena wiestii* Steudel.	Widespread								X					X			
	167	*Milium vernale* Bieb. subsp. *vernale*	Mediterranean													X			
	168	*Briza media* L.	Widespread								X					X			
	169	*Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman	Mediterranean								X					X			
	170	*Psilurus incurvus* (Gouan) Schinz & Thell.	Widespread													X			
	171	*Hordeum bulbosum* L.	Widespread								X					X			
	172	*Cynosurus echinatus* L.	Mediterranean								X					X			
	173	*Phleum phleoides* (L.) Karsten	Euro-Siberia								X					X			

Relative abundance: 1: Very Rare, 2: Rare, 3: Moderately Abundant 4: Abundant 5: Very Abundant

Endemism: R: Regional **W**: Widespread

TRDB: Turkish Red Data Book: Cr: Critically Endangered, En: Endangered, VU: Vulnerable, NT: Near Threatened, LC: Least Concern

Habitat Classification:

1: G3.5: Pinus nigra woodland

2: G4.B: Mixed mediterranean pine - thermophilous oak woodland

3: G5.5: Small mixed broadleaved and coniferous anthropogenic woodlands

4: I1.3: Arable land with unmixed crops grown by low-intensity agricultural methods

4.1.4 Status of Plants in Terms of Threatened Category and Endemism

As a result of the field study, a total of 2 regional endemic (*Digitalis trojana* and *Cirsium balikesirense*) and 1 rare distribution but not endemic (*Cyclamen hederifolium)* plant species were identified. There is no data different from which was identified in the local EIA process for the ETL and access road. (See Table 4-9)

Digitalis trojana is a regional endemic plant species, occurring in the provinces of Balıkesir and Çanakkale within Türkiye. The species is classified under the TRDB Threatened category as "VU: Vulnerable."

Cirsium balikesirense is a regional endemic plant species, occurring in the provinces of Çanakkale and Balıkesir within Türkiye. As the population status within its distribution areas remains relatively stable, the species is classified under the TRDB Threatened category as "VU: Vulnerable."

Cyclamen hederifolium is a rare distribution but not endemic plant species, occurring in the provinces of Çanakkale, İzmir, Muğla and İstanbul within Türkiye. As the population status within its distribution areas remains relatively stable, the species is classified under the TRDB Status of Plants in Terms of Threatened Category and Endemism Threatened category as "VU: Vulnerable." *Cyclamen hederifolium* is also listed in CITES Annex II.

The plant species have been recorded in areas such as turbine locations and site roads. Due to habitat similarities, their presence in the access road and ETL areas is also considered likely, despite the absence of direct observations. (See Figure 4-2)

Table 4-9 The endemic species in the Project area of Influence and their coordinates

Taxon	TRDB	Bern	Coordinates
		Regional Endemic Species	
Digitalis trojana	VU	-	35 S 521607 N 4393383 D
Cirsium balikesirense	VU	-	35 S 519848 N 4392488 D
			35 S 517307 N 4395335 D
			35 S 521607 N 4393383 D
			35 S 521870 N 4392596 D
			35 S 521609 N 4391784 D
			35 S 521432 N 4391320 D
			35 S 519926 N 4391407 D
			35 S 520143 N 4390876 D
		Non-Endemic Rare Species	
Cyclamen hederifolium	VU	-	35 S 519848 N 4392488 D

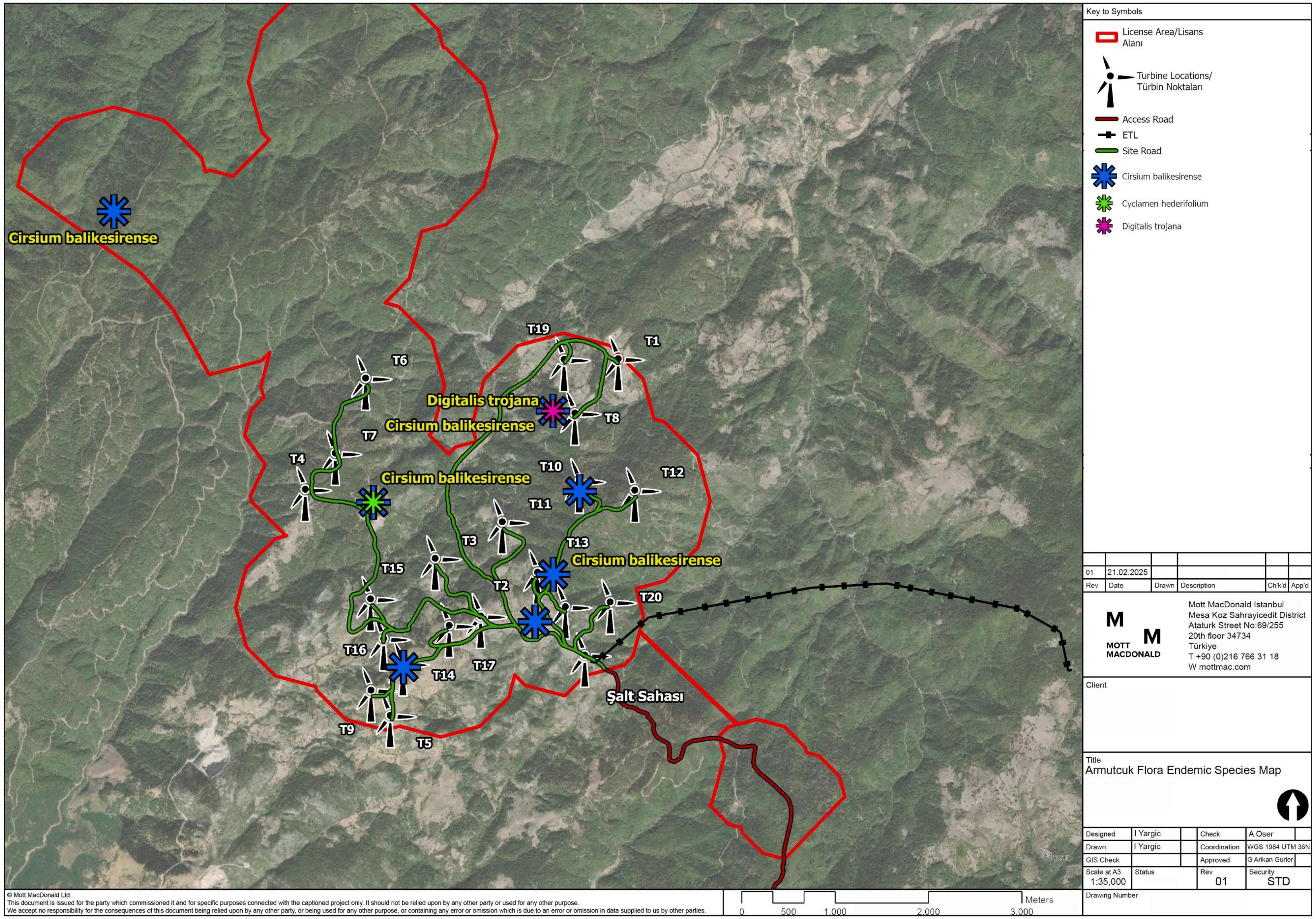

Figure 4-2 Endemic Flora Species Location Map

4.2 Terrestrial Mammal

4.2.1 Kaz Mountains Key Biodiversity Area

The Key Biodiversity Are reports for the Kaz Mountains, along with the online databases and resources reviewed, does not provide specific information regarding the presence of terrestrial mammal species relevant to the KBA in the region.

4.2.2 Terrestrial Mammals Surveys

The same data as provided in the ESIA regarding terrestrial mammals has been obtained. A total of 29 mammal species from 13 families were identified within the Project Area of Influence through a combination of field studies, and literature reviews. Among these species, 8 were directly observed during fieldwork, and 21 were identified through a review of existing literature (Table 4-10). There is no endemic mammal species among the identified species.

Among the mammal species identified in the Project Area of Influence, 5 species are listed in Annex II, 10 species in Annex III of the Bern Convention, and 3 species in Annex III, 2 species in Annex III and 2 species in Annes I of CITES. According to the IUCN Red List, no species in the area is classified as endangered, with 1 species categorized as Vulnerable (VU). The remaining species are classified as Least Concern (LC), indicating they are not currently at significant risk of extinction.

Roe deer (*Capreolus capreolus)* (LC)*,* which is distributed in very few places in the Mediterranean and Aegean Regio. It has been recorded as literature data in field and survey studies. This species is under immense hunting pressure in the Canakkale province. Although its status is Least Concern, this species is considered to have national importance.

Marbled polecat (*Vormela peregusna*) is Vulnerable (VU). Its habitat preference (open land, arid, steppe areas) does not majorly overlap with the habitat characteristics of the Project area (forest and forest clearings) but it could be a rare occurrence here. Marbled polecat has been recorded as literature data.

Brown bear (*Ursus arctos*) is Least Concern (LC) globally and in Europe, but Vulnerable in the Mediterranean. During the field studies, local residents were provided with information regarding brown bear sightings and reported incidents of bear attacks to enhance their awareness and preparedness. Brown bear has been recorded as literature data.

Table 4-10 Terrestrial Mammals Taxa and Threatened Categories Identified in the Project Area of Influence

Family	Species Name	English Name	Endemism	IUCN	BERN	CITES	Monitoring Criteria	Observation / Literature
Erinaceidae	*Erinaceus concolor*	Southern White-breasted Hedgehog	-	LC		-	-	L / O
Soricidae	*Neomys anomalus*	Iberian Water Shrew	-	LC	Ann -III	-	-	L
Soricidae	*Crocidura suaveolens*	Lesser White-toothed Shrew	-	LC	Ann -III	-	-	L
Soricidae	*Crocidura leucodon*	Bicolored Shrew	-	LC	Ann -III	-	-	L
Talpidae	*Talpa levantis*	Levantine Mole	-	LC	-	-	-	L / O
Leporidae	*Lepus europaeus*	European Hare	-	LC	-	-	-	L / O
Sciuridae	*Sciurus anomalus*	Caucasian Squirrel	-	LC	Ann -II	-	-	L
Muridae	*Microtus hartingi*	Harting's Vole	-	LC	-	-	-	L
Muridae	*Microtus mystacinus*	East European Vole	-	LC	-	-	-	L
Muridae	*Nothocricetulus migratorius*	Grey Dwarf Hamster	-	LC	-	-	-	L
Muridae	*Apodemus mystacinus*	Eastern Broad-toothed Field Mouse	-	LC	-	-	-	L
Muridae	*Apodemus flavicollis*	Yellow-necked Field Mouse	-	LC	-	-	-	L
Muridae	*Apodemus witherbyi*	Steppe Field Mouse	-	LC	-	-	-	L
Muridae	*Mus musculus*	House Mouse	-	LC	-	-	-	L / O
Muridae	*Mus macedonicus*	Macedonian Mouse	-	LC	-	-	-	L
Muridae	*Rattus rattus*	House Rat	-	LC	-	-	-	L / O
Gliridae	*Dryomys nitedula*	Forest Dormouse	-	LC	Ann -III	-	-	L
Canidae	*Canis aureus*	Golden Jackal	-	LC	-	Ann -III	-	L
Canidae	*Canis lupus*	Grey Wolf	-	LC	Ann -II	Ann -I	-	L
Canidae	*Vulpes vulpes*	Red Fox	-	LC	-	Ann -III	-	L / O
Ursidae	*Ursus arctos*	Brown Bear	-	LC	Ann -II	Ann -II	-	L
Mustelidae	*Mustela nivalis*	Least Weasel	-	LC	Ann -III	-	-	L / O
Mustelidae	*Martes foina*	Beech Marten	-	LC	Ann -III	Ann -III	-	L

Mustelidae	*Vormela peregusna*	Marbled Polecat	-	VU	Ann -II	-	-	L
Mustelidae	*Meles meles*	European Badger	-	LC	Ann -III	-	-	L
Felidae	*Felis silvestris*	European Wildcat	-	LC	Ann -II	Ann -II	-	L
Suidae	*Sus scrofa*	Wild Boar	-	LC	Ann -III	-	-	L / O
Cervidae	*Capreolus capreolus*	European Roe Deer	-	LC	Ann -III	-	-	L
Cervidae	*Cervus elaphus*	Red Deer	-	LC	Ann -III	Ann -I	-	L

4.3 Herpetofauna

4.3.1 Kaz Mountains Key Biodiversity Area

The Key Biodiversity Are reports for the Kaz Mountains, along with the online databases and resources reviewed, does not provide specific information regarding the presence of herpetofauna species relevant to the KBA in the region.

4.3.2 Amphibia

The similar data as provided in the ESIA regarding amphibia has been obtained. A total of 7 herpetofauna species from 5 families were identified within the Project Area of Influence through a combination of field studies, literature reviews, and survey interviews. Among these species, 2 were directly observed during fieldwork, and 5 were identified through a thorough review of existing literature. (See Table 4-11).

There is no endemic amphibia species among the identified species.

Among the amphibia species identified in the Project Area of Influence, 1 species are listed in Annex II of the Bern Convention, 6 species in Annex III. According to the IUCN Red List, no species in the area are classified as endangered. All species are classified as Least Concern (LC), indicating they are not currently at significant risk of extinction. According to the CITES Convention, none of the nine species are listed in the annexes.

During the field survey, no permanent water sources, such as ponds, were observed within the project area. However, water channels formed by excessive irrigation around agricultural fields, where the identified species were observed.

4.3.3 Reptilia

The similar data as provided in the ESIA regarding Reptilia has been obtained. A total of 24 Reptilia species from 11 families were identified within the Project Area of Influence through a combination of field studies, literature reviews, and survey interviews. Among these species, 7 were directly observed during fieldwork, and 17 were identified through a thorough review of existing literature. (See Table 4-12)

There is no endemic reptile species among the identified species.

Among the Reptilia species identified in the Project Area of Influence, 10 species are listed in Annex II of the Bern Convention, 14 species in Annex III. According to the IUCN Red List, no species in the area are classified as endangered.

With the exception of one species, the remaining species are categorized as Least Concern (LC) by the IUCN, signifying that they are not presently at a significant risk of extinction. One species, *Testudo graeca*, is classified as Vulnerable (VU) under IUCN criteria and is also listed in CITES Annex II. According to the CITES Convention, only two (Javelin Sand Boa and Common Tortoise) of the 24 species is included in its annexes.

Table 4-11 Amphibia Taxa and Threatened Categories Identified in the Project Area of Influence

Family	Species Name	English Name	Endemism	IUCN	BERN	CITES	Monitoring Criteria	Observation / Literature
Salamandridae	*Lissotriton schmidtleri*	Schmidtler's smooth newt	-	LC	Ann -III	-	-	L
Salamandridae	*Triturus ivanbureschi*	Buresch's Crested New	-	LC	Ann -III	-	-	L
Bufonidae	*Bufo bufo*	Common Toad	-	LC	Ann -III	-	-	L / O
Bufonidae	*Bufotes viridis*	Green Toad	-	LC	Ann -III	-	-	L / O
Hylidae	*Hyla orientalis*	Shelkovnikov's Tree Frog	-	LC	Ann -III	-	-	L
Pelobatidae	*Pelobates syriacus*	Syrian Spadefoot	-	LC	Ann -II	-	-	L
Ranidae	*Pelophylax bedriagae*	Bedriaga's Frog	-	LC	Ann -III	-	-	L

Table 4-12 Reptilia Taxa and Threatened Categories Identified in the Project Area of Influence

Family	Species Name	English Name	Endemism	IUCN	BERN	CITES	Monitoring Criteria	Observation / Literature
Testudinidae	*Testudo graeca*	Common Tortoise	-	VU	Ann -II	Ann -II	X	O / L
Gekkonidae	*Hemidactylus turcicus*	Turkish Gecko	-	LC	Ann -III	-	-	L
Agamidae	*Laudakia stellio*	Starred Agama	-	LC	Ann -II	-	-	O / L
Anguidae	*Pseudopus apodus*	Sheltopusik	-	LC	Ann -II	-	-	O / L
Scincidae	*Ablepharus kitaibelii*	Juniper Skink	-	LC	Ann -II	-	-	L
Scincidae	*Heremites auratus*	Levant skink	-	LC	Ann -III	-	-	L
Lacertidae	*Lacerta diplochondrodes*	Rhodos Green Lizard	-	LC	Ann -III	-	-	L
Lacertidae	*Lacerta viridis*	The European green lizard	-	LC	Ann -II	-	-	O / L
Lacertidae	*Ophisops elegans*	Snake-eyed Lizard	-	LC	Ann -II	-	-	O / L
Lacertidae	*Podarcis muralis*	Common Wall Lizard	-	LC	Ann -II	-	-	L
Boidae	*Eryx jaculus*	Javelin Sand Boa	-	LC	Ann -III	Ann -II	-	L
Colubridae	*Coronella austriaca*	Smooth Snake	-	LC	Ann -II	-	-	L
Colubridae	*Dolichophis caspius*	Large Whip Snake	-	LC	Ann -III	-	-	O / L
Colubridae	*Eirenis modestus*	Ring-Headed Dwarf Snake	-	LC	Ann -III	-	-	L
Colubridae	*Elaphe sauromates*	Eastern Four-Lined Ratsnake	-	LC	Ann -III	-	-	L
Colubridae	*Hemorrhois nummifer*	Coin-marked Snake	-	LC	Ann -III	-	-	L
Colubridae	*Malpolon insignitus*	Eastern Montpellier Snake	-	LC	Ann -III	-	-	L
Colubridae	*Platyceps najadum*	Dahl's Whip Snake	-	LC	Ann -III	-	-	L
Colubridae	*Platyceps collaris*	Collared Dwarf Racer	-	LC	Ann -III	-	-	L
Colubridae	*Telescopus fallax*	Cat Snake	-	LC	Ann -II	-	-	L
Colubridae	*Zamenis situla*	European Ratsnake	-	LC	Ann -III	-	-	L
Natricidae	*Natrix natrix*	Grass Snake	-	LC	Ann -III	-	-	O / L
Typhlopidae	*Xerotyphlops vermicularis*	Eurasian Blind Snake	-	LC	Ann -III	-	-	L
Viperidae	*Montivipera xanthina*	Ottoman viper	-	LC	Ann -II	-	-	L

4.4 Bird

4.4.1 Vantage Point Observations

VP methodology records bird "contacts" and the results therefore are expected to feature repeat "contacts" of the same individuals especially for resident species.

Spring

During spring VP surveys, a total of 34 birds were detected at the site (Table 4-13). The most frequently encountered species was the Common Buzzard (*Buteo buteo*), with 18 resident contacts observed. Other notable observations included the Eurasian Kestrel (*Falco tinnunculus*) and the Short-toed Snake-Eagle (*Circaetus gallicus*), both with 5 resident contacts. Additionally, 2 Eurasian Sparrowhawks (*Accipiter nisus*) were recorded as migrants. Despite the variety of species observed, no threatened species were recorded during the survey.

Table 4-13 Total number of soaring migratory and resident bird species observed in spring 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Total
Common Buzzard	*Buteo buteo*	LC	-	18	18
Eurasian Kestrel	*Falco tinnunculus*	LC	-	5	5
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	-	5	5
Eurasian Sparrowhawk	*Accipiter nisus*	LC	2	3	5
Booted Eagle	*Hieraaetus pennatus*	LC	-	1	1
Total	-	-	2	32	34

During the spring of 2024, a survey averaging approximately 33 hours and 20 minutes were conducted per vantage point. Over this period, 2 birds were identified as migrants. The migration rate was determined as 0.06 birds/hour for the spring migratory season.

Among the birds observed, 25 were reported to fly at risk zone (both fly at rotor height and below and 500 m buffer of the project site) (Table 4-14). The species that most frequently entered the risk zone was Common Buzzard (*Buteo buteo*). However, these numbers do not represent unique birds and contain multiple reports of the same bird for residents.

Table 4-14 Resident and migrant bird occurrences at risk zone in spring 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Total
Common Buzzard	*Buteo buteo*	LC	-	15	15
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	-	4	4
Eurasian Sparrowhawk	*Accipiter nisus*	LC	-	3	3
Eurasian Kestrel	*Falco tinnunculus*	LC	-	2	2
Booted Eagle	*Hieraaetus pennatus*	LC	-	1	1
Total	-	-	-	25	25

Summer

During summer VP surveys, a total of 193 birds were detected at the site (Table 4-15). The most frequently encountered species was the Eleonora's Falcon (*Falco eleonorae*), with 91 contacts observed, all of which were residents, including a single flock of 23 contacts. Despite the variety of species, no threatened species were recorded during the survey.

Table 4-15: Total number of soaring migratory and resident bird species observed in summer 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Total
Eleonora's Falcon	*Falco eleonorae*	LC	-	91	91
Common Buzzard	*Buteo buteo*	LC	-	57	57
European Honey-buzzard	*Pernis apivorus*	LC	-	21	21
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	-	10	10
Eurasian Sparrowhawk	*Accipiter nisus*	LC	-	3	3
Booted Eagle	*Hieraaetus pennatus*	LC	-	3	3
unidentified Falcon	*Falco spp.*	-	-	3	3
Black Stork	*Ciconia nigra*	LC	-	2	2
Eurasian Kestrel	*Falco tinnunculus*	LC	-	2	2
unidentified Raptor	*Accipitridae sp.*	-	-	1	1
Total	-	-	-	193	193

During the summer of 2024, a survey averaging approximately 65 hours and 4 minutes was conducted per vantage point. Over this period, no migratory birds were identified.

Among the birds observed, 91 (about 47% of all observed birds) were reported to fly at risk height (at rotor height and below and 500 m buffer of the project site) (Table 4-16). The species that most frequently entered the risk zone was Common Buzzard (*Buteo buteo*). However, these numbers do not represent unique birds and contain multiple reports of the same bird for residents.

Table 4-16 Resident and migrant bird occurrences at risk zone in summer 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Total
Eleonora's Falcon	*Falco eleonorae*	LC	-	91	91
Common Buzzard	*Buteo buteo*	LC	-	57	57
European Honey-buzzard	*Pernis apivorus*	LC	-	21	21
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	-	10	10
Eurasian Sparrowhawk	*Accipiter nisus*	LC	-	3	3
Booted Eagle	*Hieraaetus pennatus*	LC	-	3	3
unidentified Falcon	*Falco spp.*	-	-	3	3
Black Stork	*Ciconia nigra*	LC	-	2	2
Eurasian Kestrel	*Falco tinnunculus*	LC	-	2	2
unidentified Raptor	*Accipitridae sp.*	-	-	1	1
Total	-	-	-	193	193

Autumn

During autumn VP surveys, a total of 71 birds were detected at the site (Table 4-17). The most frequently encountered species was the Common Buzzard (*Buteo buteo*), with 34 contacts observed. Other notable observations included the Eurasian Sparrowhawk (*Accipiter nisus*) with 3 migrant and 10 resident contacts. Despite the variety of species, no threatened species were recorded during the survey.

Table 4-17 Total number of soaring migratory and resident bird species observed in autumn 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Unknown	Total
Common Buzzard	*Buteo buteo*	LC	15	19	-	34

Common Name	Scientific Name	IUCN	Migrant	Resident	Unknown	Total
Eurasian Sparrowhawk	*Accipiter nisus*	LC	3	10	6	19
unidentified Buzzard	*Buteo spp.*	-	4	-	-	4
Eurasian Marsh-Harrier	*Circus aeruginosus*	LC	3	-	-	3
unidentified Raptor	*Accipitridae spp.*	-	-	-	3	3
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	2	-	1	3
European Honey-buzzard	*Pernis apivorus*	LC	2	-	-	2
unidentified Falcon	*Falco spp.*	-	-	-	2	2
Black Stork	*Ciconia nigra*	LC	-	1	-	1
Total	-	-	29	30	12	71

During the autumn of 2024, a survey averaging approximately 40 hours and 16 minutes was conducted per vantage point. Over this period, 29 birds were identified as migrants. The migration rate was determined to be 0.72 birds per hour for the autumn season.

Among the birds observed, 45 (about 63% of all observed birds) were reported to fly at risk height (at rotor height and below and 500 m buffer of the project site) (Table 4-18). The species that most frequently entered the risk zone was Common Buzzard (*Buteo buteo*). However, these numbers do not represent unique birds and contain multiple reports of the same bird for residents.

Table 4-18 Resident and migrant bird occurrences at risk zone in autumn 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Unknown	Total
Common Buzzard	*Buteo buteo*	LC	13	15	-	28
Eurasian Sparrowhawk	*Accipiter nisus*	LC	1	8	5	14
European Honey-buzzard	*Pernis apivorus*	LC	2	-	-	2
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	1	-	-	1
Total	-	-	17	23	5	45

4.4.2 ETL Observations

For collision risk model, the average time spent at each VP for each season was utilized. It would be the most optimal and would provide the best possible results if the individual VP efforts are very similar. However often in field conditions survey effort at each VP may vary due to logistics, weather, surveyor wellbeing and other circumstances that may arise. While bigger differences in survey effort may degrade the predictive power of the model at locations where target bird species are highly active, where activity is even and at low – moderate levels the model's estimations are not considered significantly.

VP observations, where appropriate, ran in parallel to ETL observations to optimize field survey schedules, if shared VPs were available Similar to the first point, while for busy airspaces (such as major migration routes) this would have a negative impact on study results, at locations lower rates of activity, the two methodologies are compatible and do not detract from survey effort. This is due to NatureScot methodology not involving continuous surveillance of the airspace, but rather surveillance at intervals (every 5 minutes). The two methodologies can be stacked due to the interval observations approach.

Spring

During the spring 2024 surveys at VP ETL points, a total of 92 birds were detected across various species (Table 4-19). Out of these, 37 birds, which account for approximately 41% of the total, were observed flying at the height of the transmission lines, placing them at potential risk of collision. The most common species observed was the Common Buzzard (*Buteo buteo*), with 45 contacts detected and 25 of them flying at risk height.

Table 4-19 Total number of bird species observed at VP ETL points at risk height in spring 2024.

Common Name	Scientific Name	IUCN	VP ETL1	VP ETL2	Total
Common Buzzard	*Buteo buteo*	LC	12	13	25
Eurasian Sparrowhawk	*Accipiter nisus*	LC	4	2	6
Peregrine Falcon	*Falco peregrinus*	LC	-	2	2
Black Stork	*Ciconia nigra*	LC	1	1	2
Eurasian Hobby	*Falco subbuteo*	LC	1	-	1
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	1	-	1
Total			**19**	**18**	**37**

Summer

During the Summer 2024 surveys at VP ETL points, a total of 162 birds were detected across various species (Table 4-20). Out of these, 81 birds, which account for approximately 50% of the total, were observed flying at the height of the transmission lines, placing them at potential risk of collision. The most common species observed was the European Honey-buzzard (*Pernis apivorus*), with 52 contacts detected and 32 of them flying at risk height which is a significant result given KBA trigger status. Another notable species includes the Common Buzzard (*Buteo buteo*) with 66 contacts observed, 32 of which were at risk height.

Table 4-20 Total number of bird species observed at VP ETL points at risk height in summer 2024.

Common Name	Scientific Name	Status	IUCN	VP ETL1	VP ETL2	Total
European Honey-buzzard	*Pernis apivorus*	Migrant	LC	24	8	32
Common Buzzard	*Buteo buteo*	Resident	LC	19	13	32

Common Name	Scientific Name	Status	IUCN	VP ETL1	VP ETL2	Total
Eleonora's Falcon	*Falco eleonorae*	Resident	LC	5	-	5
Eurasian Sparrowhawk	*Accipiter nisus*	Resident	LC	3	1	4
Short-toed Snake-Eagle	*Circaetus gallicus*	Resident	LC	2	1	3
Eurasian Hobby	*Falco subbuteo*	Resident	LC	1	-	1
Black Stork	*Ciconia nigra*	Resident	LC	1	-	1
Eurasian Kestrel	*Falco tinnunculus*	Resident	LC	1	-	1
unidentified Raptor	*Accipitridae sp.*	Resident	-	-	1	1
unidentified Buzzard	*Buteo sp.*	Resident	-	-	1	1
Total	-		-	56	25	81

With the available data, the bird passages are distributed fairly uniform along the route of the transmission line.

Autumn

During the Autumn 2024 surveys at VP ETL points, a total of 95 birds were detected across various species (Table 4-21). Out of these, 27 birds, which account for approximately 28% of the total, were observed flying at the height of the transmission lines, placing them at potential risk of collision. The most common species observed was the the Common Buzzard (*Buteo buteo*), with 53 contacts detected and 21 of them flying at risk height. Another notable species includes the Eurasian Sparrowhawk (*Accipiter nisus*) with 17 contacts observed, 6 of which were at risk height.

Table 4-21 Total number of bird species observed at VP ETL points at risk height in autumn 2024.

Common Name	Scientific Name	Status	IUCN	VP ETL1	VP ETL2	Total
Common Buzzard	*Buteo buteo*	Resident	LC	7	14	21
Eurasian Sparrowhawk	*Accipiter nisus*	Resident	LC	5	1	6
Total	-		-	12	15	27

With the available data, the bird passages are distributed fairly uniform along the route of the transmission line.

Summary

Based on the surveys conducted in spring, summer, and autumn 2024 at the transmission line points (TL1 and TL2), the overall risk of bird collision with the Energy Transmission Lines appears moderate especially given European Honey-buzzard activity (Figure 4-3). Across all seasons, a total of 349 birds were detected, with 145 birds (approximately 41%) observed flying at the height of the transmission lines, placing them at potential risk of collision. However, this is a relatively small proportion of the total bird sightings.

Table 4-22 Total number of bird species observed across all TL points.

Common Name	Scientific Name	Status	IUCN	VP ETL1	VP ETL2	Total
Common Buzzard	*Buteo buteo*	Resident	LC	70	94	164
European Honey-buzzard	*Pernis apivorus*	Migrant	LC	44	33	77
Eurasian Sparrowhawk	*Accipiter nisus*	Resident	LC	18	15	33
Short-toed Snake-Eagle	*Circaetus gallicus*	Resident	LC	16	14	30
Black Stork	*Ciconia nigra*	Resident	LC	2	9	11

Common Name	Scientific Name	Status	IUCN	VP ETL1	VP ETL2	Total
Eleonora's Falcon	*Falco eleonorae*	Resident	LC	7	2	9
Booted Eagle	*Hieraaetus pennatus*	Migrant	LC	2	6	8
Unidentified Raptor	*Accipiter spp.*	Resident	-	5	1	6
Peregrine Falcon	*Falco peregrinus*	Resident	LC	-	3	3
Eurasian Hobby	*Falco subbuteo*	Resident	LC	2	-	2
Unidentified Falcon	*Falco spp.*	Resident	-	1	1	2
Golden Eagle	*Aquila chrysaetos*	Resident	LC	-	1	1
Eurasian Kestrel	*Falco tinnunculus*	Resident	LC	1	-	1
Unidentified Buzzard	*Buteo sp.*	Resident	-	-	1	1
Montagu's Harrier	*Circus pygargus*	Resident	LC	1	-	1
Total	-		-	169	180	349

Certain species, such as the Common Buzzard, European Honey-buzzard, and Eurasian Sparrowhawk, were frequently observed at risk height and , the total number of birds at risk appears moderate. Since European Honey-buzzard, a KBA trigger species, is relatively active as well, the ETL was determined moderate risk for its entire length.

Table 4-23 Risk quantification values of each TL point based on passage rates.

Season	VP ETL1	VP ETL2
Spring	0.61	0.59
Summer	0.76	0.31
Autumn	0.29	0.40
Average	0.55	0.43

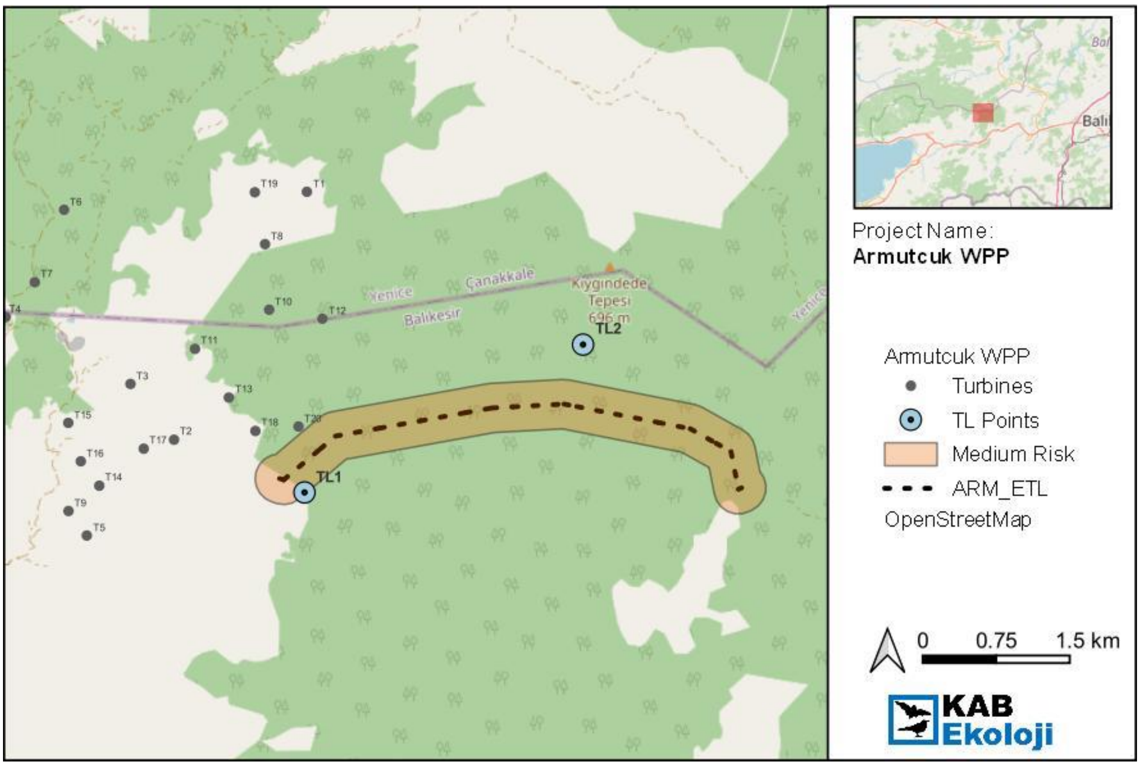

Figure 4-3 ETL segment risk assessment.

4.4.3 Collision Risk Model

For collision risk model, the average time spent at each VP for each season was utilized. It would be the most optimal and would provide the best possible results if the individual VP efforts are very similar. However often in field conditions survey effort at each VP may vary due to logistics, weather, surveyor wellbeing and other circumstances that may arise. While bigger differences in survey effort may degrade the predictive power of the model at locations where target bird species are highly active, where activity is even and at low – moderate levels the model's estimations are not considered significantly.

VP observations, where appropriate, ran in parallel to ETL observations to optimize field survey schedules, if shared VPs were available Similar to the first point, while for busy airspaces (such as major migration routes) this would have a negative impact on study results, at locations lower rates of activity, the two methodologies are compatible and do not detract from survey effort. This is due to NatureScot methodology not involving continuous surveillance of the airspace, but rather surveillance at intervals (every 5 minutes). The two methodologies can be stacked due to the interval observations approach.

Total daylight hours in each season are calculated based on 12 hours for residents and 10 hours for migrants. This is a practice that enhances the predictive power of the model which is backed by studies of migrant behaviour from Istanbul migration counts. Migrant soaring species, relative to their resident counterparts, are mostly inactive before the sun is higher and the thermal air currents are better developed since energy conservation during migration is of critical importance. This behaviour is reflected in the hourly distribution of bird passages in most raptor counts (typically between 09:00 and 17:00). Therefore, 2 hours from daylight are subtracted to reflect migrant active hours in the model. There are one published and two unpublished reports on the bird migration over the Bosporus, which also features analysis of the hourly distribution of birds.[5][6][7]

Spring

Since no migrants were observed at risk zone, collision risk for migrants was not calculated. (Table 4-24)

Table 4-24 The estimated mortality rates of migrant species in spring 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	Total	Total (sec/year)	Occupancy	# passage	Mort. w/o avo.	Mort. w/ avo.
Total	0	0	0	0	0	0

Sample collision risk calculation for resident species is shown in Table 4-25. Calculation for all species with risk above 0 is shown on Table 4-26.

[5] Üner, Ö., Boyla, K.A., Bacak, E., Birel, E., Çelikoba, İ., Dalyan, C., Tabur, E. & Yardım, Ü. (2006). Spring migration of soaring birds over the Bosphorus, Turkey, in 2006. Sandgrouse 32.

[6] İKGT. (2010). 2010 İstanbul Boğazı Kuş Göçü Sayımları. İstanbul Kuş Gözlem Topluluğu, İstanbul.

[7] Bilgin, S., Boyla, K.A. & Topluluğu, İ.K.G. (2011). İstanbul Boğazı Göçü–İlkbahar 2011. İstanbul Kuş Gözlem Topluluğu, İstanbul.

Table 4-25 Mortality rate calculation for resident species in detail (spring).

Variable	Value	Unit
Species	Common Buzzard	
Total duration of individual bird observations	591.83	sec
Total duration of observations	33.33	hr/VP
Study Period	2024-03-01	
	2024-06-30	
Total migration hours	1464	hr
Estimated total birds x seconds	25993.14	bird x sec
N	20	
Area	10088430	m2
height	180	m
Vw	1815917400	m3
Sweeping Area	301749.3	m2
r	69.3	m
d	4	m
L	0.58	m
Vr = N x πR2 x (d + l)	1380503	m3
n	25993.14	sec
n x (Vr / Vw)	19.76	sec
v	11.6	m/s
t = (d + l) / v	0.39	sec
n x (Vr / Vw) / t	50.1	birds
Probability of bird being hit when flying through the rotor	0.09	
Mortality rate without avoidance	4.71	birds
(1 - avoidance rate)	0.02	
Mortality estimation for study period	0.09	birds

Table 4-26 The estimated mortality rates of resident species in spring 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	Total	Total (sec/year)	Occupancy	# passage	Mort. w/o avo.	Mort. w/ avo.
Common Buzzard	588	25810	19	48	5.00	0.09
Eurasian Kestrel	180	7906	5	12	1.00	0.02
Eurasian Sparrowhawk	90	3953	3	8	1.00	0.02
Short-toed Snake-Eagle	65	2850	2	6	1.00	0.02
Booted Eagle	30	1318	1	3	0.00	0.00
Total	953	41837	30	77	8.00	0.15

Summer

Since no migrants were observed at risk zone, collision risk for migrants was not calculated.

Sample collision risk calculation for resident species is shown in Table 4-27. Calculation for all species with risk above 0 is shown on Table 4-28.

Table 4-27 Mortality rate calculation for resident species in detail (summer).

Variable	Value	Unit
Species	Eleonora's Falcon	
Total duration of individual bird observations	2001.05	sec
Total duration of observations	65.06	hr/VP
Study Period	2024-07-01	
	2024-08-31	
Total migration hours	744	hr
Estimated total birds x seconds	22884.82	bird x sec
N	20	
Area	10088430	m2
height	180	m
Vw	1815917400	m3
Sweeping Area	301749.3	m2
r	69.3	m
d	4	m
L	0.39	m
Vr = N x πR2 x (d + l)	1324680	m3
n	22884.82	sec
n x (Vr / Vw)	16.69	sec
v	12.8	m/s
t = (d + l) / v	0.34	sec
n x (Vr / Vw) / t	48.68	birds
Probability of bird being hit when flying through the rotor	0.08	
Mortality rate without avoidance	3.75	birds
(1 - avoidance rate)	0.02	
Mortality estimation for study period	0.07	birds

Table 4-28 The estimated mortality rates of resident species in summer 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	Total	Total (sec/year)	Occupancy	# passage	Mort. w/o avo.	Mort. w/ avo.
Eleonora's Falcon	2001	22885	17	49	3.75	0.07
Common Buzzard	1386	15851	12	31	2.87	0.06
European Honey-buzzard	1034	11824	9	25	2.14	0.04
Short-toed Snake-Eagle	445	5087	4	11	0.99	0.02
Eurasian Kestrel	180	2059	1	3	0.32	0.01
Others	176	2008	1	4	0.32	0.01
Total	5221	59713	44	122	10.38	0.21

Autumn

Sample collision risk calculation for migrant species is shown in Table 4-29. Calculation for all species with risk above 0 is shown on Table 4-30.

Table 4-29 Mortality rate calculation for migrant species in detail (autumn).

Variable	Value	Unit
Species	Common Buzzard	

Variable	Value	Unit
Recorded number of birds at risk height/zone	13	birds
Duration of observation	40.26	hr/VP
Study Period	2024-09-01	
	2024-11-15	
Total migration hours	760	hr
Estimated number of birds at risk height/zone (n)	245.4	birds
N	20	
width	5145	m
height	180	m
W	926100	m2
A	301749.3	m2
A/W	0.33	%
n x (A/W)	79.96	birds
P. Probability of bird being hit when flying through the rotor	0.09	
Mortality rate without avoidance	7.52	birds
(1 - avoidance rate)	0.02	
Mortality estimation per year	0.15	birds

Table 4-30 The estimated mortality rates of migrant species in autumn 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	observed	# observed	# thru rotors	Mort. w/o avo.	Mort. w/ avo.
Common Buzzard	13	245.4	79.96	7.52	0.15
European Honey-buzzard	2	37.75	12.3	1.07	0.02
Eurasian Sparrowhawk	1	18.88	6.15	0.52	0.01
Short-toed Snake-Eagle	1	18.88	6.15	0.54	0.01
Total	17	320.91	104.56	9.64	0.19

Sample collision risk calculation for resident species is shown in Table 4-31. Calculation for all species with risk above 0 is shown on Table 4-32.

Table 4-31 Mortality rate calculation for resident species in detail (autumn).

Variable	Value	Unit
Species	Common Buzzard	
Total duration of individual bird observations	711.98	sec
Total duration of observations	40.26	hr/VP
Study Period	2024-09-01	
	2024-11-15	
Total migration hours	912	hr
Estimated total birds x seconds	16127.88	bird x sec
N	20	
Area	10088430	m2
height	180	m
Vw	1815917400	m3
Sweeping Area	301749.3	m2
r	69.3	m

Variable	Value	Unit
d	4	m
L	0.58	m
Vr = N x πR2 x (d + l)	1380503	m3
n	16127.88	sec
n x (Vr / Vw)	12.26	sec
v	11.6	m/s
t = (d + l) / v	0.39	sec
n x (Vr / Vw) / t	31.09	birds
Probability of bird being hit when flying through the rotor	0.09	
Mortality rate without avoidance	2.92	birds
(1 - avoidance rate)	0.02	
Mortality estimation for study period	0.06	birds

Table 4-32 The estimated mortality rates of resident species in autumn 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	Total	Total (sec/year)	Occupancy	# passage	Mort. w/o avo.	Mort. w/ avo.
Common Buzzard	712	16128	12	31	2.92	0.06
Eurasian Sparrowhawk	353	7991	6	15	1.26	0.03
Total	1065	24119	18	46	4.18	0.08

4.4.4 Additive Collision Risk (Project Galeforce)

Since each WPP within the financial package is a project of Project Galeforce consisting of 9 WPPs, the Lenders would like an evaluation of avian collision risks of the package in its entirety. The additive collision risk which is a collation of collision risk estimation results from each project are presented in this section.

It should be noted that this section presents an “additive” collision risk evaluation, not a “cumulative” evaluation. Previously, the Consultant has provided a regional, high-level, qualitative assessment for the Project. In this assessment, the Project’s potential impact on the migratory flyways was considered. Submitted qualitative assessment in ESIA Report for each project’s Chapter 17 was based on Gauld et al (2022) study[8] where collision vulnerability of migratory species is identified which was also restricted by the lack of data for majority of the grids for the regional assessment.

The main limitations regarding a qualitative Cumulative Collision Risk for the Project are (1) WPPs in Türkiye either do not carry out collision risk assessments or mortality studies, or do not carry those up to IFI standards, or if conducted, do not publicly disclose such studies, and this leads to (2) a lack of credible publications on mortality risks for WPPs in Türkiye which the quantitative cumulative assessment for Project Galeforce would have benefitted from in terms of data points.

Furthermore, (3) a regional level Cumulative CRA requires an understanding of how the WPPs in the region might potentially synergize, publications on which are not available from the region either. (4) Due to the vast geographical extent of the Project Galeforce, the variety of terrain and habitats, etc., gathering the data needed for a quantitative cumulative assessment is a high effort and long-term task.

Finally, (5) a cumulative risk assessment of the 9 WPPs would need to include rates associated with ETL collision mortality since those are considered project components, the quantitative data for which is also scarce from the region, and modelling methods, such as those associated with turbine mortality, are not well established in literature. These limitations must be considered if a cumulative collision risk assessment is to be undertaken in the future.

For the additive assessment section of the interim reports, National EIA data was incorporated into the evaluations for the purpose of having as little data gap as possible. However, it was already well established that the National EIA collision risk tables were incomplete on multiple accounts, such as on project or season levels, or had methodological inconsistencies or gaps that challenged robust comparison. Additionally, the risk tables clock almost all mortality estimations at “zero” except for *Buteo buteo* at 0.03 bird/spring season at Dampınar, and Falco tinnunculus at 0.03 birds/spring season for Akköy.

With the completion of the supplementary baseline in 2024 at hand, which was conducted by the same team, applying consistent methodology over 3 seasons across all projects over the same time period, and seeing that the inclusion of National EIA would simply complicate the dataset and dilute the risk estimations, it is more sensible to only consider 2024 results in the final baseline report for 2024 and interim reports for 2024 baseline may be reviewed for a compilation of National EIA results.

An overview of baseline collision risk estimation at each project broken down by resident or migrant status, covering spring, summer and autumn seasons based on 2024 studies are shown in Table 4-33. The results demonstrate that baseline risk over the study period was

[8] Gauld et al (2022). Hotspots in the grid: Avian sensitivity and vulnerability to collision risk from energy infrastructure interactions in Europe and North Africa. Journal of Applied Ecology.

driven mainly by resident activity as opposed to migratory movement over the minor pathways which was a picture that was already emerging at the interim stage.

It is important to note that none of the 2024 surveys account for winter periods. Though activity in winter is expected to be significantly diminished, it is not expected to be non-existent either. Projects located in high altitudes, with extensive precipitation and high winds over the winter are not expected to host significant activity over the winter (e.g. Kestanederesi, potentially) while those projects in lowlands and near important wetlands may indeed receive activity (such as Ihlamur, with anecdotal findings, and Akköy, near a well-known protected wetland for wintering bird species). Therefore, the data from the three seasons was not extrapolated to cover winter (such as substituting an average or a minimum value or applying a coefficient to represent "winter" data) since the effect of winter on collision risk is mixed across the projects.

The table features additional lines to account for the potential effect of the discontinued surveys in Hacıhıdırlar WPP which resulted in missed seasons for autumn and summer. The line 8 WPP without Hacıhıdırlar calculates the %migrant and collision per turbine per year values without the project. The line 8 WPP with extrapolated Hacıhıdırlar is obtained by assuming the same collision risk values in summer and autumn as the spring results for the project.

Table 4-33 Collision risk summary for Project Galeforce and each of its projects as calculated in 2024

Projects	Migrant /yr*	Resident /yr*	Total /yr*	%migrant	Turbine count	Collision/ turbine/ yr*
Akköy	0.05	0.49	0.54	9.26	6	0.09
Armutçuk	0.19	0.43	0.62	30.65	20	0.03
Dampınar	0.06	1.44	1.50	4.00	11	0.14
Hacıhıdırlar**	0.00	0.50	0.50	0.00	15	0.03
Harmancık	0.05	0.06	0.11	45.45	10	0.01
Ihlamur	0.27	2.51	2.78	9.71	18	0.15
Kestanederesi	0.18	5.10	5.28	3.41	28	0.19
Ovacık	0.07	0.16	0.23	30.43	13	0.02
Uygar	0.65	1.76	2.41	26.97	60	0.04
Project Galeforce	1.52	12.45	13.97	10.88	181	0.08
8 WPP (- Hacıhıdırlar)	1.52	11.95	13.47	11.28	166	0.08

*Though denoted year (yr), the survey period consists of spring, summer and autumn, and does not account for winter periods

**Hacıhıdırlar WPP baseline collection was disrupted, and summer and autumn data could not be collected.

The data table summarizing the project specific collision risk estimations from the data is presented in Table 4-34.

Table 4-34 Additive Collision Risk Assessment summary for Project Galeforce

Common Name	Projects	Migrant	Resident	Total
Black Kite	Harmancık	0.00	0.00	0.00
Subtotal		0.00	0.00	0.00
Black Stork	Ihlamur	0.00	0.02	0.02
	Uygar	0.01	0.01	0.02
Subtotal		0.01	0.03	0.04
Booted Eagle	Akköy	0.00	0.00	0.00
	Armutçuk	0.00	0.00	0.00
	Harmancık	0.00	0.00	0.00
	Ihlamur	0.01	0.00	0.01
	Kestanederesi	0.00	0.02	0.02
	Ovacık	0.01	0.00	0.01
	Uygar	0.00	0.02	0.02
Subtotal		0.02	0.04	0.06
Common Buzzard	Akköy	0.00	0.01	0.01
	Armutçuk	0.15	0.21	0.36
	Dampınar	0.00	0.19	0.19
	Hacıhıdırlar	0.00	0.40	0.40
	Harmancık	0.02	0.03	0.05
	Ihlamur	0.11	0.50	0.61
	Kestanederesi	0.00	1.00	1.00
	Ovacık	0.02	0.10	0.12
	Uygar	0.25	0.98	1.23
Subtotal		0.55	3.42	3.97
Dalmatian Pelican	Akköy	0.00	0.06	0.06
Subtotal		0.00	0.06	0.06
Eleonora's Falcon	Armutçuk	0.00	0.07	0.07
	Dampınar	0.00	0.48	0.48
	Hacıhıdırlar	0.00	0.04	0.04
	Harmancık	0.00	0.02	0.02
	Ihlamur	0.04	0.65	0.69
	Kestanederesi	0.00	0.35	0.35
	Ovacık	0.00	0.01	0.01
	Uygar	0.00	0.02	0.02
Subtotal		0.04	1.64	1.68
Eurasian Hobby	Ihlamur	0.00	0.06	0.06
	Ovacık	0.00	0.00	0.00
	Uygar	0.01	0.00	0.01
Subtotal		0.01	0.06	0.07
Eurasian Kestrel	Akköy	0.00	0.05	0.05
	Armutçuk	0.00	0.03	0.03
	Dampınar	0.01	0.00	0.01
	Hacıhıdırlar	0.00	0.02	0.02
	Harmancık	0.00	0.00	0.00
	Ihlamur	0.00	0.74	0.74
	Kestanederesi	0.00	1.06	1.06
	Ovacık	0.00	0.01	0.01
	Uygar	0.01	0.10	0.11
Subtotal		0.02	2.01	2.03
Eurasian Marsh-Harrier	Akköy	0.00	0.00	0.00
	Ihlamur	0.01	0.00	0.01
	Kestanederesi	0.03	0.00	0.03
	Ovacık	0.01	0.00	0.01
Subtotal		0.05	0.00	0.05
Eurasian Sparrowhawk	Akköy	0.00	0.04	0.04
	Armutçuk	0.01	0.04	0.05
	Dampınar	0.03	0.03	0.06
	Hacıhıdırlar	0.00	0.02	0.02
	Harmancık	0.02	0.00	0.02
	Ihlamur	0.03	0.02	0.05
	Kestanederesi	0.03	0.00	0.03
	Ovacık	0.02	0.01	0.03
	Uygar	0.30	0.05	0.35
Subtotal		0.44	0.21	0.65
European Honey-buzzard	Armutçuk	0.02	0.04	0.06
	Dampınar	0.01	0.01	0.02
	Harmancık	0.01	0.00	0.01
	Ihlamur	0.01	0.06	0.07
	Kestanederesi	0.11	0.00	0.11
	Uygar	0.04	0.04	0.08
Subtotal		0.20	0.15	0.35
Hen Harrier	Ihlamur	0.01	0.00	0.01
Subtotal		0.01	0.00	0.01
Lesser Kestrel	Kestanederesi	0.00	1.91	1.91
Subtotal		0.00	1.91	1.91
Levant Sparrowhawk	Harmancık	0.00	0.00	0.00
	Uygar	0.02	0.00	0.02
Subtotal		0.02	0.00	0.02
Long-legged Buzzard	Akköy	0.01	0.01	0.02
	Dampınar	0.00	0.00	0.00
	Kestanederesi	0.00	0.28	0.28
Long-legged Buzzard Total		0.01	0.29	0.30
Montagu's Harrier	Akköy	0.00	0.00	0.00
	Dampınar	0.01	0.00	0.01
	Kestanederesi	0.01	0.00	0.01
Subtotal		0.02	0.00	0.02
Peregrine Falcon	Dampınar	0.00	0.00	0.00
	Kestanederesi	0.00	0.04	0.04
Peregrine Falcon Total		0.00	0.04	0.04
Red-footed Falcon	Ihlamur	0.01	0.00	0.01
Red-footed Falcon Total		0.01	0.00	0.01
Short-toed Snake-Eagle	Akköy	0.03	0.15	0.18
	Armutçuk	0.01	0.04	0.05
	Dampınar	0.00	0.73	0.73
	Hacıhıdırlar	0.00	0.02	0.02
	Harmancık	0.00	0.01	0.01
	Ihlamur	0.04	0.46	0.50
	Kestanederesi	0.00	0.44	0.44
	Ovacık	0.01	0.03	0.04
	Uygar	0.00	0.54	0.54
Subtotal		0.09	2.42	2.51
unidentified Falcon	Harmancık	0.00	0.00	0.00
	Uygar	0.01	0.00	0.01
Subtotal		0.01	0.00	0.01
White Stork	Akköy	0.01	0.17	0.18
Subtotal		0.01	0.17	0.18
Total		1.52	12.45	13.97

4.4.5 Breeding Bird Observations

The survey recorded a total of 65 bird species. Among these, 61 species have a breeding code higher than 0, indicating active breeding. Notably, the vulnerable European Turtle-Dove (*Streptopelia turtur*) and the near-threatened Woodchat Shrike (*Lanius senator*) were recorded. The most common species observed were the Common Wood-Pigeon (*Columba palumbus*), Eurasian Jay (*Garrulus glandarius*), and Common Chaffinch (Fringilla coelebs). Significant observations also include the European Bee-eater (*Merops apiaster*) with high counts, and various raptors such as the Short-toed Snake-Eagle (*Circaetus gallicus*) and Booted Eagle (*Hieraaetus pennatus*). Additionally, species observed during breeding bird surveys which are not breeding were included (denoted -). All species are listed in Table 4-35.

Table 4-35 List of species encountered during breeding bird surveys and highest number recorded each month.

Common Name	Scientific Name	IUCN	Breeding Code	Apr	May	Jun	Jul
Chukar	*Alectoris chukar*	LC	-	-	-	-	1
Common Wood-Pigeon	*Columba palumbus*	LC	B3	X	3	2	2
European Turtle-Dove	*Streptopelia turtur*	VU	A2	-	-	-	2
Common Cuckoo	*Cuculus canorus*	LC	A2	3	3	-	-
Black Stork	*Ciconia nigra*	LC	A1	-	1	1	1
European Honey-buzzard	*Pernis apivorus*	LC	B6	-	3	-	2
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	A2	-	1	2	2
Booted Eagle	*Hieraaetus pennatus*	LC	A1	-	2	1	2
Eurasian Sparrowhawk	*Accipiter nisus*	LC	A1	-	2	2	2
Common Buzzard	*Buteo buteo*	LC	B5	2	2	1	3
Tawny Owl	*Strix aluco*	LC	-	-	-	1	1
Eurasian Hoopoe	*Upupa epops*	LC	A2	X	1	1	1
European Bee-eater	*Merops apiaster*	LC	A2	-	259	-	-
Middle Spotted Woodpecker	*Dendrocoptes medius*	LC	A2	-	2	1	1
Syrian Woodpecker	*Dendrocopos syriacus*	LC	-	-	-	-	1
Lesser Spotted Woodpecker	*Dryobates minor*	LC	-	-	-	-	1
Eurasian Green Woodpecker	*Picus viridis*	LC	A2	-	1	2	1
Eurasian Hobby	*Falco subbuteo*	LC	-	-	-	1	-
Red-backed Shrike	*Lanius collurio*	LC	B6	-	-	-	1
Woodchat Shrike	*Lanius senator*	NT	-	-	-	-	X
Eurasian Jay	*Garrulus glandarius*	LC	C12	4	4	1	5
Common Raven	*Corvus corax*	LC	B7	4	2	2	7
Coal Tit	*Periparus ater*	LC	C13	25	11	3	8
Sombre Tit	*Poecile lugubris*	LC	B3	-	2	-	3
Eurasian Blue Tit	*Cyanistes caeruleus*	LC	C12	4	3	2	2
Great Tit	*Parus major*	LC	C12	9	5	1	1
Wood Lark	*Lullula arborea*	LC	C12	3	10	1	5
Eurasian Skylark	*Alauda arvensis*	LC	A2	-	1	-	-
Greater Short-toed Lark	*Calandrella brachydactyla*	LC	A2	-	2	-	-
Barn Swallow	*Hirundo rustica*	LC	B3	-	6	6	10
European red-rumped swallow	*Cecropis rufula*	LC	A1	X	2	-	4

Common Name	Scientific Name	IUCN	Breeding Code	Apr	May	Jun	Jul
Eastern Bonelli's Warbler	*Phylloscopus orientalis*	LC	A2	1	2	-	X
Willow Warbler	*Phylloscopus trochilus*	LC	A2	-	2	-	-
Common Chiffchaff	*Phylloscopus collybita*	LC	A2	5	6	-	X
Long-tailed Tit	*Aegithalos caudatus*	LC	C12	4	3	2	3
Eurasian Blackcap	*Sylvia atricapilla*	LC	A2	-	3	-	-
Lesser Whitethroat	*Curruca curruca*	LC	A2	1	4	-	1
Sardinian Warbler	*Curruca melanocephala*	LC	-	-	X	-	-
Eastern Subalpine Warbler	*Curruca cantillans*	LC	B5	1	4	1	1
Greater Whitethroat	*Curruca communis*	LC	C12	2	-	-	5
Common Firecrest	*Regulus ignicapilla*	LC	A2	2	3	-	-
Krüper's Nuthatch	*Sitta krueperi*	LC	B6	4	4	3	2
Eurasian Nuthatch	*Sitta europaea*	LC	A1	-	1	-	X
Short-toed Treecreeper	*Certhia brachydactyla*	LC	B3	6	7	1	7
Eurasian Wren	*Troglodytes troglodytes*	LC	A2	10	4	1	3
Mistle Thrush	*Turdus viscivorus*	LC	B3	1	3	2	2
Song Thrush	*Turdus philomelos*	LC	A2	-	1	-	-
Eurasian Blackbird	*Turdus merula*	LC	B3	4	8	2	1
Spotted Flycatcher	*Muscicapa striata*	LC	A2	-	5	-	3
European Robin	*Erithacus rubecula*	LC	C12	7	12	2	2
Common Nightingale	*Luscinia megarhynchos*	LC	A2	-	1	-	-
Red-breasted Flycatcher	*Ficedula parva*	LC	A1	-	-	-	1
European Stonechat	*Saxicola rubicola*	LC	C13	2	2	1	4
Northern Wheatear	*Oenanthe oenanthe*	LC	A1	-	2	-	1
Eastern Black-eared Wheatear	*Oenanthe melanoleuca*	LC	B3	-	2	-	-
House Sparrow	*Passer domesticus*	LC	A1	X	1	-	-
Gray Wagtail	*Motacilla cinerea*	LC	A2	-	1	-	2
Common Chaffinch	*Fringilla coelebs*	LC	C12	25	17	2	14
Hawfinch	*Coccothraustes coccothraustes*	LC	A1	1	-	-	-
European Greenfinch	*Chloris chloris*	LC	C12	1	2	1	1
Eurasian Linnet	*Linaria cannabina*	LC	B6	2	4	3	4
European Goldfinch	*Carduelis carduelis*	LC	B6	-	4	10	1
European Serin	*Serinus serinus*	LC	C12	11	17	3	4
Corn Bunting	*Emberiza calandra*	LC	A2	-	1	-	-
Cirl Bunting	*Emberiza cirlus*	LC	B3	1	2	2	1

4.5 Bat

Spring

Based on Auto-ID results, a total of 89,827 recordings were made. Of those, only 19,169 recordings, corresponding to 21.36% of all recordings, were identified as bats. Noise accounted for the majority of the recordings (78.66%), with an average nightly noise percentage ranging from 55.16% to 99.11%. All nights were analysed manually. Analysis summary is provided in Table 4-36.

Table 4-36 Number of bat recordings and noise recorded each night based on Auto-ID in spring.

Night	Detectors	Bat	Noise	Total	Noise Ratio	Analysis
1	13	334	2393	2727	87.75%	Manual_ID
2	13	1693	6948	8641	80.41%	Manual_ID
3	13	195	9247	9442	97.93%	Manual_ID
4	13	107	11864	11971	99.11%	Manual_ID
5	13	489	7436	7925	93.83%	Manual_ID
6	13	2654	6144	8798	69.83%	Manual_ID
7	13	3274	7790	11064	70.41%	Manual_ID
8	13	3024	7349	10373	70.85%	Manual_ID
9	13	2577	4034	6611	61.02%	Manual_ID
10	13	2761	3397	6158	55.16%	Manual_ID
11	13	2061	4056	6117	66.31%	Manual_ID
Total	-	19121	70658	89827	78.66%	-

Table 4-37 presents the distribution of bat recordings across 13 SPs based on Manual-ID results. SP08 and SP09 had the highest average recordings, accounting for 2.31 times the average value, followed by SP11 and SP01. Night 7 recorded the highest bat activity 24.5 times the average value, showing the highest potential of the site. Failures of the recorders are indicated by blank cells in the table.

Table 4-37 Distribution of bat recordings across SPs by night based on Manual-ID results in spring

Night	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total
1	90	154	41	15	0	0	0	0	0	0	0	0	0	300
2	92	152	39	75	118	57	79	133	181	22	419	96	63	1526
3	12	17	0	0	25	6	0	10	25	0	20	18	7	140
4	7	0	0	0	1	2	0	2	3	0	1	6	0	22
5	20	21	5	2	69	4	1	48	21	5	40	59	2	297
6	78	213	57	48	68	62	252	93	573	35	945	71	61	2556
7	240	188	412	221	71	84	151	113	424	406	390	146	139	2985
8	540	257	94	268	40	88	40	649	186	122	264	78	175	2801
9	520	344	95		16	124	24	833	93	24		105	126	2304
10	212	198	89		32	129	330	684	563	149		101	108	2595
11	78	90	34		59	111	118	545	597	25		232	41	1930
Total	1889	1634	866	629	499	667	995	3110	2666	788	2079	912	722	17456
Ave.	172	149	79	57	45	61	90	283	242	72	189	83	66	122

Table 4-38 summarizes the results of the Auto-ID analysis of bat recordings for the selected nights (all nights in spring), yielding a total of 19,121 recordings across 13 SPs over three nights. Overall, the number of recordings identified through Manual-ID closely aligns with those identified through Auto-ID, with a difference of approximately 8.7%. However, in some instances, noise was misclassified as bat calls by one detector, widening the discrepancy. Ultimately, the total number of bat recordings identified through Manual-ID corresponds to 91.3% of the total results from Auto-ID for the surveyed period.

Table 4-38 Number of bat recordings per night with Auto ID results in spring

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total
1	Auto ID	92	158	55	29	0	0	0	0	0	0	0	0	0	334
2	Auto ID	116	153	42	85	139	67	88	140	186	22	416	106	133	1693
3	Auto ID	13	19	0	0	29	8	0	15	24	0	22	18	42	190
4	Auto ID	8	0	0	0	24	5	0	2	17	0	1	7	0	64
5	Auto ID	24	22	5	3	99	14	3	55	40	5	43	62	114	489
6	Auto ID	86	215	63	57	75	71	257	104	719	36	836	71	64	2654
7	Auto ID	245	189	418	243	88	110	158	119	536	399	380	147	242	3274
8	Auto ID	543	254	107	289	49	101	45	652	294	126	252	76	236	3024
9	Auto ID	521	379	166	0	48	140	25	839	183	25	0	99	152	2577
10	Auto ID	216	199	95	0	38	210	351	687	576	155	0	98	136	2761
11	Auto ID	84	96	44	0	181	115	125	546	588	27	0	208	47	2061
Total	Auto ID	1948	1684	995	706	770	841	1052	3159	3163	795	1950	892	1166	19121

The Auto-ID analysis for all nights reveals that the most common species recorded was Common Pipistrelle (*Pipistrellus pipistrellus*), comprising 55.77% of all bat recordings and 73.80% of identified recordings when non-identified sounds are distributed evenly (Table 4-39). The second most frequently recorded species was Lesser Noctule (*Nyctalus leisleri*), accounting for 4.24% of recordings and 5.61% of identified recordings with adjusted distribution.

Notably, the VU species Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) was recorded at 1.55% of the total bat calls, equating to 2.05% when non-identified recordings are redistributed. Additionally, another VU species, Giant Noctule (*Nyctalus lasiopterus*) were detected.

When checking the Manual ID species 17,456 records in total, we can see some differences compared to the Auto ID data (Table 4-40). Firstly, Common Pipistrelle (*Pipistrellus pipistrellus*) is the most common species in both datasets, with 11,188 records (64.09%) in Manual ID results and 10,690 record (55.77%) in Auto ID results. It dominates across almost all sampling points (SPs). Secondly, Lesser Noctule (*Nyctalus leisleri*), a member of the *Nyctaloid* group, is the second most frequently recorded species with 2,856 records (16.36%) in Manual ID while it recorded 4.24% in Auto-ID, showing a significantly lower proportion compared to Common Pipistrelle.

Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), a vulnerable species, is consistently recorded in all SPs, accounting for 566 3.24% in Manual ID, while it’s lower percantage as 1.55% in Auto ID results.

Table 4-39 Bat groups and species recorded during selected nights at each SP based on Auto-ID in spring

Night	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total	Percent	Percent_2
Pipistrelloid	PIPPIP	LC	1038	379	326	481	231	103	751	2814	1972	562	1313	332	388	10690	55.77%	73.80%
Pipistrelloid	HYPSAV	LC	46	62	109	10	9	22	4	3	18	36	7	3	33	362	1.89%	2.50%
Pipistrelloid	MINSCH	VU	162	11	10	7	2	12	6	13	21	12	22	7	12	297	1.55%	2.05%
Pipistrelloid	PIPKUH	LC	38	21	25	1	2	15	1	0	12	8	1	3	1	128	0.67%	0.88%
Pipistrelloid	PIPPYG	LC	23	0	2	0	0	0	3	0	1	1	1	49	0	80	0.42%	0.55%
Pipistrelloid	PIPNAT	LC	2	0	2	1	1	5	0	1	0	3	2	2	1	20	0.10%	0.14%
Nyctaloid	NYCLEI	LC	58	235	82	12	39	124	22	38	71	13	33	47	38	812	4.24%	5.61%
Nyctaloid	EPTSER	LC	14	33	61	8	22	22	46	44	118	13	15	34	21	451	2.35%	3.11%
Nyctaloid	NYCNOC	LC	5	33	1	5	17	11	9	17	44	7	5	26	14	194	1.01%	1.34%
Nyctaloid	VESMUR	LC	14	45	19	5	8	23	1	4	41	13	3	7	8	191	1.00%	1.32%
Nyctaloid	NYCLAS	VU	3	5	8	2	2	4	0	5	31	3	5	9	11	88	0.46%	0.61%
Tadarida	TADTEN	LC	43	17	35	8	65	69	14	9	222	8	15	19	334	858	4.48%	5.92%
Plecotus	PLESPE	NA	0	4	1	0	4	2	4	2	1	0	1	2	2	23	0.12%	0.16%
Myotis	MYOSPE	NA	21	4	1	13	11	10	8	12	13	6	45	20	25	189	0.99%	1.30%
Rhinolophus	RHIHIP	NT (E,M)	5	4	0	1	0	0	1	0	0	0	0	86	0	97	0.51%	0.67%
Rhinolophus	RHIFER	NT (E,M)	0	1	0	0	0	0	0	1	1	0	1	0	0	4	0.02%	0.03%
Rhinolophus	RHIEUR	VU (E,M)	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.01%	0.01%
-	NoID	-	476	831	321	153	357	419	187	196	597	110	481	245	311	4684	24.44%	
Total	-	-	1948	1685	1003	707	770	841	1057	3159	3163	795	1950	892	1199	19169	-	-

Table 4-40 Bat groups and species recorded during selected nights at each SP based on Manual ID in spring

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total	Percent
Pipistrelloid	PIPPIP	LC	1130	404	340	528	240	122	767	2841	2008	575	1476	359	398	11188	64.09%
Pipistrelloid	MINSCH	VU	278	22	17	8	3	21	23	32	26	25	52	11	48	566	3.24%
Pipistrelloid	HYPSAV	LC	48	64	113	9	10	20	4	3	18	37	8	4	37	375	2.15%
Pipistrelloid	PIPKUH/PIPNAT	-	133	11	40	3	3	28	3	3	19	21	2	6	0	272	1.56%
Pipistrelloid	PIPPYG	LC	1	0	0	0	0	0	0	0	17	0	1	73	0	92	0.53%
Pipistrelloid	PIPNAT	LC	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0.01%
Nyctaloid	NYCLEI	LC	187	982	141	29	119	368	82	100	290	81	116	218	143	2856	16.36%
Nyctaloid	EPTSER	LC	10	38	113	8	30	28	52	47	155	7	6	35	20	549	3.15%
Nyctaloid	VESMUR	LC	47	2	42	1	3	9	0	1	19	1	2	0	0	127	0.73%
Nyctaloid	NYCNOC	LC	0	5	3	2	3	5	2	2	1	4	1	18	4	50	0.29%
Nyctaloid	NYCLEI/VESMUR	-	0	38	0	0	0	0	0	0	0	0	0	0	0	38	0.22%
Nyctaloid	NYCLEI/NYCNOC	-	0	27	0	0	0	0	0	0	0	0	0	0	0	27	0.15%
Nyctaloid	NYCLAS	VU	0	3	4	0	1	0	0	0	0	0	2	9	1	20	0.11%
Tadarida	TADTEN	LC	6	8	3	5	3	5	0	0	0	4	6	15	0	55	0.32%
Plecotus	PLESPE	NA	6	6	16	2	8	7	44	5	46	3	5	5	1	154	0.88%
Myotis	MYOSPE	NA	30	16	18	26	24	34	12	71	60	28	395	52	65	831	4.76%
Rhinolophus	RHIHIP	NT (E,M)	6	4	0	1	0	0	0	0	0	0	0	102	0	113	0.65%
Rhinolophus	RHIBLA	VU (E)	0	0	16	0	48	18	6	3	4	0	4	2	0	101	0.58%
Rhinolophus	RHIFER	NT (E,M)	5	3	0	7	4	2	0	2	3	2	3	2	3	36	0.21%
Rhinolophus	RHIEUR	VU (E,M)	2	1	0	0	0	0	0	0	0	0	0	1	0	4	0.02%
Total	-	-	**1889**	**1634**	**866**	**629**	**499**	**667**	**995**	**3110**	**2666**	**788**	**2079**	**912**	**722**	**17456**	-

The bat activity during the hours of the night was analyzed for Pipistrelloid, Nyctaloid, and Tadarida groups, as they are known to be high and middle altitude fliers[9], making them potential subjects to possible curtailment planning. Figure 4-4 illustrates the activity patterns of these selected species throughout the night during the spring season, spanning from 19:00 to 06:00.

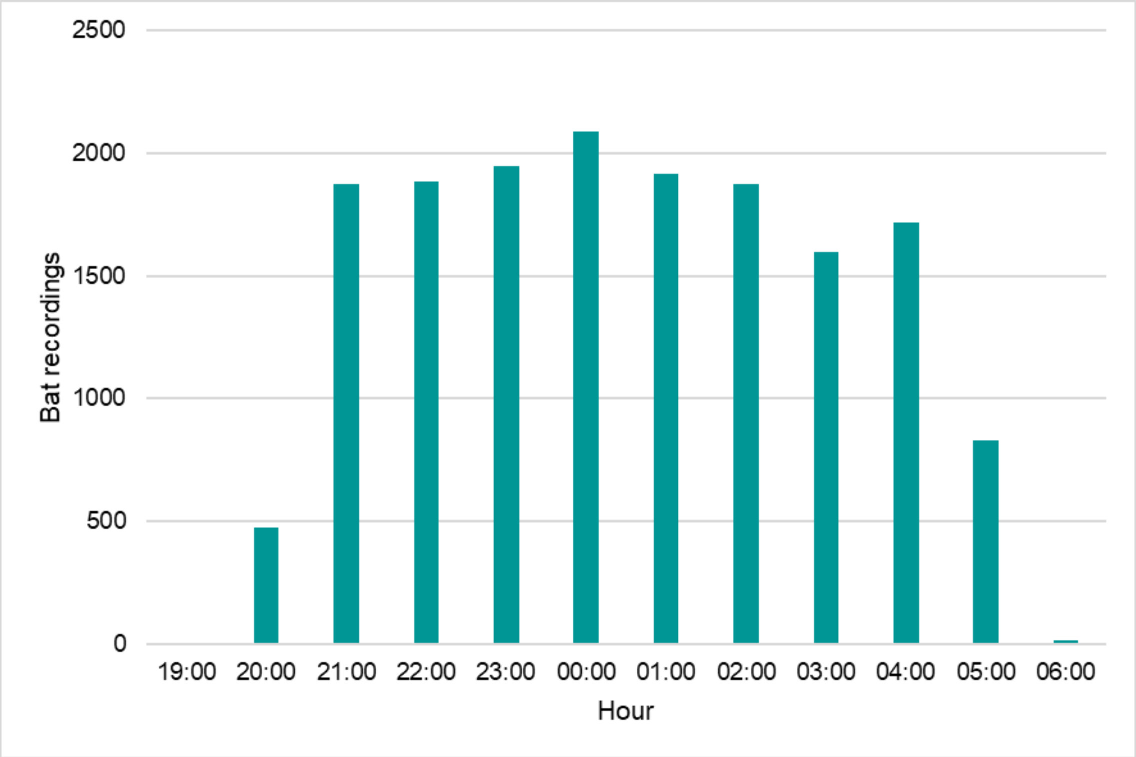

Figure 4-4 Hourly distribution of bat recordings through the night in spring

Summer

Based on Auto-ID results, a total of 94,185 recordings were made. 27,595 recordings, or approximately 29.3%, were identified as bat recordings in the summer season. Noise accounted for the majority of the recordings, with 66,590 noise recordings, representing 70.7% of the total. The average nightly noise percentage ranged from 59.82% to 79.77%. Nights 2 and 4 were selected for manual species identification. (Table 4-41).

Nights 2 and 4 were selected for manual species identification.

Table 4-41 Number of bat recordings and noise recorded each night based on Auto-ID in summer

Night	Detectors	Bat	Noise	Total	Noise Ratio	Analysis
1	13	3185	6554	9739	67.30%	
2	13	3721	8334	12055	69.13%	Manual_ID
3	13	3067	8898	11965	74.37%	
4	13	3918	5834	9752	59.82%	Manual_ID
5	13	2740	8458	11198	75.53%	
6	13	2960	6840	9800	69.80%	

[9] Rodrigues L., Bach L., Dubourg-Savage M.J., Karapandža B., Kovač D., Kervyn T., ... and Mindermann J. (2014). Guidelines for consideration of bats in wind farm projects, Revision 2014. EUROBATS Publication Series No. 6. Bonn: UNEP/EUROBATS Secretariat.

Night	Detectors	Bat	Noise	Total	Noise Ratio	Analysis
7	13	2737	5616	8353	67.23%	
8	13	2015	7944	9959	79.77%	
9	13	1368	5263	6631	79.37%	
10	13	1884	2849	4733	60.19%	
Total	-	27595	66590	94185	70.70%	-

Table 4-42 presents the distribution of bat recordings across 13 SPs based on Auto-ID results. SP08 had the highest average recordings, followed by SP12 and SP11. Night 4 recorded the highest bat activity (3918), 14.8 times the average value, showing the highest potential of the site. Failures of the recorders are indicated by blank cells in the table. SP02 has completely failed to record. SP3 can be considered since it's geographically nearby and habitats wise similar.

Table 4-42 Distribution of bat recordings across SPs by night based on Auto-ID results in summer

Night	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total
1	199		284	92	486	409	94	331	232	98	441	357	162	3185
2	252		111	185	297	427	76	321	375	74	486	315	802	3721
3	196		133	173	141	352	198	368	300	133	389	421	263	3067
4	247		91	238	225	459	185	897	295	134	412	502	233	3918
5	184		26	122		265	75	639	373	99	310	492	155	2740
6	167		30	147		388	315	632	203	136	433	399	110	2960
7	700		85	120		220	88	518	32	126	325	317	206	2737
8	283		59			219	72	458		72	401	276	175	2015
9	372		60			121	86	301		77	81		270	1368
10	470		272			324	235	160		201			222	1884
Average	307	-	115	154	287	318	142	462	259	115	364	385	260	264

Table 4-43 and Table 4-44 summarizes the results of the Manual-ID analysis of bat recordings for the selected nights (2 and 4), yielding a total of 7962 recordings across 13 SPs over two nights. Overall, the number of recordings identified through Manual-ID closely aligns with those identified through Auto-ID, with a difference of approximately 5%. However, in some instances, noise was misclassified as bat calls by one detector, widening the discrepancy. Ultimately, the total number of bat recordings identified through Manual-ID corresponds to 104.2% of the total results from Auto-ID for summer.

Table 4-43 Distribution of bat recordings across SPs by selected nights based on Auto-ID results in summer

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total
2	Auto ID	252		111	185	297	427	76	321	375	74	486	315	802	3721
4	Auto ID	247		91	238	225	459	185	897	295	134	412	502	233	3918
Total	Auto ID	499		202	423	522	886	261	1218	670	208	898	817	1035	7639

Table 4-44 Distribution of bat recordings across SPs by selected nights based on Manual-ID results in summer

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total
2	Manual ID	281		97	145	367	451	80	349	307	76	651	334	788	3926
4	Manual ID	265		93	244	252	479	186	939	303	147	365	550	213	4036
Total	Manual ID	546	-	190	389	619	930	266	1288	610	223	1016	884	1001	7962

The Auto-ID results from all nights show that the most common species recorded was Common Pipistrelle (*Pipistrellus pipistrellus*), accounting for 44.81% of all recordings (Table 4-45). When non-identified species are evenly distributed, this species still represents 68.15% of the total recordings. The second most common species was Lesser Noctule (*Nyctalus leisleri*) (LC), with 3.58% of all recordings, or 5.45% when non-identified species are evenly distributed.

The VU species, such as Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) (VU) and Giant Noctule (*Nyctalus lasiopterus*) (VU), were recorded.The software failed to identify more than 34.26% of the recordings.

When the Manual-ID species of the total 1,640 records were checked, some differences compared to the Auto-ID results (Table 4-46) were observed. In the Auto-ID results, the Common Pipistrelle (*Pipistrellus pipistrellus*) accounted for 66.37% of the recordings, whereas in the Manual-ID results, it accounted for 79.63%. This indicates that this species was identified more frequently by Manual-ID, suggesting more accurate identification of the most common bat species. In the Auto-ID results, Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) was the second most common with 3.21%, while in the Manual-ID results, it accounted for 7.68%. This shows that this species was identified more often by Manual-ID than by Auto-ID.

Table 4-45 Bat groups and species recorded during selected nights at each SP based on Auto-ID in summer

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total	Percent	Percent_2
Pipistrelloid	PIPPIP	LC	703		450	443	342	1929	590	3260	826	749	975	1359	738	12364	44.81%	68.15%
Pipistrelloid	HYPSAV	LC	309		31	54	12	43	12	20	5	16	22	16	15	555	2.01%	3.06%
Pipistrelloid	PIPNAT	LC	63		33	45	22	77	36	41	35	27	57	73	36	545	1.97%	3.00%
Pipistrelloid	MINSCH	VU	40		26	15	9	84	20	122	32	13	21	76	18	476	1.72%	2.62%
Pipistrelloid	PIPKUH	LC	73		33	32	54	62	16	61	16	23	29	27	19	445	1.61%	2.45%
Pipistrelloid	PIPPYG	LC	2		1	2	1	15	6	4	4	3	36	10	5	89	0.32%	0.49%
Nyctaloid	NYCLEI	LC	181		34	57	45	112	29	130	45	16	113	134	92	988	3.58%	5.45%
Nyctaloid	NYCNOC	LC	17		24	11	20	32	8	40	21	2	81	43	264	563	2.04%	3.10%
Nyctaloid	EPTSER	LC	47		28	17	15	47	43	48	46	32	71	23	18	435	1.58%	2.40%
Nyctaloid	VESMUR	LC	72		7	14	4	18	8	40	5	9	38	31	30	276	1.00%	1.52%
Nyctaloid	NYCLAS	VU	13		2	9	3	19	8	22	4	0	17	13	50	160	0.58%	0.88%
Tadarida	TADTEN	LC	27		4	4	41	39	19	24	59	12	59	48	13	349	1.26%	1.92%
Plecotus	PLESPE	NA	51		10	3	34	7	10	17	16	1	74	22	26	271	0.98%	1.49%
Myotis	MYOSPE	NA	25		15	32	17	44	1	16	16	26	93	153	52	490	1.78%	2.70%
Rhinolophus	RHIHIP	NT (E,M)	1		3	0	0	0	0	2	1	0	0	3	4	14	0.05%	0.08%
Rhinolophus	RHIFER	NT (E,M)	0		0	1	1	4	0	0	0	0	1	0	0	7	0.03%	0.04%
Rhinolophus	RHIEUR	VU (E,M)	0		0	0	0	1	0	0	0	0	0	0	0	1	0.00%	0.01%
Barbastella	BARBAR	VU (E)	18		2	8	4	13	2	8	10	6	9	22	12	114	0.41%	0.63%
-	NoID	-	1428		448	330	525	638	616	770	669	215	1582	1026	1206	9453	34.26%	
Total	-	-	3070	-	1151	1077	1149	3184	1424	4625	1810	1150	3278	3079	2598	27595	-	-

Table 4-46 Bat groups and species recorded during selected nights at each SP based on Manual ID in summer

Group	Species	IUCN	SP01	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total	Percent
Pipistrelloid	PIPPIP	LC	229	103	180	296	577	151	973	399	156	411	499	274	4248	53.35%
Pipistrelloid	PIPKUH/PIPNAT	-	50	24	47	21	62	28	36	27	18	31	49	18	411	5.14%
Pipistrelloid	MINSCH	VU	26	7	15	7	39	7	57	4	9	16	26	10	223	2.80%
Pipistrelloid	HYPSAV	LC	9	7	14	8	9	0	4	1	4	11	4	1	72	0.90%
Pipistrelloid	PIPPYG	LC	2	0	0	0	7	0	1	0	0	2	8	2	22	0.28%
Nyctaloid	NYCLEI	LC	154	27	75	115	142	29	111	78	18	122	143	53	1067	13.40%
Nyctaloid	NYCNOC	LC	4	1	1	7	9	0	2	0	0	9	8	577	618	7.76%
Nyctaloid	EPTSER	LC	19	15	20	14	30	32	43	33	5	99	33	21	364	4.57%
Nyctaloid	NYCLAS	VU	6	0	4	2	4	2	4	8	0	1	1	7	39	0.49%
Tadarida	TADTEN	LC	2	2	3	30	4	5	10	21	1	23	20	3	124	1.56%
Plecotus	PLESPE	NA	28	0	5	105	11	11	34	21	6	208	38	11	478	6.00%
Myotis	MYOSPE	NA	14	3	19	12	28	1	8	11	4	79	43	18	240	3.01%
Rhinolophus	RHIFER	NT (E,M)	1	0	0	0	1	0	2	3	1	2	2	1	13	0.16%
Rhinolophus	RHIHIP	NT (E,M)	0	1	0	0	0	0	0	0	0	0	1	3	5	0.06%
Rhinolophus	RHIBLA	VU (E)	0	0	1	0	2	0	1	0	0	1	0	0	5	0.06%
Rhinolophus	RHIEUR	VU (E,M)	0	0	0	0	1	0	0	0	0	0	0	0	1	0.01%
Barbastella	BARBAR	VU (E)	2	0	5	2	4	0	2	4	1	1	9	2	32	0.40%
Total	-	-	546	190	389	619	930	266	1288	610	223	1016	884	1001	7962	-

The bat activity during the hours of the night was analysed for *Pipistrelloid*, *Nyctaloid*, and *Tadarida* groups, as they are known to be high and middle altitude fliers[10], making them potential subjects to possible curtailment planning. Figure 4-5 illustrates the activity patterns of these selected species throughout the night during the summer season, spanning from 19:00 to 06:00.

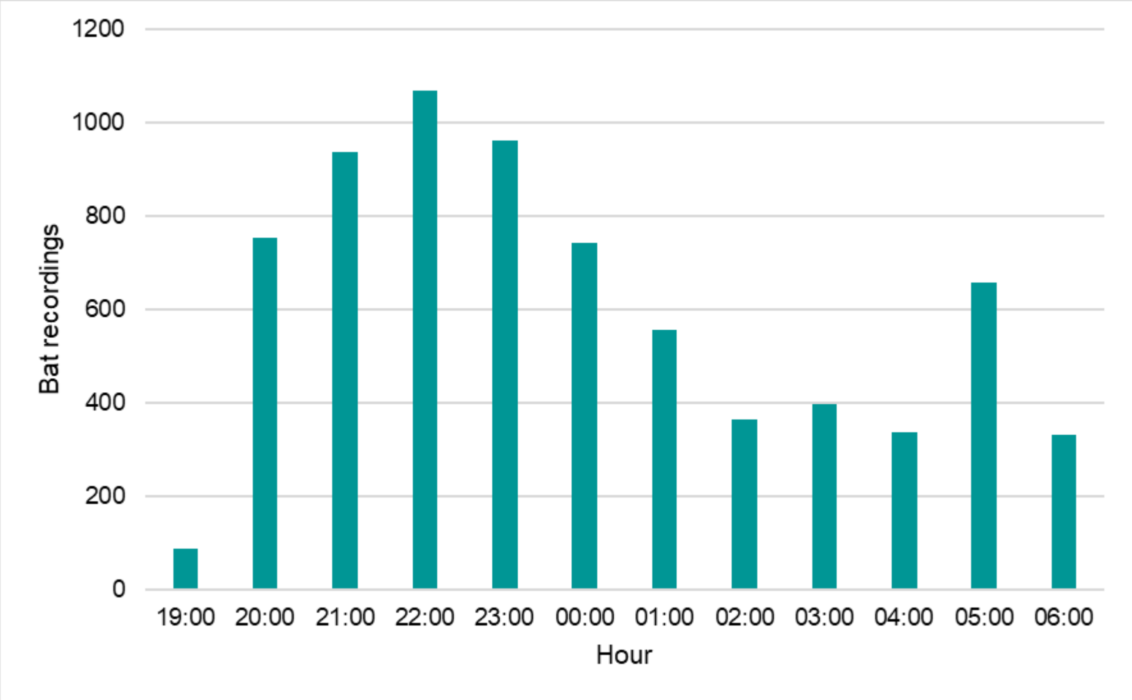

Figure 4-5 Hourly distribution of bat recordings through the night in summer

Autumn

Based on Auto-ID results, a total of 100,258 recordings were made. Of these, 24,042 recordings, or 23.99%, were identified as bat recordings in autumn. Noise accounted for the majority of the recordings, representing 76.01% of the total, with an average nightly noise percentage ranging from 50.30% to 89.57%. Nights 2, 3, 4, and 5 were selected for manual species identification. A summary is shown on Table 4-47.

Nights 2, 3, 4, and 5 were selected for manual species identification.

Table 4-47 Number of bat recordings and noise recorded each night based on Auto-ID in autumn

Night	Detectors	Bat	Noise	Total	Noise Ratio	Analysis
1	13	1588	3157	4745	66.53%	
2	13	3024	7751	10775	71.94%	Manual_ID
3	13	1170	1184	2354	50.30%	Manual_ID
4	13	1965	9618	11583	83.04%	Manual_ID
5	13	1689	10368	12057	85.99%	Manual_ID
6	13	2919	9471	12390	76.44%	
7	13	3725	8624	12349	69.84%	

[10] Rodrigues L., Bach L., Dubourg-Savage M.J., Karapandža B., Kovač D., Kervyn T., ... and Mindermann J. (2014). Guidelines for consideration of bats in wind farm projects, Revision 2014. EUROBATS Publication Series No. 6. Bonn: UNEP/EUROBATS Secretariat.

Night	Detectors	Bat	Noise	Total	Noise Ratio	Analysis
8	13	2176	6842	9018	75.87%	
9	13	2292	3988	6280	63.50%	
10	13	1122	1603	2725	58.83%	
11	13	877	3229	4106	78.64%	
12	13	493	4236	4729	89.57%	
13	13	736	5477	6213	88.15%	
14	13	266	668	934	71.52%	
Total	-	24042	76216	100258	76.02%	-

Table 4-48 presents the distribution of bat recordings across 13 SPs based on Auto-ID results in autumn. SP01 had the highest average recordings, accounting for 547, followed by SP11 and SP12. Night 7 recorded the highest bat activity, with 3,725 detections, which is 19.5 times the average. Failures of the recorders are indicated by blank cells in the table.

Table 4-48 Distribution of bat recordings across SPs by night based on Auto-ID results in autumn

Night	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total
1	0	0	0	0	0	0	0	0	354	152	541	541	0	1588
2	166	601	122	145	249	262	166	273	137	61	513	166	163	3024
3	155	33	58	43	108	97	49	155	63	31	217	122	39	1170
4	133	28	21	43	117	147	515	195	76	13	322	291	64	1965
5	249	41	149	67	142	133	54	86	99	26	279	304	60	1689
6	1300	39		127	113	79	189	60	305	78	386	94	149	2919
7	2020	21		81	45	76	270		242	87	438	370	75	3725
8	135	42		133	673	117	47		133	39	585	144	128	2176
9	842	77		402	127	233			5	37		387	182	2292
10	231	41		105	192	137				32		174	210	1122
11	243	59		108	195	134				55			83	877
12		56		104	174	69				10			80	493
13		64		206	161	80				17			208	736
14		16		105	4	82				22			37	266
Ave	547	86	88	128	177	127	184	154	157	47	410	259	114	191
Ave_cor	414	65	67	97	134	96	139	117	119	36	311	196	86	144

Table 4-49 and Table 4-50 summarizes the results of the Manual-ID analysis for the selected nights (2, 3, 4, and 5), yielding a total of 2,568 recordings across 13 SPs. This analysis closely aligns with Auto-ID results, which recorded 3,389 detections during the same nights. The overall difference between the two methods is approximately 5%, primarily due to occasional misclassification of noise as bat calls by Auto-ID. Manual-ID recordings correspond to 75.8% of the total Auto-ID results for autumn.

Table 4-49 Distribution of bat recordings across SPs by selected nights based on Auto-ID results in autumn

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total
2	Auto ID	0	0	122	0	0	0	0	0	0	0	0	0	0	122
3	Auto ID	0	0	58	0	0	0	0	0	63	31	217	122	0	491
4	Auto ID	133	28	0	43	117	147	515	195	76	13	322	291	64	1944
5	Auto ID	249	41	0	67	142	133	54	86	0	0	0	0	60	832
Total	Auto ID	382	69	180	110	259	280	569	281	139	44	539	413	124	3389

Table 4-50 Distribution of bat recordings across SPs by selected nights based on Manual-ID results in autumn

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total
2	Manual ID	0	0	114	0	0	0	0	0	0	0	0	0	0	114
3	Manual ID	0	0	43	0	0	0	0	0	62	30	201	118	0	454
4	Manual ID	141	13	0	43	111	133	46	136	66	12	313	118	64	1196
5	Manual ID	253	39	0	68	146	132	41	77	0	0	0	0	48	804
Total	Manual ID	394	52	157	111	257	265	87	213	128	42	514	236	112	2568

The Auto-ID analysis of all nights reveals that the most common species was Common Pipistrelle (*Pipistrellus pipistrellus*), accounting for 23.53% of the recordings, which increases to 49.29% when unidentified recordings are distributed evenly. The second most common species was Kuhl's Pipistrelle (*Pipistrellus kuhlii*), contributing 4.48% of the recordings, or 9.37% when unidentified recordings are evenly allocated. Notably, Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), classified as Vulnerable (VU) on the IUCN Red List, was recorded in 1.52% of total detections (3.18% when unidentified data is distributed). However, the software failed to identify 52.25% of the total recordings(Table 4-51)

When comparing the results of Manual-ID and Auto-ID, notable differences emerge in the identification of common bat species. For the Common Pipistrelle (*Pipistrellus pipistrellus*), Auto-ID attributed 23.53% of the recordings to this species, increasing to 49.29% when unidentified calls were distributed, while Manual-ID identified a slightly higher representation at 43.34%. For Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), a Vulnerable species, Auto-ID recorded 1.52% (3.18% with redistributed unidentified calls), whereas Manual-ID attributed 7.01% of the total recordings to this species, suggesting improved sensitivity for this conservation priority species through manual analysis. A significant discrepancy was observed for Lesser Noctule (*Nyctalus leisleri*), with Auto-ID identifying 4.14% of the recordings (8.68% with redistributed unidentified calls), compared to 29.32% from Manual-ID, indicating potential underestimation by Auto-ID (Table 4-52).

Table 4-51 Bat groups and species recorded during selected nights at each SP based on Auto-ID in autumn

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total	Percent	Percent_2
Pipistrelloid	PIPPIP	LC	511	98	185	547	483	491	125	229	588	300	1089	471	541	5658	23.53%	49.29%
Pipistrelloid	PIPKUH	LC	746	129	5	36	32	24	33	5	3	15	12	14	22	1076	4.48%	9.37%
Pipistrelloid	MINSCH	LC	12	7	1	20	13	40	12	75	47	19	60	40	19	365	1.52%	3.18%
Pipistrelloid	HYPSAV	VU	144	16	5	62	12	22	3	0	3	39	8	2	7	323	1.34%	2.81%
Pipistrelloid	PIPNAT	LC	18	6	4	10	17	11	3	9	17	13	14	23	16	161	0.67%	1.40%
Pipistrelloid	PIPPYG	LC	3	5	0	1	0	5	2	3	3	0	25	1	2	50	0.21%	0.44%
Nyctaloid	NYCLEI	LC	247	48	10	151	87	93	7	29	32	33	82	96	81	996	4.14%	8.68%
Nyctaloid	NYCNOC	LC	33	10	3	33	299	47	29	7	26	13	32	137	39	708	2.94%	6.17%
Nyctaloid	VESMUR	LC	107	13	0	63	38	30	3	5	12	7	41	18	32	369	1.53%	3.21%
Nyctaloid	NYCLAS	LC	14	13	3	37	31	18	3	11	7	5	17	35	44	238	0.99%	2.07%
Nyctaloid	EPTSER	VU	21	3	1	0	12	11	6	8	20	6	38	7	15	148	0.62%	1.29%
Tadarida	TADTEN	LC	31	25	8	48	45	87	8	16	61	19	173	64	102	687	2.86%	5.98%
Plecotus	PLESPE	NA	22	1	10	21	7	32	3	4	10	0	101	13	17	241	1.00%	2.10%
Myotis	MYOSPE	NA	10	10	0	17	27	28	11	6	12	4	23	20	43	211	0.88%	1.84%
Rhinolophus	RHIHIP	NT (E,M)	0	9	3	0	0	4	1	0	3	0	1	4	1	26	0.11%	0.23%
Rhinolophus	RHIFER	NT (E,M)	0	0	0	0	0	1	0	0	0	0	4	3	0	8	0.03%	0.07%
Rhinolophus	RHIEUR	VU (E,M)	1	0	0	0	0	0	0	0	0	0	1	0	0	2	0.01%	0.02%
Barbastella	BARBAR	VU (E)	77	5	2	17	17	15	2	7	3	1	11	23	32	212	0.88%	1.85%
-	NoID	-	3477	720	110	606	1180	687	1039	355	567	186	1549	1622	465	12563	52.25%	
Total	-	-	5474	1118	350	1669	2300	1646	1290	769	1414	660	3281	2593	1478	24042	-	-

Table 4-52 Bat groups and species recorded during selected nights at each SP based on Manual ID in autumn

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	SP08	SP09	SP10	SP11	SP12	SP13	Total	Percent
Pipistrelloid	PIPPIP	LC	144	10	96	43	118	125	38	64	44	20	270	100	41	1113	43.34%
Pipistrelloid	MINSCH	VU	5	3	2	5	1	22	8	77	23	0	19	8	7	180	7.01%
Pipistrelloid	PIPKUH/PIPNAT	-	8	7	6	4	12	7	5	11	4	1	8	12	12	97	3.78%
Pipistrelloid	HYPSAV	LC	7	0	5	2	4	2	0	0	0	1	0	0	0	21	0.82%
Pipistrelloid	PIPPYG	LC	0	1	0	0	0	1	0	0	1	0	2	0	0	5	0.19%
Nyctaloid	NYCLEI	LC	198	25	23	44	89	64	20	27	38	12	121	71	21	753	29.32%
Nyctaloid	EPTSER	LC	15	0	4	0	0	8	4	1	5	2	9	4	6	58	2.26%
Nyctaloid	NYCLAS	VU	2	0	1	3	6	2	2	7	3	0	8	5	2	41	1.60%
Nyctaloid	NYCNOC	LC	2	0	2	0	0	5	0	0	0	0	3	0	0	12	0.47%
Tadarida	TADTEN	LC	9	2	3	3	9	2	2	11	6	1	49	10	2	109	4.24%
Plecotus	PLESPE	NA	0	1	0	0	0	5	0	3	0	0	3	2	1	15	0.58%
Myotis	MYOSPE	NA	1	0	6	3	16	11	4	9	3	3	17	15	15	103	4.01%
Rhinolophus	RHIFER	NT (E,M)	2	3	7	3	2	6	0	3	1	1	4	7	5	44	1.71%
Rhinolophus	RHIHIP	NT (E,M)	0	0	2	0	0	3	3	0	0	0	0	1	0	9	0.35%
Rhinolophus	RHIBLA	VU (E)	0	0	0	0	0	1	0	0	0	1	0	1	0	3	0.12%
Rhinolophus	RHIEUR	VU (E,M)	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.04%
Barbastella	BARBAR	VU (E)	0	0	0	1	0	1	1	0	0	0	1	0	0	4	0.16%
Total	-	-	394	52	157	111	257	265	87	213	128	42	514	236	112	2568	-

The bat activity during the hours of the night was analysed for *Pipistrelloid, Nyctaloid*, and *Tadarida* groups, as they are known to be high and middle altitude fliers (Rodrigues et al. 2014), making them potential subjects to possible curtailment planning. Figure 4-6 illustrates the activity patterns of these selected species throughout the night during the autumn season, spanning from 19:00 to 06:00.

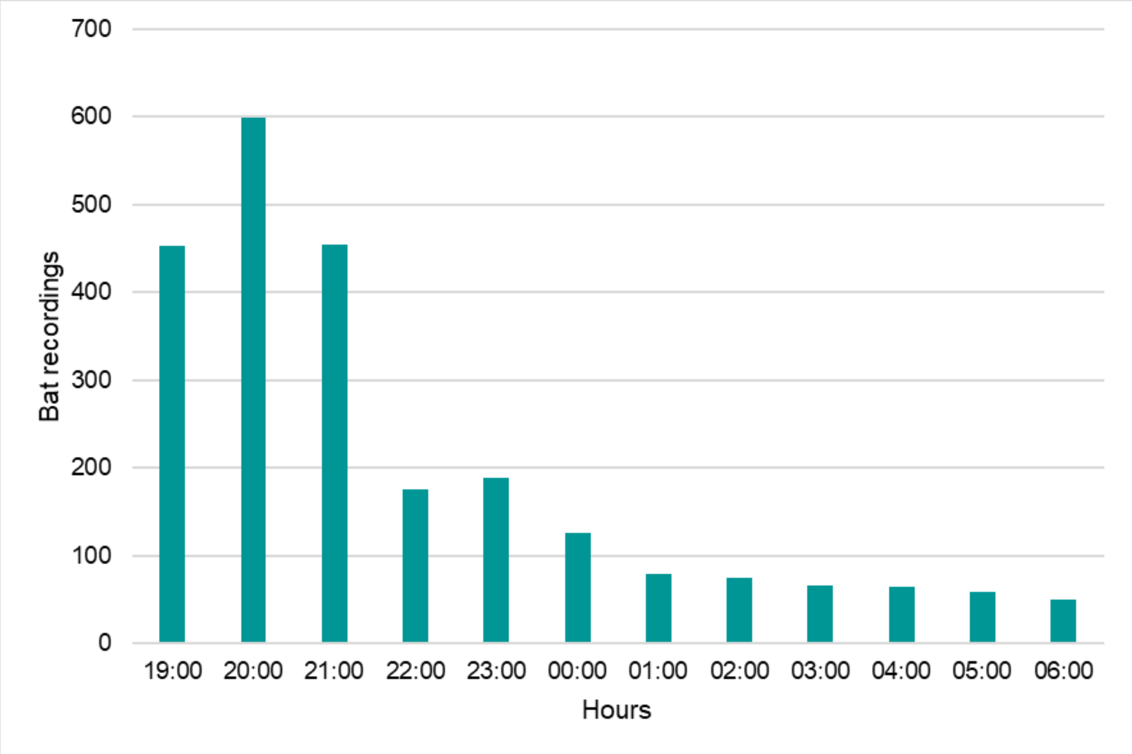

Figure 4-6 Bat groups and species recorded during the hours of the night in autumn

Transect Surveys

Based on transect surveys, a total of 3,554 recordings were made. 2,332 recordings, or 65.62% of the total, were identified as bat recordings in spring, summer, and autumn. Noise accounted for the remaining 1,222 recordings, constituting 34.38% of the total. The average nightly noise percentage varied between 27.68% and 49.26% (Table 4-53).

Table 4-53 Number of bat recordings and noise recorded each night during transect surveys

Date	Bat	Noise	Total	Noise Ratio
2024-05-25	250	144	394	36.55%
2024-06-02	431	170	601	28.29%
2024-09-04	528	250	778	32.13%
2024-09-05	512	196	708	27.68%
2024-10-11	310	301	611	49.26%
2024-10-12	301	161	462	34.85%
Total	2332	1222	3554	34.38%

The Auto-ID analysis of all mobile survey recordings indicates that the most common species was the Common Pipistrelle (*Pipistrellus pipistrellus*), accounting for 45.63% of the identified recordings and 62.30% when non-identified species are distributed evenly. Notably, the second most common species was the Noctule (*Nyctalus noctula*), comprising 16.81% of the recordings and 22.95% when adjusted for non-identified species. Despite these dominant species, a significant portion of the recordings (26.76%) remained unidentified, highlighting potential challenges in species recognition (Table 4-54).

Table 4-54 at groups and species recorded during mobile surveys based on Auto-ID results

Group	Species	IUCN	05_M1a	05_M1b	08_M1a	08_M1b	09_M1a	09_M1b	Total	Percent	Percent_2
Pipistrelloid	PIPPIP	LC	99	280	237	209	118	121	1064	45.63%	62.30%
Pipistrelloid	MINSCH	VU	3	3	9	14	4	6	39	1.67%	2.28%
Pipistrelloid	HYPSAV	LC	0	4	5	6	1	2	18	0.77%	1.05%
Pipistrelloid	PIPNAT	LC	0	2	1	4	3	3	13	0.56%	0.76%
Pipistrelloid	PIPKUH	LC	0	1	1	2	0	2	6	0.26%	0.35%
Pipistrelloid	PIPPYG	LC	0	0	0	0	1	1	2	0.09%	0.12%
Nyctaloid	NYCNOC	LC	65	51	128	103	28	17	392	16.81%	22.95%
Nyctaloid	NYCLEI	LC	10	12	15	19	12	20	88	3.77%	5.15%
Nyctaloid	VESMUR	LC	2	5	1	2	5	10	25	1.07%	1.46%
Nyctaloid	EPTSER	LC	1	4	1	4	5	4	19	0.81%	1.11%
Nyctaloid	NYCLAS	VU	0	3	1	0	6	2	12	0.51%	0.70%
Tadarida	TADTEN	LC	0	1	3	1	6	5	16	0.69%	0.94%
Plecotus	PLESPE	NA	0	0	1	1	1	6	9	0.39%	0.53%
Myotis	MYOSPE	NA	0	3	1	1	0	0	5	0.21%	0.29%
-	NoID	-	70	62	124	146	120	102	624	26.76%	
Total	-	-	250	431	528	512	310	301	2332	-	-

When checking the manual identification of 1,782 total records, notable differences emerge compared to the Auto-ID results. The Common Pipistrelle (*Pipistrellus pipistrellus*) remains the most abundant species in both analyses but is recorded more frequently in the manual ID (72.73%) compared to the Auto-ID (45.63%), suggesting a potential underestimation by the Auto-ID. Conversely, the Noctule (*Nyctalus noctula*), which was the second most common species in the Auto-ID (16.81%), accounts for a much lower proportion in the manual ID (0.79%), indicating a potential overestimation by the Auto-ID. Additionally, *Plecotus* species were identified more frequently in the manual ID (5.56%) than in the Auto-ID (0.39%), highlighting the manual method's higher sensitivity to less common or harder-to-identify species Table 4-55).

Table 4-55 Bat groups and species recorded during mobile surveys based on Manual ID results

Group	Species	IUCN	06_M1a	06_M1b	08_M1a	08_M1b	09_M1a	09_M1b	Total	Percent
Pipistrelloid	PIPPIP	LC	106	298	302	288	149	153	1296	72.73%
Pipistrelloid	MINSCH	VU	3	3	15	16	3	5	45	2.53%
Pipistrelloid	PIPKUH/PIPNAT	-	0	0	2	8	11	12	33	1.85%
Pipistrelloid	HYPSAV	LC	0	2	0	2	1	2	7	0.39%
Nyctaloid	NYCLEI	LC	3	23	27	32	33	50	168	9.43%

Group	Species	IUCN	06_M1a	06_M1b	08_M1a	08_M1b	09_M1a	09_M1b	Total	Percent
Nyctaloid	EPTSER	LC	0	11	11	12	2	16	52	2.92%
Nyctaloid	NYCLAS	VU	0	1	6	3	4	2	16	0.90%
Nyctaloid	NYCNOC	LC	1	0	2	2	7	2	14	0.79%
Tadarida	TADTEN	LC	0	0	0	1	13	13	27	1.52%
Plecotus	PLESPE	NA	0	0	1	2	29	67	99	5.56%
Myotis	MYOSPE	NA	1	14	2	5	0	2	24	1.35%
Barbastella	BARBAR	VU (E)	0	0	1	0	0	0	1	0.06%
Total	-	-	114	352	369	371	252	324	1782	-

Heat maps are currently available exclusively for the summer and autumn seasons, as no tracks were recorded during the spring mobile surveys. Without these tracks, proper data for a comprehensive analysis is lacking (Figure 4-7).

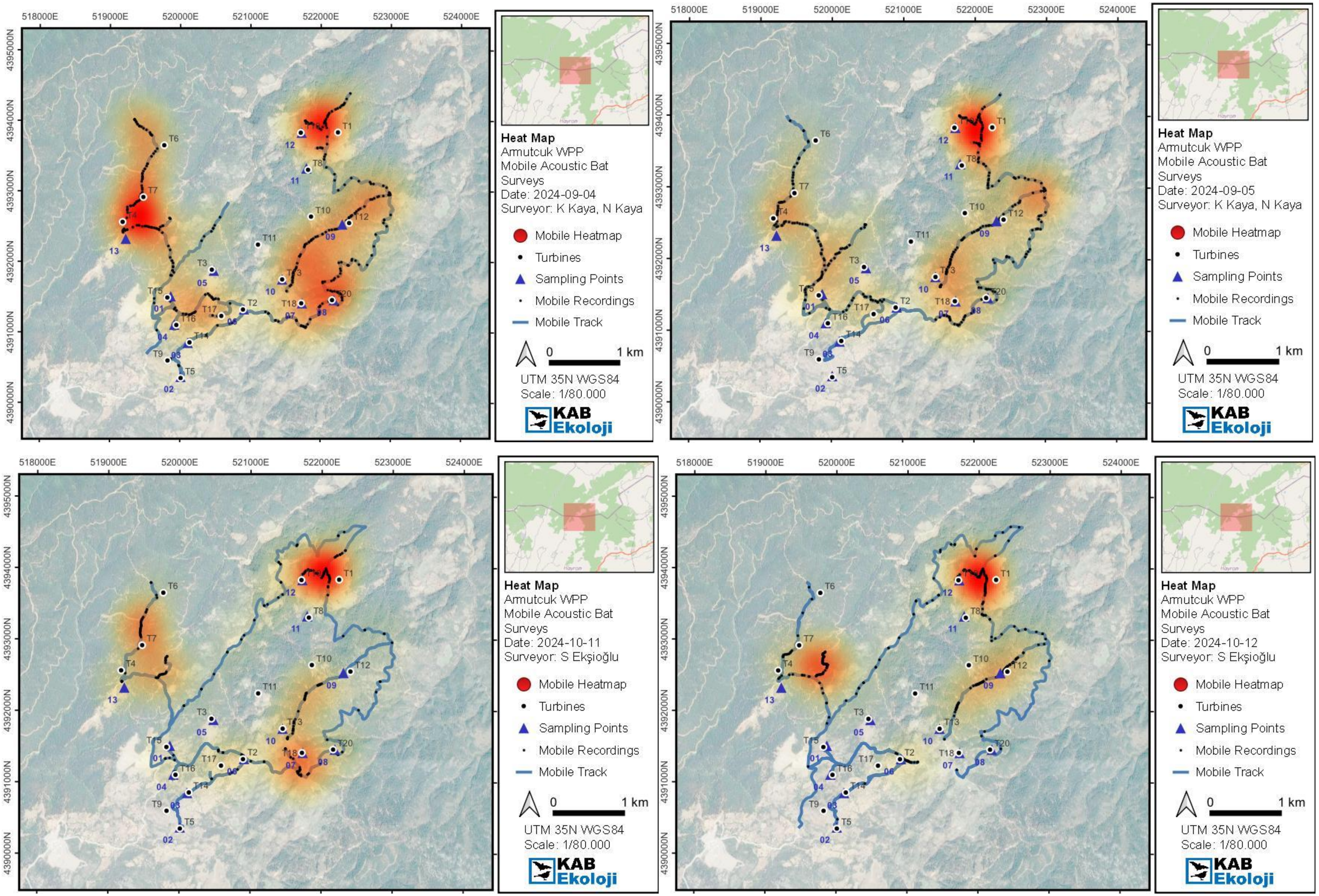

Figure 4-7 Heat maps from transect surveys

5 Discussion

5.1 Flora

- As a result of the field study, a total of 2 regional endemic (*Digitalis trojana* and *Cirsium balikesirense*) and 1 rare distribution but not endemic (*Cyclamen hederifolium)* plant species were identified.
- The seed of *Digitalis trojana* and *Cirsium balikesirense* are collected and delivered to Ankara Seed-Gen Bank.
- *Cyclamen hederifolium* is a species that is difficult to produce from seed and is usually protected by translocation. Since direct habitat loss will not occur due to Project footprint, translocation was not carried out. However, it is recommended to continue monitoring the population due to dust impact. The population of the species is in good condition in the areas where it is distributed in the region.
- The plant species have been recorded in areas such as turbine locations and site roads. Due to habitat similarities, their presence in the access road and ETL areas is also considered likely, despite the absence of direct observations.

5.2 Terrestrial Mammal

- The sensitivity of the terrestrial fauna within the project area, as assessed in the ESIA, has been categorized as low. Given the mitigation measures outlined in the ESIA, no significant impacts are expected on terrestrial fauna due to the project operational activities. Additionally, the monitoring schedule proposed in BMP will enable the assessment of long-term effects on terrestrial fauna during the operational phase. This monitoring framework will allow for the identification and addressing of any potential ecological disturbances over time. Based on the current evaluation and mitigation strategies, the project is not expected to cause any lasting or significant impact on the terrestrial mammal.
- One mammal species that may potentially be found in the area and are classified as VU (Vulnerable) by the IUCN, namely *Vormela peregusna*, *Capreolus capreolus,* is one of the important mammal species. Although its status is Least Concern, this species is considered to have national importance. These two species have been recorded as literature.
- *Ursus arctos* is Least Concern (LC) globally and in Europe, but Vulnerable in the Mediterranean. During the field studies, local residents were provided with information regarding brown bear sightings and reported incidents of bear attacks to enhance their awareness and preparedness. Brown bear has been recorded as literature data. Regarding the identified bear individual, the BMP should be updated to include additional recommendations to enhance worker safety. Furthermore, appropriate measures must be implemented to mitigate potential human-wildlife conflicts associated with this species.
- The monitoring period and frequency for the mammal species: should be conducted annually during the operational phase, specifically for 10 days each in April, May, and June.

5.3 Herpetofauna

- The sensitivity of the herpetofauna, as determined in the ESIA, has been classified as low. With the implementation of the impact mitigation measures outlined in the ESIA, the significance of potential impacts on herpetofauna is considered negligible.

Monitoring schedule provided in the BMP will facilitate the assessment of long-term effects on herpetofauna during the operational phase. Based on the available data and the mitigation measures in place, no significant or lasting impacts on herpetofauna are anticipated because of the project.

- Among the reptiles identified in the project area and its surroundings, ıt is recommended to relocate the species *Testudo graeca*, which was detected in the field, Additionally, if the species is identified within the project area, translocation (relocation) efforts should be carried out.
- The ESIA demonstrates that the impacts on herpetofauna are expected to be minor. Moreover, the implementation of the BMP actions will be sufficient to address and mitigate any potential effects.

5.4 Bird

For spring VP surveys, an average of 33 hours has been spent at three vantage points for bird surveys. A total of 34 birds were counted during the observations, comprising 2 migrant birds and 32 resident birds. Among these observed birds, 29 passed through the risk zone of the wind farm. The collision risk modelling for spring indicated a rate of 0.16 for resident birds.

During the spring surveys, only approximately 33 hours of observation was completed, which is less than the 36 hours recommended by NatureScot for a single season. Several factors contributed to this situation. Firstly, the access roads had very bad conditions. Although the team allocated sufficient days to cover the targeted survey hours, they faced significant challenges. The roads were not ready at the time of the surveys, requiring the vehicle to cross rivers to reach the identified vantage points. Consequently, the team could only conduct surveys in the afternoons. Secondly, the forest cover and topography were difficult. On the first two days, the team had to spend time looking for more appropriate locations for vantage points as those identified using Geographical Information System software were not suitable for full visual coverage. Third, the weather conditions are harsher at the site. The Project is located near the mountainous regions of the Kaz Mountains which can present harsh weather conditions well into June-July. Even on July 4, the team had to abandon the survey locations due to severe rain and gale storms. On the other hand, an average of 33 and 65 hours has been spent at three vantage points for bird surveys in summer, with additional survey hours, and autumn surveys respectively.

The reduced survey hours for the period between April and May at Armutçuk project is not expected to have any significant impact both to our understanding of migrant and resident soaring bird populations. The location is known to be sufficiently distanced from the major migration paths for migratory soaring species. This is confirmed by the low number of migratory bird species reported during the surveys and low migratory rates.

For summer VP surveys, an average of 65 hours has been spent at three vantage points for bird surveys. A total of 193 birds were counted during the observations, all resident birds. Among these observed birds, 91 passed through the risk zone of the wind farm. The collision risk modelling for summer indicated 0.21 collisions for resident birds.

For autumn VP surveys, an average of 40 hours has been spent at three vantage points for bird surveys. A total of 71 birds were counted during the observations, comprising 29 migrant birds and 30 resident birds. Autumn migration rate at 0.72 birds/hr indicates low-moderate migrant activity for the project in autumn. Among these observed birds, 45 passed through the risk zone of the wind farm. The collision risk modelling for autumn indicated a rate of 0.19 and 0.08 collisions for migrant and resident birds, respectively.

The Project is located on the mountains where spring tends to arrive later, and the breeding activity starts later. Spring season might be regarded as lasting to 30 June. The project is situated within an extensive forest landscape, which likely contains some raptor nests. Detecting these nests is extremely difficult from the ground level, and some raptor species might be breeding within or near the area.

Though not KBA triggers, raptor species of Kaz Mountains region include the Golden Eagle (*Aquila chrysaetos*) and the Short-toed Snake Eagle (*Circaetus gallicus*). Golden Eagles were not detected during turbine VP surveys, or breeding bird surveys, but one resident individual was detected during ETL monitoring in September. Historical KBA inventory or EBBA does not necessarily help clarify a possible nest location within the AoI. eBird records additionally confirm presence of the species within the AoI in April, but a breeding code is not available. Other species such as the Booted Eagle (*Hieraaetus pennatus*) and European Honey-buzzard (*Pernis apivorus*) which is also a KBA trigger, were observed, but no evidence of breeding has been found so far, likely due to the forest cover hinderance. Both species are common and widespread and may potentially breed at or near the Project. It is important to understand that those two species are certainly not restricted to Kaz Mountains and are known to be found in wide variety of landscapes.

The other KBA species, Kruper's Nuthatch, was recorded during breeding bird surveys as possibly breeding. Krüper's Nuthatch (*Sitta krueperi)* is a species restricted to the coniferous forests of Turkey, with the highest densities found in western regions where Turkish (Calabrian) Pine (Pinus brutia) dominates. The species especially favors stands with older trees. While it is adaptable in its nesting habits—frequently using nest boxes and human-made structures such as roofs, shelters, and poles—the removal of trees, especially older individuals, may negatively affect some individuals and possibly local sub-populations. In the project, G4.B Mixed mediterranean pine - thermophilous oak woodland is suitable breeding habitat for the species, of which about 12.35 ha was lost according to the habitat loss calculations provided in Section 4.1.2, majority (over 95%) of which was sustained due to ETL construction. Since this is a KBA trigger species, mitigation options were provided under Section 5.6 of this report.

The surveys recorded no globally threatened soaring bird species, with the Common Buzzard (Buteo buteo), Short-toed Snake-Eagle (*Circaetus gallicus*), and Eurasian Sparrowhawk (Accipiter nisus) being the most frequently observed species. The verbal communication with national experts (Ornithologist Özmen Yeltekin and Ornithologist Ornithologist Cansu Özcan) indicates that there are no globally threatened Eastern Imperial Eagle breeding near the site.

During VP ETL surveys, all the observed species are classified as Least Concern (LC). Common Buzzard was observed more frequently at risk height. Bird observations along the ETL indicate that bird passages are relatively evenly distributed along the transmission line route and generally passage frequency. However, higher activity levels of European Honey-buzzard which is a KBA trigger species for Kaz Mountains KBA was observed. Activity was even across the ETL length which led to moderate risk classification.

During the breeding bird surveys, all the observed species are classified as Least Concern (LC) and are both common and widespread. The only globally threatened species recorded was the European Turtle Dove (*Streptopelia turtur*). Despite its conservation status, this species is widespread in Turkey and is known for its fast, low flight, reducing its risk of turbine collisions. This is further supported by carcass search data from Turkey.

Additive Collision Risk Assessment (Project Galeforce)

Additive collision risk evaluation for Project Galeforce established from the 2024 baseline collection estimated the yearly total target species collision risk at 14 birds for the study period (spring, summer, autumn). The results indicate that about 11% of the collision risk was driven by migrant activity, while 80% of migrant collision risk was attributed to autumn period movement as opposed to spring migration. This finding is congruent with literature information regarding spring and autumn movement across Anatolia. Whereas spring movement occurs in a more concentrated manner spatially and temporally, autumn movement is usually more dispersed both over autumn period and geographically.

Interestingly, due to the correlation with autumn migrant activity, the project which accounted for the most estimated migrant risk was Uygar, followed by a three-way tie between Armutçuk, Ihlamur and Kestanederesi. Due to the massive area that over which Uygar spreads, its higher proportion in total migrant risk makes sense. Harmancık receiving little migratory activity and accounting for low risk this year was the least expected result, however Harmancık is indeed distinct in the sense that it is the only project where the percentage of migrant risk overall is approximately 50%, while others are lower, meaning risk at Harmancık is more so driven by migrants than any other project. This is significant due to the year-on-year variations in migratory rates over minor routes, which are not as consistently active each year as the major routes are, however can exhibit bursts of activity over some years. This is one of the reasons long-term monitoring datasets are crucial.

For residents, approximately half of the collision risk is attributed to summer season while spring and autumn are more or less equivalent. In terms of species, Common Buzzard, Short-toed Snake Eagle and Eurasian Kestrel, which are common, abundant, breeding raptors, topped the collision risk estimations and accounted for approximately 65% of the estimated risk for residents. These species are expected to continue to be active post-construction due to the habituation effect, and many of the projects providing adequate habitat for feeding and opportunities for perching. Additionally, Eleanora’s Falcon activity will continue to be associated with late-summer and autumn passerine migration movement, since their breeding activity is reliant on the food source represented by migrant passerines in autumn. The species is also an indirect indicator of passerine migration at each project and wherever they are active can be assumed to be significant fly-over and/or rest habitats for songbirds.

Two further considerations are pertinent for the additive collision risk evaluation. (1) Regarding substitution of data for Hacıhıdırlar, if summer and autumn are assumed homogenous with spring, the overall results are not altered much. However, if resident bird species are relatively more active over the summer, or if autumn migratory movement is similarly moderate like with some other projects, this has the potential to have a medium level of influence on the overall picture which is the more likely case. Operation phase monitoring and management may require a more pro-active approach due to baseline data gaps. Scheduling additional baseline collection study, while ensuring its smooth implementation ahead of construction is another option.

The second consideration is that (2) the baseline does not account for winter activity. As previously mentioned, target species activity in the WPP airspaces are generally expected to be diminished, though not non-existent. For some projects near important wetlands, such as Akköy and Ihlamur, wintering waterbird and wetland associating raptor activity might be a concern and these are discussed in respective final baseline reports. If winter activity is factored in as about the same as overall spring collision risk (which would indicate the maximum expected risk level), overall target species mortality for Project Galeforce would be contained within the range of 14-17 birds annually.

5.5 Bat

The methodology was applied effectively, and the results appear reliable. The survey confirmed that the equipment was deployed successfully, and recordings were completed across all seasons. The NatureScot methodology demonstrated that the 10-day monitoring period is effective. Drastic changes in bat call recordings across days highlighted significant fluctuations in bat activity. However, there were some issues with the detectors. During the spring survey, 11 out of 13 detectors were functional during the final days of the study. In the summer survey, 7 out of 13 detectors were operational, while in the autumn survey, 6 out of 13 detectors functioned properly until the end of the monitoring period.

During the analyses, it was observed that some recorders failed and stopped recording on certain nights. For instance, while the detector may have failed on nights 3 or 4, recordings were successfully made on night 5, indicating that the problem was not consistent or related to external factors such as battery life or fieldwork mishandling.

The highest bat activity area was identified as near SP1, corresponding to T15, which was highly active with P.pipistrellus and N. leisleri in autumn. Additionally, high levels of bat activity were exhibited by the eastern cluster near SP8 and SP9, representing turbines T10, T12 and T20 in spring and summer, again primarily of P. pipistrellus activity.

In Turkey, assessing the risk level of a wind turbine is challenging due to the lack of comprehensive datasets and analytical ecological studies on bat population sizes. Based on ground static acoustic monitoring methodology, an indirect measure of activity levels is obtained in terms of recording numbers per unit time, which is not equivalent to number of individuals, yet is still a useful measure for gauging relative activity. The activity level, on average, is in the range of 100-200 recordings / night / turbine for the Project in the spring season, 200-300 recordings / night / turbine in summer, and 200-300 recordings / night / turbine in autumn. At the maximum, SP1 (as T15) in autumn had up to 2000 recordings per night (on night 7).

The most common species recorded as were Common Pipistrelle (*Pipistrellus pipistrellus*), the most widespread and abundant bat species in Europe and much of Turkey. This species accounted for 20–60% of all recordings. The second most recorded species was Lesser Noctule (*Nyctalus leisleri*), accounted for 5–10% of all recordings.

Schreiber’s Bent-Winged Bat (*Miniopterus schreibersii*), a vulnerable species requiring conservation attention, were recorded at the project site. Approximately 2–4% of the bats were identified as *M. schreibersii*. Another globally threatened species, the Giant Noctule (*Nyctalus lasiopterus*), was also recorded. It inhabits forest habitats, is classified as vulnerable, and is naturally found in lower numbers. Despite its lower abundance, its presence is significant, and further studies are recommended.

With respect to Kaz Mountains KBA, Mehely's Horseshoe Bat, which is a trigger species, was not identified during the ground static acoustic bat studies. The identification of the Mehely’s Horseshoe bat can be a challenge due to overlapping ranges with other Rhinolophus species occur together with this species which requires careful examination. The reference table used by the acoustic experts, which was one of the criteria that was considered (e.g. frequency closer to 108–110 kHz, for Mehely’s, closer to 110–115 kHz, for Lesser horseshoe bat, 97–105 kHz for Mediterranean horseshoe), as well sample spectrograms for Lesser Horseshoe and Mediterranean horseshoe are provided (However, neither manual nor auto identification of acoustic data is sufficient to effectively rule out the species. A very detailed study over the acoustic data is needed which is not certain to rule out the species anyway. The Consultant’s specialist’s opinion is that due to presence of the Lesser horseshoe and due to the project’s location within Mehely’s range and distribution, the species presence is still possible despite absence of acoustic evidence. Morphological evidence from photography or mist netting, or genetic evidence would be needed, which were beyond the scope of 2024 bat baseline methodologies presented in the present report.

Table 5-1, **Figure 5-1**).

However, neither manual nor auto identification of acoustic data is sufficient to effectively rule out the species. A very detailed study over the acoustic data is needed which is not certain to rule out the species anyway. The Consultant's specialist's opinion is that due to presence of the Lesser horseshoe and due to the project's location within Mehely's range and distribution, the species presence is still possible despite absence of acoustic evidence. Morphological evidence from photography or mist netting, or genetic evidence would be needed, which were beyond the scope of 2024 bat baseline methodologies presented in the present report.

Table 5-1: Reference acoustic identification information for possible Rhinolophus species

Species	Peak Frequency (FmaxE, kHz)	Overlap with Others
Rhinolophus mehelyi (Mehely's)	105–115 kHz	Overlaps with R. hipposideros (108–115 kHz) and slightly with R. euryale (~105 kHz)
Rhinolophus hipposideros (Lesser)	108–115 kHz	Overlaps with R. mehelyi in the 108–115 kHz range
Rhinolophus euryale (Mediterranean)	97–105 kHz	Overlaps slightly with R. mehelyi around 105 kHz
Rhinolophus blasii (Blasius)	92–98 kHz	Overlaps slightly with R. euryale (~97 kHz)

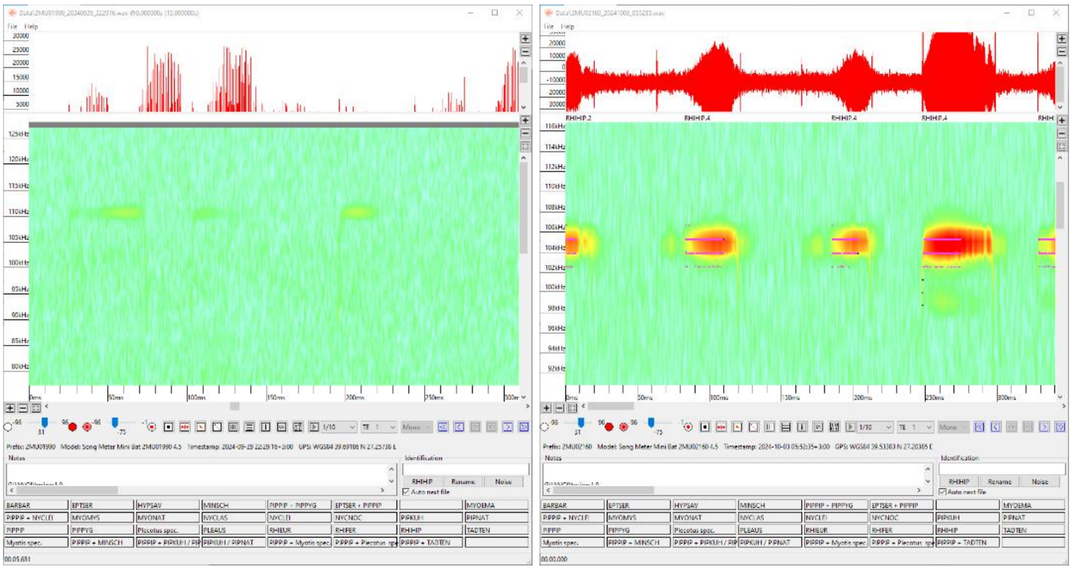

Figure 5-1: Sample spectrograms of Lesser horseshoe bat (left) and Mediterranean horseshoe bat (right).

Similarly, manual acoustic identification of Myotis species from acoustics alone is very complex, time intensive and a process which, vast majority of the time, does not yield robust species identifications anyway. For some recordings, the genus can be narrowed down to 2-3 species. Therefore, Myotis capaccinii which is the other KBA trigger species remains a possibility for the project based on Myotis presence and the species being known to occur in this region. Other sources of evidence as detailed for Mehely's above is needed for reliable Myotis identifications.

To provide additional information, auto-id results are provided on Table 5.2. Note that in the same recording, more than one Myotis species can be found. Auto-id may have skipped the "second" species and only identified the first or the most dominant. The species list is only provided for a list of potential Myotis species. This species list does not effectively rule out Myotis capaccinii in the absence of targeted methodologies. Note presence of species which is highly similar to M. capaccinii in acoustic signature such as M. daubentonii. Myotis capaccinii closely associates with lentic or slow-moving freshwater systems to capture invertebrates for food, which is a habitat type that was not designated for the project. The species could occur here as a short to mid-range migrant, however since suitable caves were not indicated for the project either, the species would not be expected in any significant concentrations.

Table 5.2: Total recordings with Myotis species from all nights and devices each season detected with auto-id.

Spring		Summer		Autumn	
Species	Recording#	Species	Recording#	Species	Recording#
MYOBEC	15	MYOBEC	27	MYOBEC	22
MYOBRA	12	MYOBRA	22	MYOBRA	5
MYODAU	69	MYODAU	251	MYODAU	93
MYOEMA	13	MYOEMA	17	MYOEMA	6
MYOMYO	52	MYOMYO	100	MYOMYO	51
MYOMYS	5	MYOMYS	4	MYOMYS	3
MYONAT	23	MYONAT	69	MYONAT	31

In terms of activity patterns, most bats were active during the first half of the night, between 21:00 and 01:00. This suggests that any turbine curtailment should focus on this timeframe. The presence of *Miniopterus schreibersii* suggest the existence of caves in the area, while *Nyctalus noctula* indicates old-growth forest habitats with cavity-bearing trees. Both features are crucial for bat conservation.

5.6 Monitoring and Mitigation Implications

The implications for additional project monitoring and mitigation measures based on final results are summarised below:

- Flora: The monitoring actions outlined in the BMP should be implemented, and the current status should be presented and evaluated in progress reports.
- Habitats: All natural habitats, including access roads and ETL areas should be monitored for disturbances, with BMP actions implemented and progress evaluated in reports.
- Bird species: No additional monitoring and mitigation implications than for which commitments have already been established are indicated for bird species based on baseline results.
    - Operation phase VP and breeding bird / raptor monitoring, collision risk estimates, post-construction fatality monitoring will further inform adaptive management.
    - Resident raptor nesting, disturbance to breeding activity and nest success will be a key concern during operation phase due to KBA triggers and other noteworthy species. The project should develop and implement a robust breeding raptor monitoring methodology which can identify and track nests, determine if nesting raptors are adversely impacted, satellite-tag and track juveniles to determine WPP airspace utilization, if needed. This includes measures to safeguard European Honey-buzzard across the ETL length.
    - Construction activities, mainly ETL route, results in a 12.35 ha area loss of G4.B Mixed mediterranean pine - thermophilous oak woodland habitat which is suitable breeding habitat for Kruper Nuthatch, which is a KBA trigger and an Anatolia restricted bird species. The Project Company could (1) preserve any mature *Pinus brutia* for the breeding of the species, and (2) install nest boxes since the species is adaptable in nesting activity and readily utilizes correctly designed nest boxes when available.

- Bats:
    - Confirmation of presence or absence of the two KBA triggers, *Rhinolophus mehelyi* and *Myotis capaccinii,* based on methodologies which can identify these species is recommended moving forward as 2024 results show these species may possibly occur at the project.
    - Notable activity of high-flyer *Pipistrellus pipistrellus* near SP1, SP8 and SP9 (T10, T12, T15, T20) suggests the forest at the eastern cluster (Ts 12, 12, 13, 18 and 20) and T15 are favoured by woodland bat species. Increased device coverage at these turbine locations (covering turbine zero locations of T10 and T11) may be useful in further pinpointing activity patterns. This information should be leveraged to pinpoint the *when*, *how* and *why* of increased activity, especially of threatened species, which would enable finetuning of the turbine curtailment program since the highly active species are also under protection, collision prone and threatened.
- Fauna: The monitoring actions outlined in the BMP should be implemented, with progress reports evaluating the status vulnerable mammal species and national importance.
- Herpetofauna: The monitoring actions outlined in the BMP should be implemented, with progress reports evaluating the status of *Testudo graeca*, a potentially present vulnerable reptile species.

6 Appendix

6.1 Literature for Flora Surveys

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6.6 Bird Survey Conditions

Spring

Date	Surveyor	VP	Cloud %	WindDir	WindSp (m/s)	Prec(mm)	Temp (°)	Vis (km)
14/04	MÜ	VP1	30	NE	7	0	21	10
15/04	YÖG	VP3	0	NE	3	0	22	10
15/04	MÜ	VP1	0	E	1	0	21	20
15/04	NY	VP2	0	NE	2	0	23	10
19/05	MÜ	VP1	80	N	2	-	26	15
19/05	YÖG	VP3	80	NE	1	-	20	7
19/05	NY	VP2	80	N	2	3	25	15
20/05	MÜ	VP1	80	NE	5	-	22	20
20/05	YÖG	VP3	80	N	4	-	20	10
20/05	NY	VP2	80	N	4	3	21	10
24/06	NK	VP1	10	NE	12	0	30	2
24/06	KK	VP2	10	NE	12	0	30	3
25/06	NK	VP2	10	NE	17	0	29	5
25/06	KK	VP3	10	NE	17	0	29	4
26/06	NK	VP2	10	NE	21	0	27	5
26/06	KK	VP3	10	NE	21	0	27	4

Summer

Date	Surveyor	VP	Cloud %	WindDir	WindSp (m/s)	Prec(mm)	Temp (°)	Vis (km)
03/07	MÜ	VP1	30	W	5	-	31	20
03/07	YÖG	VP3	30	W	5	-	31	20
03/07	NY	VP2	30	W	5	2	31	20
04/07	YÖG, MÜ	VP3	90	N	1	2	20	10
04/07	NY	VP2	100	N	2	2	20	10
13/07	KK	VP3	10	NE	19	0	30	5
13/07	NK	VP1	10	NE	19	0	30	5
14/07	KK	VP2	10	NE	19	0	30	5
14/07	NK	VP3	10	NE	19	0	30	5
17/07	YÖG	VP3	20	NE	6	-	31	20
17/07	NY	VP2	30	NE	7	-	34	20
17/07	MÜ	VP1	10	NE	5	-	30	20
18/07	MÜ	VP1	0	NE	5	-	31	20
18/07	NY	VP2	0	NE	5	-	31	20
18/07	YÖG	VP3	0	NE	6	-	32	20
22/07	NK	VP2	10	NE	19	0	30	5
22/07	KK	VP3	10	NE	19	0	30	5
23/07	NK	VP2	10	NE	19	0	30	5
23/07	KK	VP3	10	NE	19	0	30	5
24/07	NK	VP1	10	NE	19	0	30	5
24/07	KK	VP2	10	NE	19	0	30	5
05/08	NK	VP2	10	NE	19	0	30	5
05/08	KK	VP3	10	NE	19	0	30	5

07/08	KK	VP1	10	NE	19	0	30	5
08/08	NK	VP1	10	NE	19	0	30	5
14/08	MÜ	VP1	0	NE	6	-	33	20
14/08	NY	VP2	0	N	4	-	31	20
14/08	YÖG	VP3	0	NE	5	-	31	20
15/08	MÜ	VP1	0	NE	9	-	32	20
15/08	NY	VP2	0	N	6	-	30	20
15/08	YÖG	VP3	0	N	6	-	30	20

Autumn

Date	Surveyor	VP	Cloud %	WindDir	WindSp (m/s)	Prec(mm)	Temp (°)	Vis (km)
08/09	MÜ	VP1	50	N	6	2	23	10
08/09	YÖG	VP3	70	N	6	2	22	10
08/09	NY	VP2	70	N	6	2	23	15
09/09	YÖG	VP3	30	NE	4	-	24	15
09/09	NY	VP2	30	NE	4	-	24	20
09/09	MÜ	VP1	30	NE	4	-	24	20
08/10	MÜ	VP1	0	NE	4	-	23	20
08/10	NY	VP2	0	E	4	-	25	20
08/10	YÖG	VP3	0	E	4	-	25	20
09/10	YÖG	VP3	50	SW	6	-	23	20
09/10	MÜ	VP1	40	SW	6	-	20	20
09/10	NY	VP2	50	SW	6	-	23	20
26/10	KK	VP2	50	NE	13	0	18	5
26/10	NK	VP3	60	NE	13	0	18	5
07/11	NK	VP1	80	NE	15	0	15	4
07/11	KK	VP2	100	NE	15	0	15	3
08/11	NK	VP2	30	NE	14	0	16	5
08/11	KK	VP3	30	NE	14	0	16	5

6.7 Bird Observation Data

Sample rows from the Project bird data table is provided. Total duration of flight is noted as Dur. The height intervals are below the rotor height (a), at rotor height (b) and above the rotor height (c). Spec* abbreviations follow first three letters of genus name and first two letters of species name convention (for example, *Cirga denotes* and *Circaetus gallicus*)

Spring

Date	VP	Time	Spec*	Number	Dur (sec)	Flight_Height	Behaviour	Status
14/04	VP1	16:53	Falti	1	15	a-------------------	patrolling	Resident
15/04	VP3	12:26	Butbu	2	15	a-------------------	soaring	Resident
15/04	VP1	16:54	Falti	2	30	bb------------------	patrolling	Resident
15/04	VP2	12:09	Falti	1	120	bbbbbbbb------------	other	Resident
15/04	VP2	12:13	Butbu	1	60	bbba----------------	patrolling	Resident
15/04	VP2	13:28	Butbu	1	120	cccccccc------------	patrolling	Resident
15/04	VP2	14:02	Accni	1	60	cccc----------------	migrating	Migrant
15/04	VP2	15:17	Butbu	1	180	bbbbccccbbbb--------	patrolling	Resident
15/04	VP2	16:04	Accni	1	120	cccccccc------------	migrating	Migrant
20/05	VP1	13:45	Cirga	1	45	ccb-----------------	soaring	Resident
19/05	VP3	13:47	Butbu	1	15	a-------------------	other	Resident
19/05	VP3	15:10	Cirga	1	15	b-------------------	soaring	Resident
19/05	VP2	11:58	Butbu	1	90	cccbbb--------------	patrolling	Resident
19/05	VP2	15:42	Falti	1	60	bbaa----------------	other	Resident
20/05	VP2	10:23	Butbu	2	90	bbbbbb--------------	patrolling	Resident
20/05	VP2	10:47	Butbu	1	60	ccbb----------------	patrolling	Resident
20/05	VP2	12:53	Cirga	1	90	cccccc--------------	other	Resident
20/05	VP2	15:27	Butbu	1	90	cccccc--------------	patrolling	Resident
24/06	VP1	09:51	Butbu	1	120	bbbbbbb-------------	hunting/foraging	Resident
24/06	VP2	10:46	Butbu	1	30	aa------------------	patrolling	Resident
24/06	VP2	11:28	Butbu	1	45	aab-----------------	patrolling	Resident
…								

Summer

Date	VP	Time	Spec*	Number	Dur (sec)	Flight_Height	Behaviour	Status
03/07	VP1	10:49	Butbu	1	15	b-------------------	patrolling	Resident
03/07	VP1	10:50	Falel	2	30	cc------------------	patrolling	Resident
03/07	VP1	11:14	Falel	1	150	cccccccccc----------	patrolling	Resident
03/07	VP1	11:17	Falel	3	15	c-------------------	patrolling	Resident
03/07	VP1	11:49	Butbu	1	15	b-------------------	soaring	Resident
03/07	VP3	10:08	Falel	2	15	b-------------------	hunting/foraging	Resident
03/07	VP3	10:33	Falel	23	300	cccccccccccccccccccc	hunting/foraging	Resident
03/07	VP3	10:48	Falel	1	15	a-------------------	hunting/foraging	Resident
03/07	VP3	11:51	Butbu	1	15	b-------------------	other	Resident
03/07	VP3	12:17	Butbu	1	30	ab------------------	other	Resident
03/07	VP3	13:20	Butbu	1	15	a-------------------	other	Resident
03/07	VP2	10:33	Butbu	1	60	bbbb----------------	patrolling	Resident
03/07	VP2	10:35	Falel	6	240	cccccccccccccccc----	hunting/foraging	Resident

03/07	VP2	10:35	Falel	3	240	bbbbbbbbbbbbbbbb----	hunting/foraging	Resident
03/07	VP2	10:42	Falel	4	300	cccccccccccccccccccc	hunting/foraging	Resident
03/07	VP2	10:51	Butbu	1	75	bbbbb---------------	patrolling	Resident
03/07	VP2	10:52	Falel	4	300	cccccccccccccccccccc	hunting/foraging	Resident
03/07	VP2	10:52	Falel	2	300	bbbbbbbbbbbbbbbbbbbb	hunting/foraging	Resident
03/07	VP2	11:04	Falel	6	240	cccccccccccccccc----	hunting/foraging	Resident
03/07	VP2	15:08	Butbu	1	60	bbbb----------------	patrolling	Resident
17/07	VP3	11:32	Perap	1	15	a-------------------	soaring	Resident
…								

Autumn

Date	VP	Time	Spec*	Number	Dur (sec)	Flight_Height	Behaviour	Status
08/09	VP1	10:05	Accni	1	30	ba------------------	patrolling	Resident
08/09	VP3	11:22	Accxx	1	15	c-------------------	soaring	U
08/09	VP3	11:27	Accni	1	60	cccc----------------	patrolling	Resident
08/09	VP3	11:48	Cirga	1	15	b-------------------	migrating	Migrant
08/09	VP3	12:01	Cirae	1	45	ccc-----------------	migrating	Migrant
08/09	VP3	14:07	Butbu	1	15	a-------------------	other	Resident
08/09	VP2	10:13	Accni	1	30	bb------------------	patrolling	U
09/09	VP2	10:17	Accni	1	30	bb------------------	patrolling	U
09/09	VP2	10:29	Butbu	1	90	cccccc--------------	patrolling	Resident
09/09	VP2	14:40	Cirga	1	45	ccc-----------------	migrating	Migrant
09/09	VP2	14:58	Butbu	1	60	cccc----------------	patrolling	Resident
09/09	VP2	16:10	Falsp	1	15	c-------------------	patrolling	U
09/09	VP1	15:31	Cirga	1	60	cccc----------------	soaring	U
08/10	VP1	10:49	Accni	1	45	aba-----------------	patrolling	U
08/10	VP1	13:04	Accxx	1	30	ba------------------	hunting/foraging	U
08/10	VP2	13:11	Accni	1	45	ccc-----------------	migrating	Migrant
08/10	VP2	14:21	Butbu	1	120	cccccccc------------	patrolling	Resident
08/10	VP2	14:42	Accni	1	45	bbb-----------------	patrolling	U
08/10	VP3	16:21	Perap	2	90	bccccc--------------	migrating	Migrant
08/10	VP3	16:23	Falsp	1	15	c-------------------	other	U
09/10	VP3	12:03	Butbu	1	15	b-------------------	other	Resident
…								

6.8 Collision Probability Calculation

Calculation of collision risk for bird passing through rotor area as in NatureScot (2010),

Only enter input parameters in blue

Parameters	Value	Unit
K: [1D or [3D] (0 or 1)	1	
NoBlades	3	
MaxChord	4,2	m
Pitch (degrees)	30	
Species	Common Buzzard	
BirdLength	0,58	m
Wingspan	1,37	m
F: Flapping (0) or gliding (+1)	1	
Bird speed	11,6	m/sec
RotorDiam	138	m
RotationPeriod	5,00	sec

Calculation of alpha and p(collision) as a function of radius

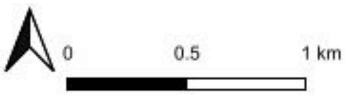
			Upwind:			Downwind:		
r/R	c/C	a	collide		contribution	collide		contribution
radius	chord	alpha	length	p(collision)	from radius r	length	p(collision)	from radius r
0,025	0,575	5,35	17,07	0,88	0,00110	14,65	0,76	0,00095
0,075	0,575	1,78	6,49	0,34	0,00252	4,08	0,21	0,00158
0,125	0,702	1,07	5,14	0,27	0,00332	2,19	0,11	0,00142
0,175	0,860	0,76	4,86	0,25	0,00440	1,25	0,06	0,00113
0,225	0,994	0,59	4,76	0,25	0,00554	0,58	0,03	0,00068
0,275	0,947	0,49	4,09	0,21	0,00581	0,74	0,04	0,00105
0,325	0,899	0,41	3,81	0,20	0,00640	1,12	0,06	0,00188
0,375	0,851	0,36	3,47	0,18	0,00673	1,26	0,07	0,00244
0,425	0,804	0,31	3,18	0,16	0,00700	1,34	0,07	0,00295
0,475	0,756	0,28	2,94	0,15	0,00721	1,39	0,07	0,00341
0,525	0,708	0,25	2,72	0,14	0,00738	1,41	0,07	0,00382
0,575	0,660	0,23	2,52	0,13	0,00750	1,40	0,07	0,00417
0,625	0,613	0,21	2,34	0,12	0,00756	1,38	0,07	0,00448
0,675	0,565	0,20	2,17	0,11	0,00757	1,35	0,07	0,00473
0,725	0,517	0,18	2,01	0,10	0,00753	1,31	0,07	0,00493
0,775	0,470	0,17	1,86	0,10	0,00744	1,27	0,07	0,00508
0,825	0,422	0,16	1,71	0,09	0,00730	1,21	0,06	0,00517
0,875	0,374	0,15	1,57	0,08	0,00710	1,15	0,06	0,00522
0,925	0,327	0,14	1,43	0,07	0,00685	1,09	0,06	0,00521
0,975	0,279	0,14	1,30	0,07	0,00655	1,02	0,05	0,00515
Overall p(collision) =				Up-wind	12,3%		Downwind	6,5%
				Average	9,4%			

6.9 Sample Field Recording Sheets

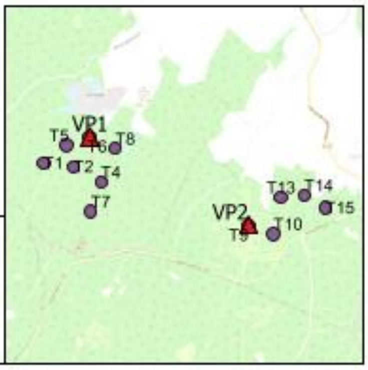
6.9.1 VP Map and Sheet

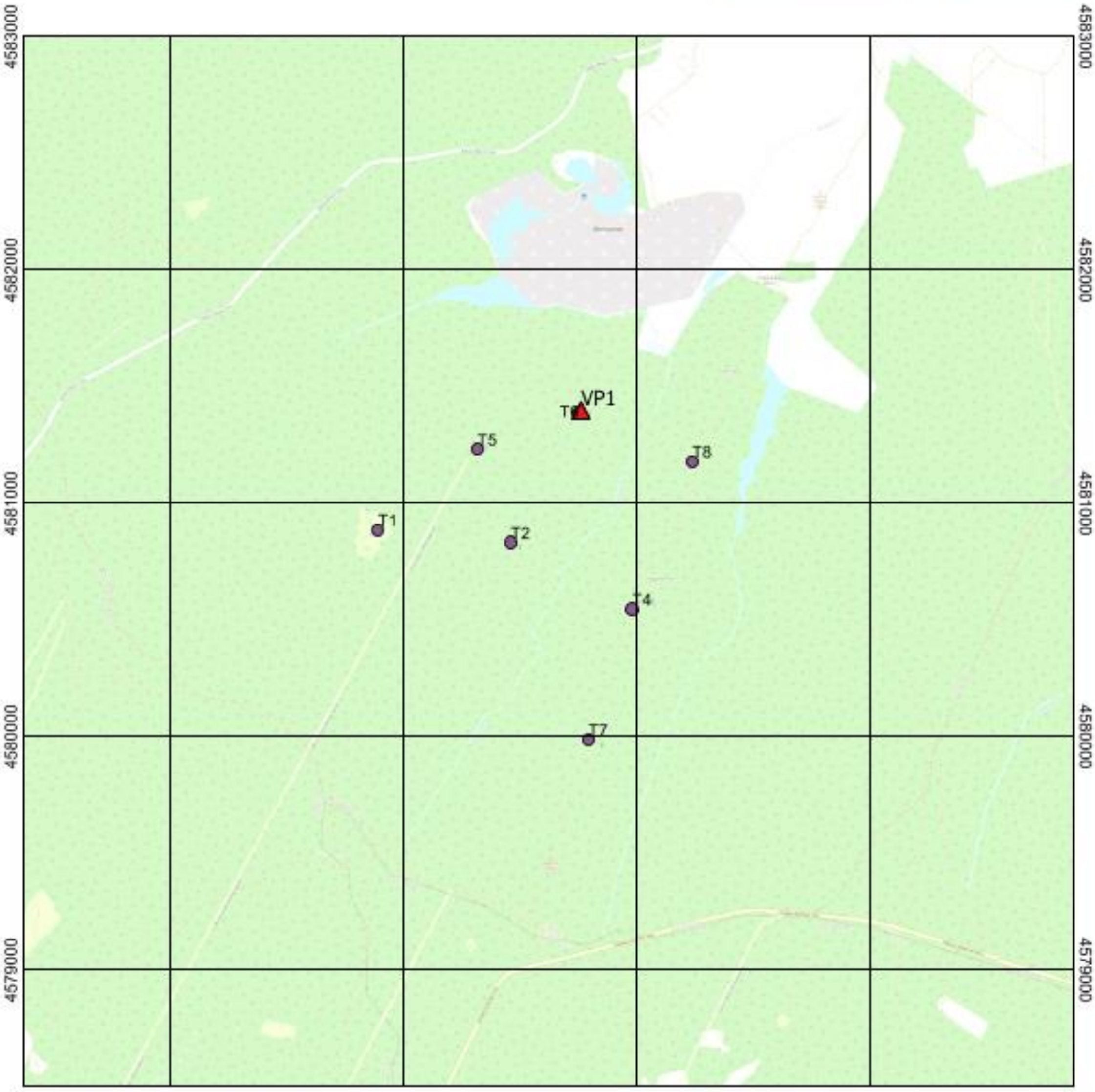
VP Number	
Surveyor	
Project	

Date	
Start Time	
End Time	



1:25.000
WGS 84 UTM 35N





Project		VP			Cloud cover	%	Precipitation	mm
Date		Start1-Finish1-			Wind Direction		Temp. (max)	°C
Surveyor		Start2-Finish2			Wind Speed	m/s	Visibility	km
Comments								

Height: A (below rotor height), B (at rotor height), C (above rotor height)

	Time	Species	Count	Behaviour	Resident/Migrant/Unclear	Duration (sec)	Height	60	120	180	240	300
1							C					
							B					
							A					
2							C					
							B					
							A					
3							C					
							B					
							A					
4							C					
							B					
							A					
5							C					
							B					
							A					
6							C					
							B					
							A					
7							C					
							B					
							A					
8							C					
							B					
							A					
9							C					
							B					
							A					

6.9.2 Breeding Bird

Project		Point		Start time		Temperature (Celsius)	
Date		North (UTM)		Finish time		Wind direction	
Surveyor		East (UTM)		Duration (min)		Wind speed (m/s)	
Notes						Precipitation (mm)	
						Visibility (km)	

Species	Min. count	Max. count	Breeding code	Species	Min. count	Max. count	Breeding code

6.9.3 Acoustic Bat

Project		Coordinates (Utm-Wgs84)	
Surveyor		Folder Name	
Location		4 Directional Photo	☐
Detector Serial#		Notes	

Start	Control	Finish	Date	Hour	# Recording	Temp (C°)	Cloud (%)	Wind (M/S)	Precipitation?	Fog?	Notes
☐	☐	☐	___/___/___	___:___					☐	☐	
☐	☐	☐	___/___/___	___:___					☐	☐	
☐	☐	☐	___/___/___	___:___					☐	☐	
☐	☐	☐	___/___/___	___:___					☐	☐	
☐	☐	☐	___/___/___	___:___					☐	☐	

6.10 Flight Line Maps

[Maps were provided in a separate document.]

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