Environmental and Social Impact Assessment

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Uzbekistan: Samarkand I Solar PV and BESS Project

PART 3

Prepared by ACWA Power for the Asian Development Bank (ADB).

10.4.9.2 Results – Habitats and Communities

Two habitat types were recorded within the 400MW PV Plant, Dry Grassland (nautral) and Fallow land (modified).

Table 10-14 Habitat Classification

HABITAT	CLASSIFICATION	NOTES
Fallow Land	Modified	Abandoned non irrigated arable land with sandy-clayey soil
Dry Grasslands	Natural	Unploughed areas with more or less rugged terrain

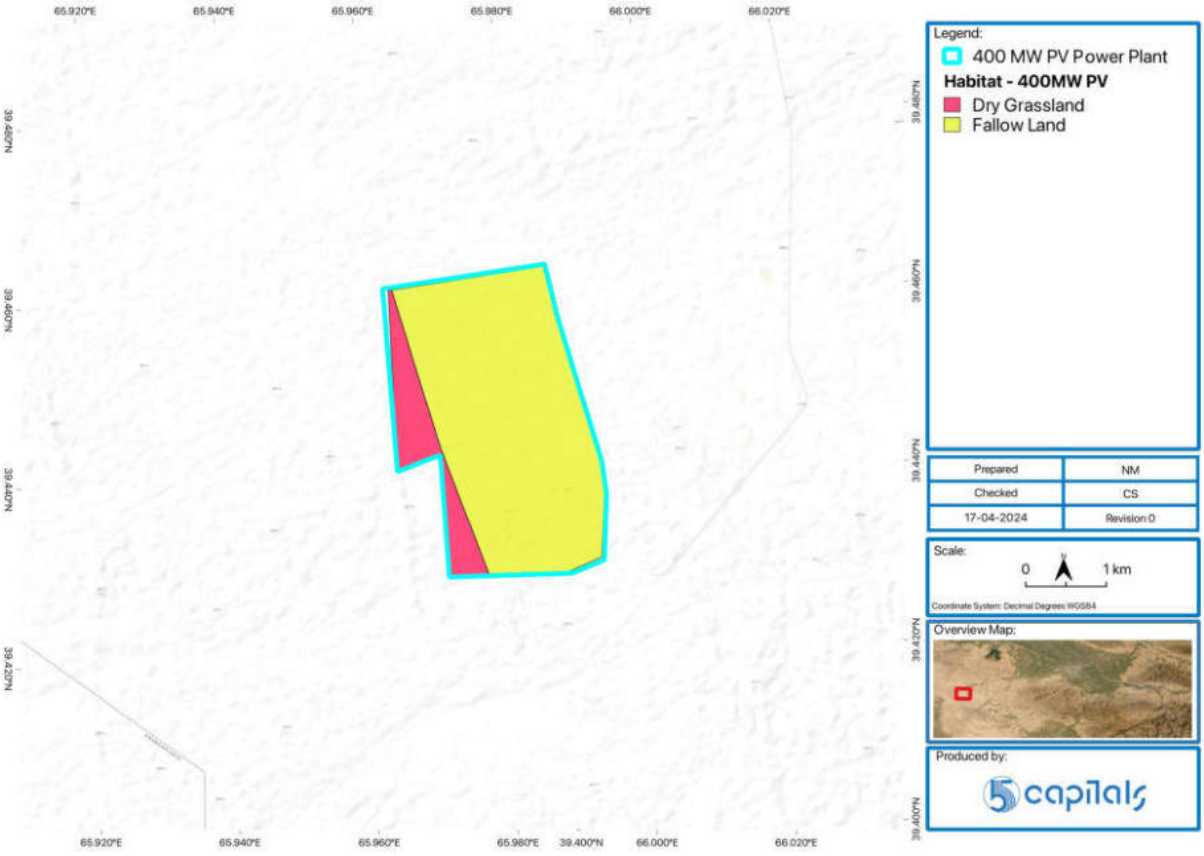

Figure 10-18 Habitat types within the 400 MW PV plant site

FALLOW LANDS

Fallow Lands within the surveyed area are classified under the IUCN habitat type 14 Artificial – Terrestrial, encompassing both subtypes 14.1 Arable Land and 14.2 Pasture Land. Correspondingly, this habitat aligns with the EUNIS habitat type V Vegetated man-made habitats, specifically subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). These lands are characterized by their transition from

previously cultivated agricultural areas to a state of natural succession, following a period of non-use.

The vegetation on these fallow lands includes:

- Bluegrass (*Poa bulbosa*);
- Harmel (*Peganum harmala*);
- Camel thorn (*Alhagi pseudalhagi subsp. kirghisorum*);
- With occurrences of *Cousinia resinosa*.

The soil composition is notably sandy-clayey, supporting communities that have adapted to these textural conditions. The presence of specific plant communities such as bluegrass-harmel-camel thorn and bluegrass-camel thorn indicates a particular ecological makeup, reflecting the land's agricultural history and its current state of ecological succession.

This habitat type showcases the dynamic process of land recovery and the establishment of new ecological communities after agricultural abandonment. The variability in plant species and community structures across different fallow lands highlights the influence of soil conditions, previous land use, and local environmental factors on the regeneration processes. These areas serve as valuable ecological niches, offering insights into the natural succession and recovery capabilities of terrestrial ecosystems following human disturbance.

DRY GRASSLANDS

Dry Grasslands are identified within the landscape as IUCN habitat type 4 Native grassland, specifically subtype 4.4 Temperate grassland. This classification is further supported by the EUNIS habitat type R, focusing on grasslands and lands dominated by forbs, mosses, or lichens, under subtype R1 Dry grasslands. Situated between abandoned fields, these habitats extend over unplowed areas that feature rugged terrain, often found along the dry beds of temporary streams, showcasing the adaptability of certain plant communities to arid conditions.

The vegetation characteristic of these dry grasslands includes:

- Bluegrass (*Poa bulbosa*);
- Harmel (*Peganum harmala*);
- Camel thorn (*Alhagi pseudalhagi subsp. kirghisorum*);

These species form distinct communities, such as bluegrass-harmel-camel thorn and bluegrass-camel thorn, which are adapted to the dry, often harsh conditions of these landscapes. Additionally, the presence of Cousinia resinosa as a solitary species further signifies the unique biodiversity of these areas.

Dry grasslands serve as critical ecosystems, supporting a variety of flora and fauna adapted to low-water environments. The resilience and biodiversity of these habitats underscore the importance of conservation efforts, particularly in regions where such ecosystems are threatened by human activities or climate change. Understanding the composition and ecological functions of dry grasslands is essential for the development of strategies aimed at preserving these valuable natural resources.

Both habitat types (fallow lands & dry grasslands) exhibit sparse vegetation cover ranging from nearly nonexistent to 10-30%, with plants occurring in scattered patches or groups. Despite the poor species composition, these habitats are practically indistinguishable in terms of landscape and vegetation characteristics, aside from the subtle presence of field contours and furrows in fallow lands.

10.4.9.3 Results – Flora Species

Within the area of the 400 MW (Samarkand 1 – Plant II), botanical surveys conducted in summer-autumn 2023 have documented the plant species, collectively summarized as follows:

- **Total Plant Species Recorded**: 14 species were identified, with the diversity of species recorded across sample plots ranging from 9 to 14, suggesting a relatively consistent level of biodiversity within the surveyed area.
- **Conservation Status**: None of the species identified are listed on national or global conservation red lists, indicating they are not considered at risk. Furthermore, no species were identified as alien, suggesting a native composition of the plant community.
- **Life Cycle Diversity**: The flora includes 8 annuals (completing their life cycle within one year) and 6 perennials (species that live for more than two years), demonstrating a mix of growth strategies adapted to the local environmental conditions.
- **Ecological Context**: All recorded plant species are characterized as typical and commonly found within the piedmont plains and foothills of Uzbekistan. This indicates the presence of plant communities that are well-adapted to the regional climate and soil conditions, reflecting the broader vegetative patterns found in the region.
- **Species Distribution**: The uniformity in species distribution across the plots suggests a stable ecological environment within the vicinity of these energy facilities, underscoring the ecological characteristics of the area surrounding the PV plants.

Within the adjacent areas of the 400 MW Photovoltaic (Samarkand 1 – Plant II) facility and access road, botanical surveys conducted in spring 2024 have comprehensively documented the plant species across sample plots 10, 11, 14, and 16. The findings are collectively summarized as follows:

- **Total Plant Species Recorded**: A total of 40 distinct species were identified across these sample plots, reflecting a rich biodiversity. This diversity spans a range of

species, each adapted to the local environmental conditions, indicative of a healthy and vibrant ecosystem.

- **Conservation Status**: None of the species documented in the spring survey are listed on national or global conservation red lists, confirming they are not currently considered at risk. This status underscores a relatively stable ecological balance in the region.
- **Life Cycle Diversity**: The recorded species include a mix of 25 annuals and 15 perennials. This distribution highlights a balanced mix of life cycles within the plant community, with species that complete their life cycle in one year and those that persist over multiple years, enhancing ecological stability and resilience.
- **Ecological Context**: The species documented are native to the region, characterized as typical of the piedmont plains and foothills of Uzbekistan. Such flora adaptation suggests that these plant communities are well-integrated with the regional climate and soil conditions, supporting a stable local ecosystem.
- **Species Distribution**: The species distribution across the sampled plots shows a high degree of consistency, with no alien species recorded, pointing to a predominantly native vegetation makeup. This uniformity in species distribution suggests that the environmental conditions across these plots are stable, supporting a diverse range of native plant species without significant ecological disruption.

10.4.10 11-km LILO OTLs Sites

10.4.10.1 Methodology

The botanical survey for the 11 km OTL was undertaken via a total of 3 sample plots, SP7, SP8, and SP9. The sample plots were surveyed in spring on 16 March 2024.

Figure 10-19 Survey map. Sample plots SP7, SP8, and SP9 assessed during the spring 2024 survey along the 11km (220 kV) OTL line (Nurabad District of Samarkand Region)

Table 10-15 Sample plots checklist for the 11 km (220kV) OTL corridor surveys in spring 2024

SP No.	Project site	Location	Date	Latitude, N	Longitude, E	Elevation, m.s.l.	Habitat type	Canopy cover, %	Number of	IUCN	UzbRDB
7	11km OTL	Nurobod District of Samarkand Region	3/16/2024	39.580849	66.754212	709	modified (young fruit garden)	0-10	19	0	0
8	11km OTL	Nurobod District of Samarkand Region, a quarry in the dry bed of the river Tepakulsay	3/16/2024	39.580547	66.775118		modified (quarry)	60-70	27	0	0
9	11km OTL	Samarkand District of Samarkand Region, 1.5 km to the north of the village Mehrobod	3/16/2024	39.579993	66.855574		modified (Fruit garden; Boundary-strips, roadsides)	60-70	29	0	0

10.4.10.2 Results – Habitats and Communities

During surveys, three types of modified habitat and two natural habitats were recorded, and are presented in the following table.

Table 10-16 Habitat Classification - for the 11 km (220kV) OTL corridor surveys in spring 2024

Habitat	Classification	Notes
Young Fruit Garden	Modified	Area dominated by young fruit trees; Impact factors: agriculture
Quarry	Modified	Area used for gravel and clay extraction, often associated with garbage dump; Impact factors: gravel and clay extraction, garbage dump
Fruit Garden; Boundary-strips, roadsides	Modified	Area with fruit garden and boundary strips/roadsides, likely utilized for agriculture; Impact factors: agriculture
Dry Grasslands on Gentle Foothills	Natural	Unploughed areas with more or less rugged terrain
Dry Bed of Temporary Streams	Natural	Narrow strips along dry beds of several rather large temporary streams
Fallow Lands	Modified	Abandoned irrigated or rainfed arable land

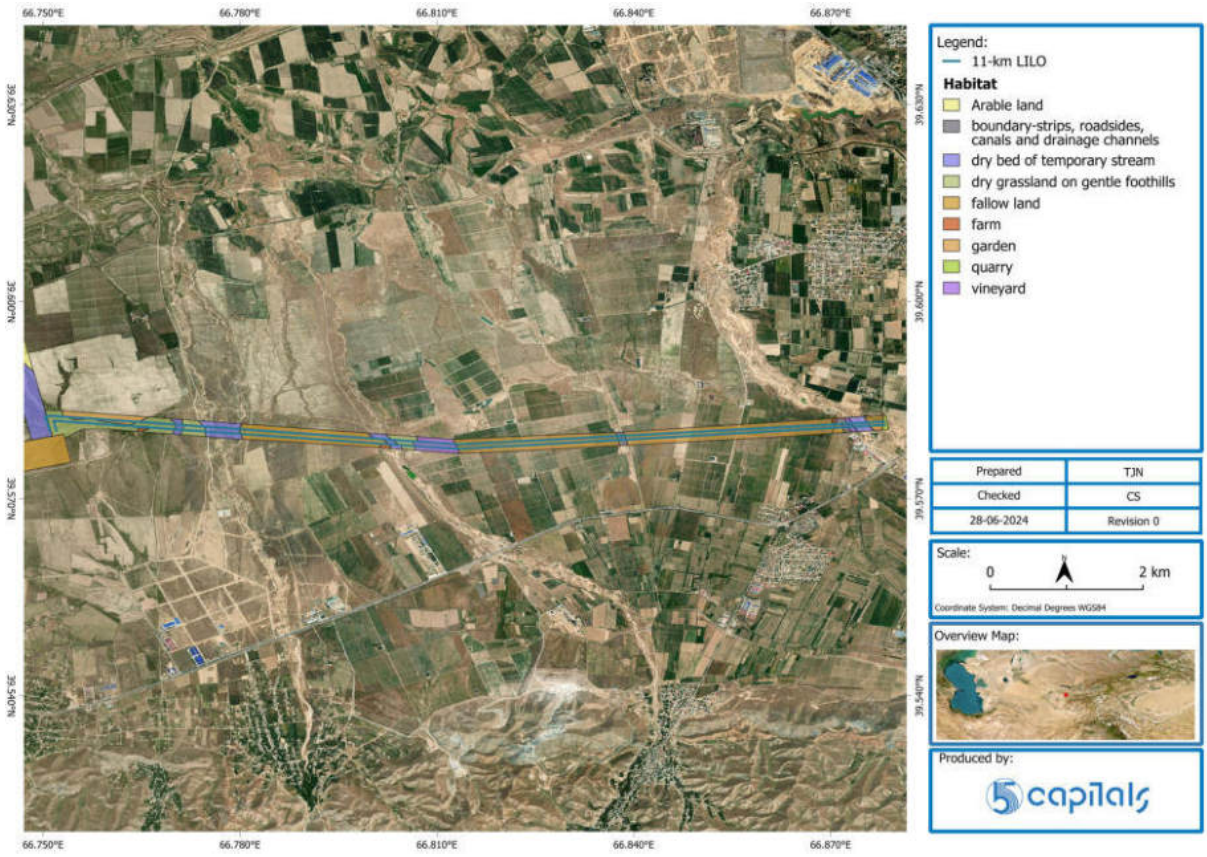

Figure 10-20 Habitat types — 11 km (220 kV) OTL

To facilitate the interpretation of the habitat classes identified along the 11km (220kv) OTL, the following legend can be used: Natural Habitats include "Dry Grasslands on Gentle Foothills," represented by light green, and "Dry Beds of Temporary Streams," depicted in gray-white. Modified Habitats encompass "Boundary Strips, Roadsides, Canals, and Drainage Channels," indicated by dark gray, "Fallow Lands" in orange, "Farmland" in red, "Young Fruit Gardens" in dark green, "Vineyards" in dark red, and "Quarry" in light gray. Using this legend, stakeholders and researchers can easily discern and differentiate between the various habitat classes present along the OTL route. The distinct color codes provide a visual reference for understanding the distribution and extent of natural and modified habitats in the surveyed area.

YOUNG FRUIT GARDEN

Within the vicinity of the OTL substation in the Nurobod District, a habitat classified as a "Young Fruit Garden" was observed. This habitat is characterized by the cultivation of young fruit trees, primarily camel thorn (Alhagi pseudalhagi) and apple trees. The presence of both native and introduced plant species indicates a modified environment influenced by agricultural practices. The habitat has a low canopy cover (0-10%) due to the relatively young age of the fruit trees. The impact factors affecting this habitat primarily stem from agricultural activities,

including grazing and ground roads. It is essential to note that this habitat provides a suitable environment for both native and alien plant species.

QUARRY

Another identified habitat class along the OTL route is the "Quarry," located near the dry bed of the river Tepakulsay in the Nurobod District. This habitat type results from gravel and clay extraction activities and is associated with a garbage dump. The vegetation in this habitat primarily consists of camel thorn (Alhagi pseudalhagi) and ephemeral plants adapted to disturbed environments. The canopy cover in this habitat is relatively high (60-70%), mainly due to the presence of the camel thorn. Impact factors such as gravel and clay extraction, as well as the presence of a garbage dump, contribute to the modification of this habitat. It is characterized by a mix of native and alien plant species, indicating its transitional nature.

FRUIT GARDEN; BOUNDARY-STRIPS, ROADSIDES

In the vicinity of the OTL substation in the Samarkand District, a habitat class identified as "Fruit Garden; Boundary-strips, Roadsides" was observed. This habitat encompasses a combination of fruit garden areas and boundary-strips/roadsides. The vegetation within this habitat consists of a mix of grasses, forbs, and camel thorn, along with apple plantation areas. With a relatively high canopy cover (60-70%), this habitat provides favorable conditions for plant growth. Agricultural activities, including grazing and ground roads, are the primary impact factors affecting this habitat. It supports a diverse array of plant species, including both native and alien taxa, indicative of its modified yet biodiverse nature.

DRY GRASSLANDS ON GENTLE FOOTHILLS

Along the route of the OTL, particularly in areas characterized by gentle foothills, natural dry grasslands were identified. These grasslands are characterized by the presence of native grass species adapted to arid environments. The canopy cover in these grasslands varies but generally ranges from 0 to 10%, allowing for the growth of a diverse range of herbaceous plants. Impact factors on these grasslands are minimal, primarily consisting of natural processes such as grazing. They support a variety of plant species, including both native and endemic taxa, contributing to their ecological significance.

DRY BED OF TEMPORARY STREAMS

Additionally, natural habitats were observed along the dry beds of temporary streams intersecting the OTL route. These habitats are characterized by their ephemeral nature, experiencing periodic flooding during rainy seasons. The vegetation in these areas primarily consists of drought-resistant species adapted to fluctuating water levels. Impact factors on these habitats are primarily natural, including occasional flooding events and grazing. Despite

the harsh conditions, these habitats support a diverse range of plant species, including both native and endemic taxa, contributing to the overall biodiversity of the region.

FALLOW LANDS

Throughout the surveyed area for the OTL line, fallow lands were observed, representing a modified habitat type. These fallow lands are characterized by abandoned arable land previously used for agricultural purposes. The vegetation in these areas typically consists of ephemeral plants and camel thorn, with a canopy cover ranging from 40 to 50%. Impact factors affecting these fallow lands include grazing and ground roads, typical of abandoned agricultural areas. Despite their modified status, these habitats support a diverse range of plant species, including both native and alien taxa.

10.4.10.3 Results – Flora Species

Within the plots designated for the 11 km (220kV) overhead transmission line (OTL), the spring 20-24 botanical survey conducted on 16 March 2024 outlines the plant diversity across sample plots SP7, SP8, and SP9. The findings are summarized as follows:

- **Total Plant Species Recorded:** A diverse array of 35 species was identified across the three plots, illustrating the resilience and variety of flora amidst varying degrees of human impact.
- **Conservation Status:** No species across the plots are listed as endangered or threatened either on national or global conservation lists. This indicates a relatively stable status for local flora under current environmental conditions.
- **Life Cycle Diversity:** The plant life forms are varied, comprising 24 annuals, 8 perennials, 2 subshrubs, and 1 tree. This diversity indicates a broad spectrum of ecological strategies for survival and reproduction in the arid conditions typical of the region.
- **Ecological Context:** The species predominantly reflect the native vegetation typical to this part of the region, with all identified plants being native except for a few transcontinental aliens. This demonstrates the native plants' adaptability and ecological resilience in a disturbed environment.
- **Anthropogenic Impact and Abundance:** Human activities, including construction and maintenance of the OTL, have influenced these plots. However, native species like Camel Thorn, Thick-stem sedge, and Bulbous Bluegrass show varying abundances from rare to abundant, suggesting a complex interaction with the anthropogenic disturbances. Alien species such as Shepherd's-purse and Chicory also appear occasionally, reflecting ecological shifts possibly influenced by human activity.

10.4.11 19-km LILO OTLs Sites

10.4.11.1 Methodology

The botanical survey for the 19 km OTL was undertaken via a total of 3 sample plots, SP7, SP8, and SP9. The sample plots were surveyed in spring on 16 March 2024.

10.4.11.2 Results – Habitats and Communities

Four types of modified habitat, and one type of natural habitat, are represented within OTL LILO 19 km.

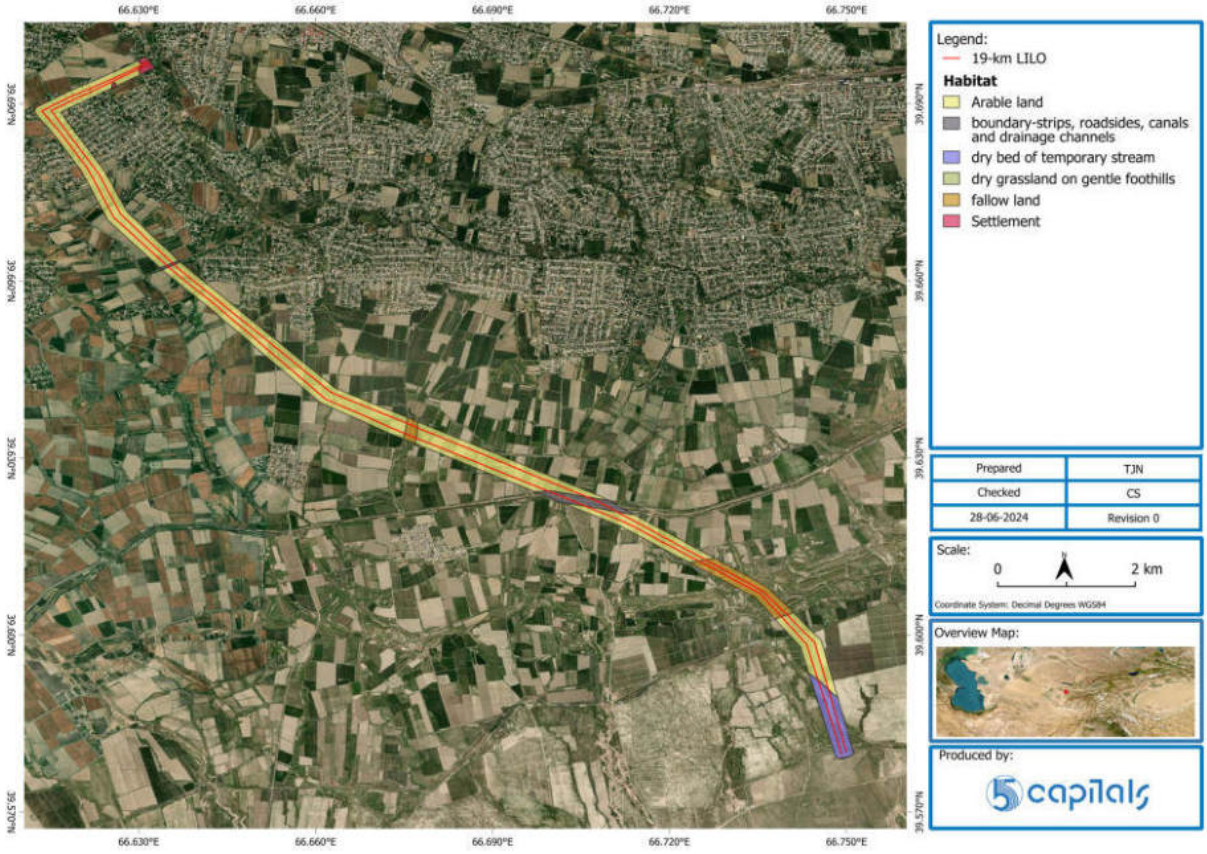

Figure 10-21 Habitat types recorded along the 19km LILO

DRY BEDS OF TEMPORARY STREAMS

This habitat covers narrow strips along dry beds of several rather large temporary streams, and corresponds with EUNIS habitat type H – Inland unvegetated or sparsely vegetated habitats. The vegetation is very sparse and represented with solitary specimens of tamarisk, camel thorn and other annual and perennial plants. This habitat is moderately to strongly degraded due to gravel extraction.

FALLOW LANDS

IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned non-irrigated arable lands with sandy-clayey soil and bluegrass-camel thorn community (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary harmel (*Peganum harmala*) and *Cousinia resinosa*. Plants are scattered or occur in patches, species composition is poor, and the canopy cover is sparse (from nearly 0 to 10-20%).

BOUNDARY-STRIPS, ROADSIDES, CANALS AND DRAINAGE CHANNELS.

This habitat type occupies a narrow stips between the fields, along the roads and irrigation systems. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, and 2 subtypes, V38 Dry perennial anthropogenic herbaceous vegetation and V39 Mesic perennial anthropogenic herbaceous vegetation. This habitat is occupied with communities of camel thorn (*Alhagi pseudalhagi*), Persian rose (Rosa persica), annual and perennial grasses (*Aegilops cylindrica, Ae. triuncialis*, *Bromus scoparius*, *B.tectorum*, *Hordeum murinum* ssp. *leporinum*, *Cynodon dactylon, Poa bulbosa),* weeds (*Centaurea iberica*, *C. solstitialis*, *Sophora alopecuroides, Sophora pachycarpa, Xanthium spinosum,* etc.). Banks of irrigation and drainage canals are occupied with oleaster (*Elaeagnus angustifolia*), tamarisk (*Tamarix sp.*), reed (*Phragmites australis*), camel thorn (*Alhagi pseudalhagi*), other mesophytic plants (*Mentha longifolia var. asiatica, Epilobium hirsutum*, etc.), as well as with mesophytic weeds. The species composition and abundance, and density of canopy cover very much varies on different areas depending of local conditions.

10.5 Herpetofauna

10.5.1 Methods

The herptile survey within the study area was designed to meticulously evaluate the status of reptiles and amphibians, aiming to delineate species specificity, quantitative composition, territorial distribution, and habitat conditions. This comprehensive assessment incorporated both field surveys and desktop analysis to ensure a thorough investigation.

Field studies adhered to established zoological methodologies for species identification, drawing upon methodological guidelines set forth by esteemed researchers such as L.G. Dinesman, M.L. Kaletskaya (1952), V.M. Makeev, A.T. Bozhansky (1988), and D.A. Bondarenko, N.G. Chelintsev (1996), among others. These studies were augmented by a review of relevant literature and statistical data to form a cohesive analysis.

The primary approach for field research involved a combination of stationary and transect surveys, strategically planned around project monitoring stations to reflect the diversity of habitat types present. This dual methodology focused on elucidating the species composition within the study area and their distribution across various habitats. The quantitative assessment of reptiles and amphibians primarily employed the transect survey technique, which entails the enumeration of individuals along a predetermined path, or transect, extending up to 1 km in length. This method facilitates the accurate measurement of the perpendicular distance from the transect axis to each observed individual, thereby allowing for the calculation of reptile density within the area.

The choice of a 1 km transect was informed by research indicating that longer transects could introduce significant errors in species with variable density and activity patterns, such as the Central Asian Tortoise. Consequently, the transect length was optimized to minimize such inaccuracies and ensure reliable density estimations.

Population densities within habitats were evaluated using a scale developed by Kuzyakin (1962), which classifies densities per hectare as rare (0.1 – 0.9), common (1.0 – 9.9), or abundant (10.0 and higher). This scale provides a standardized framework for interpreting the prevalence of reptiles across the surveyed habitats, facilitating a nuanced understanding of their ecological status and distribution within the study area. The calculation of population density for the Central Asian tortoise within the study area was meticulously carried out employing a specific formula designed to account for the unique challenges associated with surveying this species. The formula used is expressed as $D=n/2LB$, where D represents the population density, n is the number of individual animals observed along the transect, and L is the transect's length. The term B, representing the effective width of the survey strip, is calculated using the formula $B=W(0.79F+0.21F^4)$, with W denoting the width of the limited strip on both sides of the transect axis through the formula $F=2y/W$, where y is the perpendicular distance from the transect axis to each observed individual.

This methodological approach, focusing on the use of perpendicular distances within a strip of limited width, effectively mitigates the potential underestimation of population densities that might result from decreased detectability of tortoises in the farther reaches of the survey area. By considering the degree of limitation within the survey strip, this technique ensures a more accurate and reliable estimation of the Central Asian tortoise's population density, critical for understanding the species' ecological status and informing conservation strategies.

10.5.2 100 MW PV Plant and Access Road Sites

10.5.2.1 Methodology

The herpetology surveys of the 100MW PV site in the Sazagan survey area was conducted on June 28, 2023. The survey employed a blend of stationary survey points and transect methodologies, to gather detailed ecological data across different biotopes. Three survey points (PS1, PS2 and PS5) and three transects (PS1, PS2 and PS5) were selected within the 100MW Project footprint and surrounding area.

These points were chosen to capture a wide array of environmental parameters, including air and soil temperatures, and humidity levels, providing a snapshot of the local climatic and soil conditions which are vital for assessing the potential impact of the project on these ecosystems. Complementing the stationary points, transect surveys were carried out along paths that extended for 1 to 2 kilometres within both the deposited lands and the agricultural fields. The transects facilitated a dynamic examination of the environment, extending the assessment beyond fixed points to encompass a broader understanding of the biotopes within the Sazagan survey area.

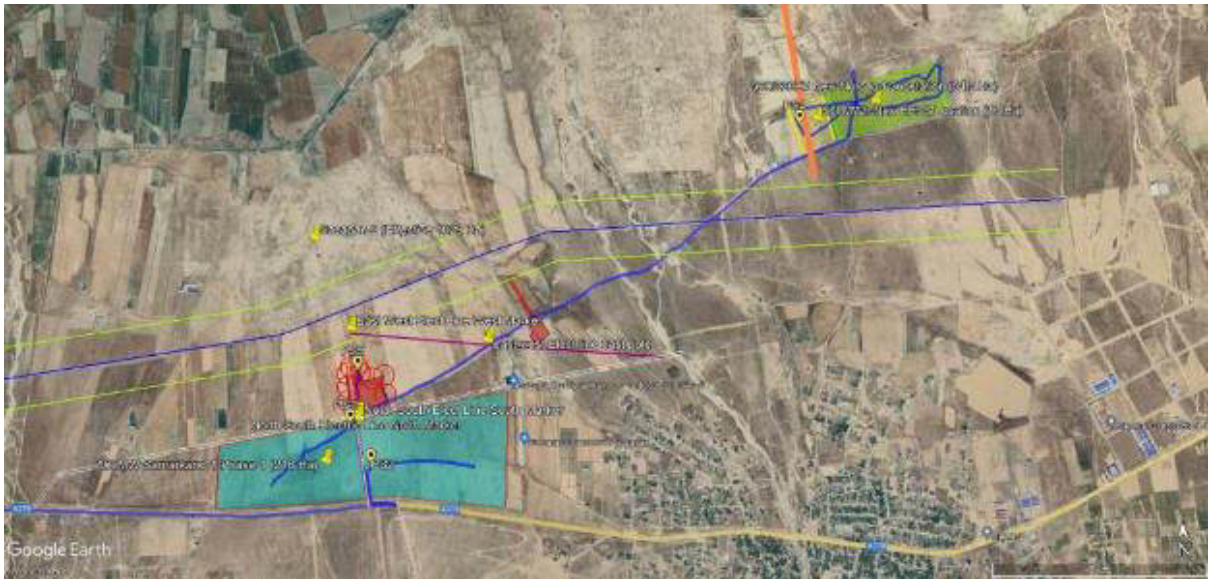

Figure 10-22 Survey points and transects on 100 MW PV in June 2023 (Blue polygon)

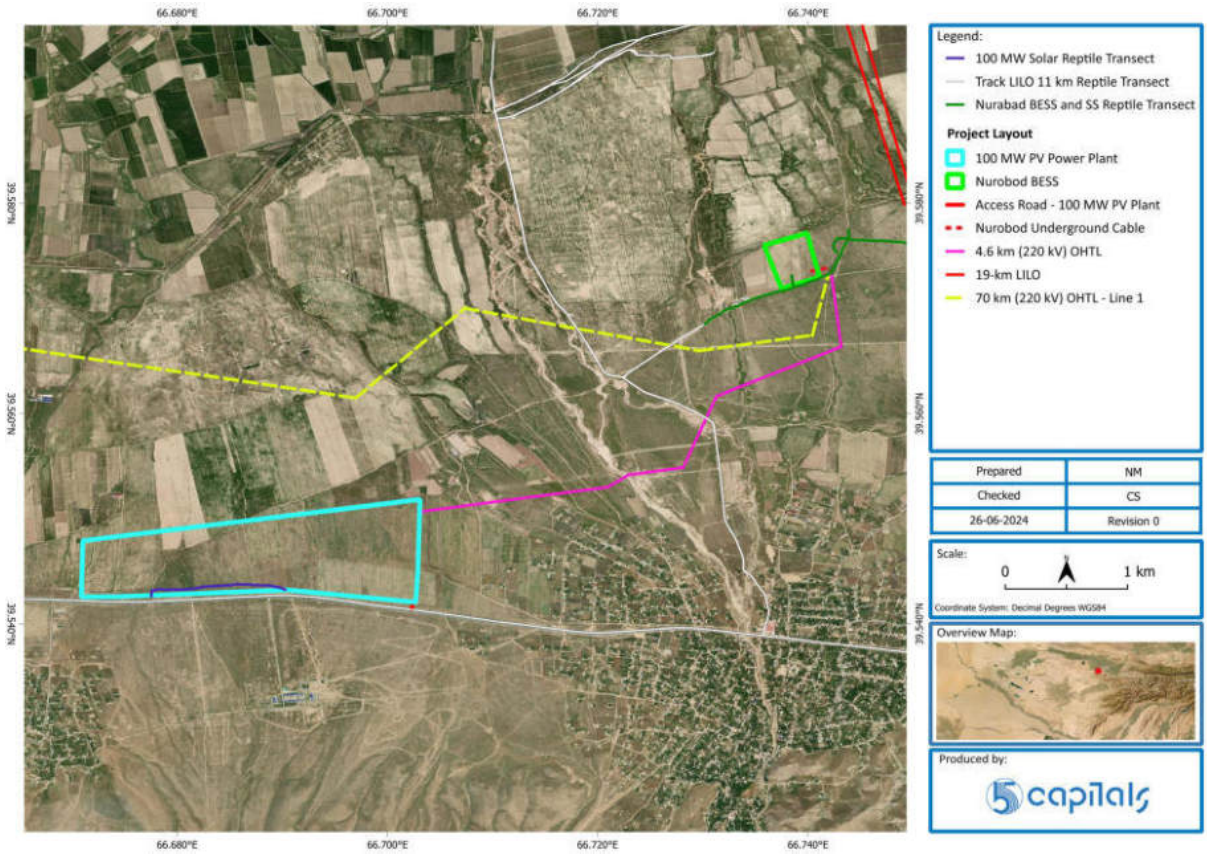

Figure 10-23 Survey points and transects on 100 MW PV in May 2024

Table 10-17 Survey Points on 100MW PV (June 2023)

NAME OF POINT	DATE	N	E	BIOTOPE	T AIR °C	T SOIL °C	HUMIDITY %
PS-1	28/06/23	39.549109°	66.685559°	Deposited lands	34,3	37,2	22
PS-2	28/06/23	39.545677°	66.687853°	Deposited lands	34,7	40,3	21
PS-5	28/06/23	39.553687°	66.686383°	Agricultural fields	35,6	47,2	20

Table 10-18 Survey Transects on 100MW PV (June 2023)

NAME OF TRANSECT	DATE	LENGTH	BIOTOPE	T AIR °C	T SOIL, °C	HUMIDITY %
PS-1	28/06/23	1 km	Deposited lands	34,3	37,2	22
PS-2	28/06/23	1 km	Deposited lands	34,7	40,3	21
PS-5	28/06/23	1 km	Agricultural fields	35,6	47,2	20

The initial survey period did not align with the Central Asian tortoise's active period. This species was in a state of aestivation during the survey. Further herpetological surveying was carried

out on 11th March 2024 in the region, specifically near the Nurobod BESS (see following section) to ensure that the active period for this species is surveyed effectively.

10.5.2.2 Results

Based on the literature review, 13 species were anticipated to inhabit the area, including notable species such as the Turan Toad, Central Asian tortoise, Turkestan Thin-toed Gecko, Steppe Agama, Asian Snake-eyed Skink, Schneider's Skink, Glass Lizard, Rapid Racerunner, Steppe Racerunner, Tatary Sand Boa, Sand Racer, Spotted Whip Snake, and Central Asian Cobra.

The surveyed territory was noted to be significantly influenced by human activities, including agriculture (wheat and barley cultivation) and pastoral land use.

Three species were observed during surveys;

a) Steppe Agama (*Trapelus sanguinolentus*) was observed at survey point PS-1, with a single individual recorded, indicating a population density of 0.9 individuals per hectare.

b) Asian Snake-eyed Skink (*Ablepharus pannonicus*) was found at survey point PS-5, with two individuals recorded, leading to a notably higher population density of 10.4 individuals per hectare.

c) Steppe Racerunner (*Eremias arguta*) was observed across survey points PS-1 and PS-2, with a combined average of 3.2 individuals recorded. The population density for this species was calculated at 9.1 individuals per hectare at PS-1 and 8.3 individuals per hectare at PS-2.

A comparison between literature sources and field survey results are shown in the table below.

Table 10-19 List of amphibian and reptile species potentially inhabiting the area at 100 MW PV

№	Species	Species presence acc. to literary sources	Species noted during surveys	Abundance	Endemism	Conservation status		
						UzRDB	IUCN	CITES
1	Turan toad *Bufotes turanensis*	+		Common	UZ, TJ, TM			
2	Central Asian *Tortoise Testudo horsfieldii*	+		Common		2 (VU)	VU	II
3	Turkestan thin-toed gecko *Tenuidactylus fedtschenkoi*	+		Common	UZ, TJ, TM, KZ			
4	Steppe Agama *Trapelus sanguinolentus*	+	+	Common				

№	Species	Species presence acc. to literary sources	Species noted during surveys	Abundance	Endemism	Conservation status		
						UzRDB	IUCN	CITES
5	Asian snake-eyed Skink *Ablepharus pannonicus*	+	+	Common				
6	Schneider's skink *Eumeces schneideri*	+		Not numerous				
7	Glass lizard *Pseudopus apodus*	+		Not numerous				
8	Rapid Racerunner *Eremias velox*	+		Common				
9	Steppe racerunner *Eremias arguta*	+	+	Not numerous				
10	Tatary sand boa *Eryx tataricus*	+		Rare		3 (NT)		II
11	Sand racer *Psammophis lineolatus*	+		Common				
12	Spotted whip snake *Hemorrhois ravergieri*	+		Common				
13	Central Asian cobra *Naja oxiana*	+		Rare	UZ, TM, TJ, IR, AF, PK	3 (NT)	DD	II

Notes: UzRDB– species/subspecies listed in the Red Data Book of Uzbekistan (2019) (VU – vulnerable; NT – near-threatened); IUCN – species included in the Red List of the International Union for Conservation of Nature (VU - vulnerable); CITES I, II – species listed in the appendices (I, II) to the Convention on International Trade in Endangered Species of Wild Fauna and Flora; Endemism: AF – Afghanistan; CN – China; KZ – Kazakhstan; IR – Iran; TM – Turkmenistan; KG – Kyrgyzstan; TJ – Tajikistan; UZ – Uzbekistan.

The Spring survey conducted in March 2024 did not record any Herptile activity, including Central Asian Tortoise. However, despite the absence of the Central Asian Tortoise it likely that this species is present in the project area, due to presence of suitable habitat distribution, albeit in low numbers.

10.5.3 Nurobod BESS and Underground Cable Sites

10.5.3.1 Methodology

The herpetology surveys for the Nurobod BESS and the surrounding underground cable sites in the Sazagan area were conducted on June 28th 2023. The survey employed a blend of stationary survey points and transect methodologies, to gather detailed ecological data across different biotopes. Two survey points (PS3 and PS4) and two transects (PS3 and PS4) were selected within the Nurobod BESS footprint and surrounding area. To ensure full survey coverage an additional transect was surveyed on 11th March 2024 along the access round to the Nurobod BESS. On 14th May 2024, to coincide with the active period of the Central Asian

Tortoise, one final transect was surveyed adjecent the Nurobod BESS site in suitable Tortoise habitat.

These points were chosen to capture a wide array of environmental parameters, including air and soil temperatures, and humidity levels, providing a snapshot of the local climatic and soil conditions which are vital for assessing the potential impact of the project on these ecosystems. Complementing the stationary points, transect surveys were carried out along paths that extended for 1 to 2 kilometres within both the deposited lands and the agricultural fields. The transects facilitated a dynamic examination of the environment, extending the assessment beyond fixed points to encompass a broader understanding of the biotopes within the Sazagan survey area.

Figure 10-24 Survey points and transects on Nurobod BESS (Yellow Polygon) in June 2023

Figure 10-25 Survey Transect (Red) and Survey Points (Nurabod BESS)

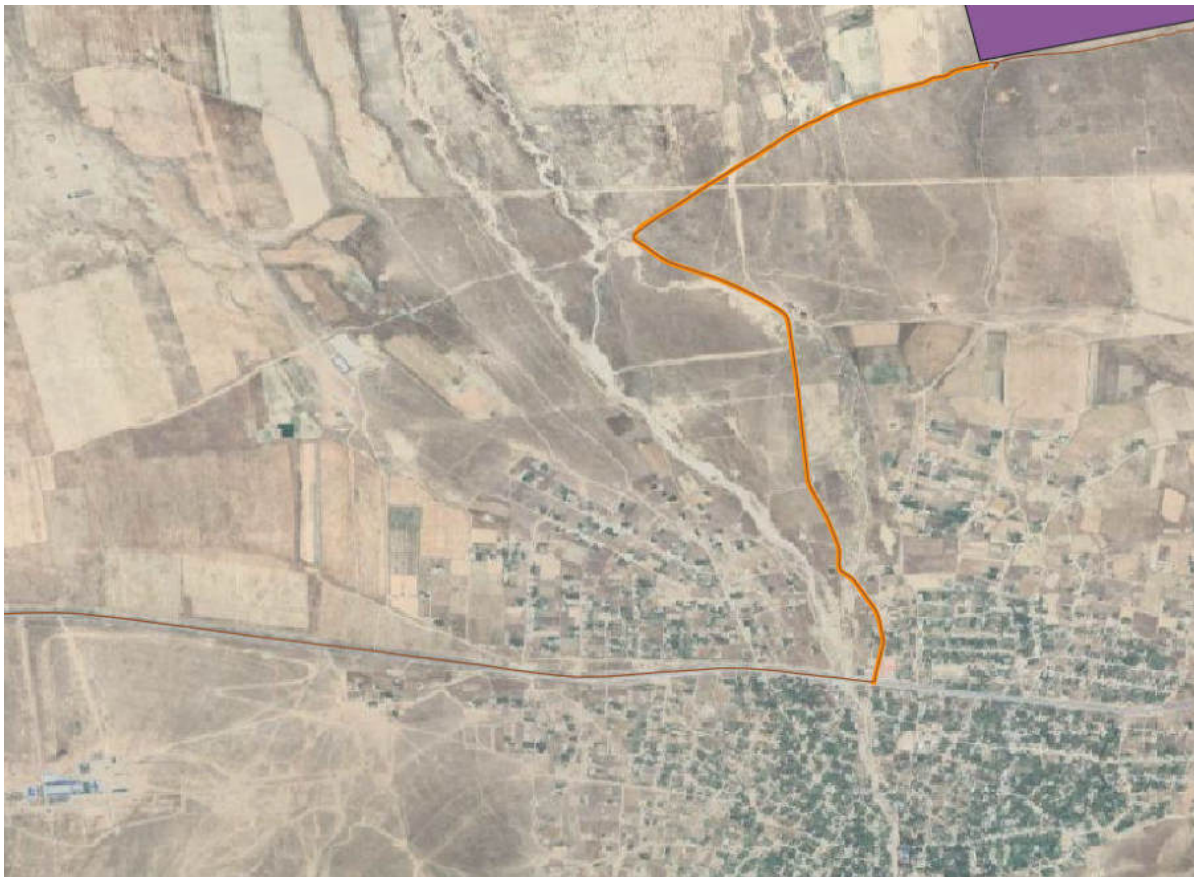

Figure 10-26 Survey Transect (Brown) of the Access Road (Orange) in March 2024

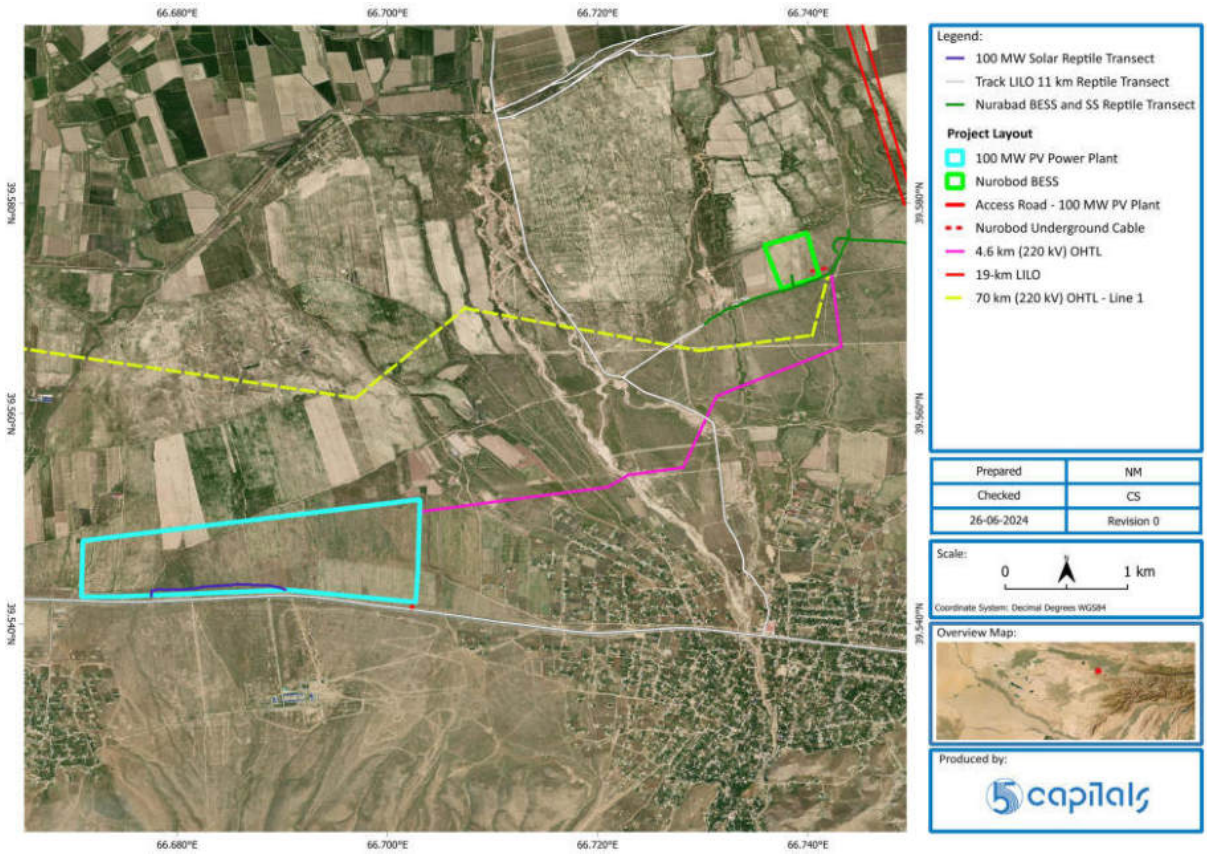

Figure 10-27 Additional transect surveyed in May 2024 adjacent to Nurobod BESS

Table 10-20 Survey Points on Nurobod BESS (June 2023)

NAME OF POINT	DATE	N	E	BIOTOPE	T AIR °C	T SOIL, °C	HUMIDITY, %
PS-3	28/06/23	39.576767°	66.744959°	Deposited lands	34.9	42.8	21
PS-4	28/06/23	39.574226°	66.737152°	Agricultural fields	35.3	44.6	20

Table 10-21 Survey Transects on Nurobod BESS (June 2023)

NAME OF TRANSECT	DATE AND TIME	LENGTH	BIOTOPE	T AIR °C	T SOIL, °C	HUMIDITY, %
PS-3	28/06/23	2 km	Deposited lands	34.9	42.8	21
PS-4	28/06/23	1 km	Agricultural fields	35.3	44.6	20

Table 10-22 Transects completed during March 2024 surveys of the Nurobod BESS area

NAME OF TRANSECT	DATE	START OF TRANSECT N, E (DD FORMAT)	END OF TRANSECT N, E (DD FORMAT)	LENGTH, KM	BIOTOPE
Nurabad_ 2024-05-14 15:22_1.12km	14/05/2024	39.575297 66.742706	39.575114 66.753605	1.12	Fallow land

10.5.3.2 Results

Literary sources suggest the potential presence of 13 species, including some endemic and conservationally important species such as the Central Asian Tortoise and Central Asian Cobra.

The surveyed territory is significantly influenced by human activities, including agriculture (wheat and barley cultivation) and pastoral land use. During the June 2023 field survey, zero species were recorded at points PS3 and PS4. However, the 100MW site has similar habitats where a total of 3 reptile species were identified at PS1, PS2 and PS5: Steppe agama (*Trapelus sanguinolentus*), Asian snake-eyed skink (*Ablepharus pannonicus*) and Steppe Racerunner (*Eremias arguta*).

Table 10-23 List of species potentially present at Nurobod BESS

№	Species	Species presence acc. to literary sources	Species noted during surveys	Abundance	Endemism	Conservation status		
						UzRDB	IUCN	CITES
1	*Turan toad* *Bufotes turanensis*	+		Common	UZ, TJ, TM			
2	Central Asian Tortoise *Testudo horsfieldii*	+		Common		2 (VU)	VU	II
3	Turkestan thin-toed gecko *Tenuidactylus fedtschenkoi*	+		Common	UZ, TJ, TM, KZ			
4	Steppe Agama *Trapelus sanguinolentus*	+	+ (Nearby 100MW Plant)	Common				
5	Asian snake-eyed Skink *Ablepharus pannonicus*	+	+ (Nearby 100MW Plant)	Common				
6	Schneider's skink *Eumeces schneideri*	+		Not numerous				
7	Glass lizard *Pseudopus apodus*	+		Not numerous				
8	Rapid Racerunner *Eremias velox*	+		Common				
9	Steppe racerunner *Eremias arguta*	+	+ (Nearby 100MW Plant)	Not numerous				
10	Tatary sand boa *Eryx tataricus*	+		Rare		3 (NT)		II

№	Species	Species presence acc. to literary sources	Species noted during surveys	Abundance	Endemism	Conservation status		
						UzRDB	IUCN	CITES
11	Sand racer *Psammophis lineolatus*	+		Common				
12	Spotted whip snake *Hemorrhois ravergieri*	+		Common				
13	Central Asian cobra *Naja oxiana*	+		Rare	UZ, TM, TJ, IR, AF, PK	3 (NT)	DD	II

Notes: UzRDB– species/subspecies listed in the Red Data Book of Uzbekistan (2019) (VU – vulnerable; NT – near-threatened); IUCN – species included in the Red List of the International Union for Conservation of Nature (VU - vulnerable); CITES I, II – species listed in the appendices (I, II) to the Convention on International Trade in Endangered Species of Wild Fauna and Flora; Endemism: AF – Afghanistan; CN – China; KZ – Kazakhstan; IR – Iran; TM – Turkmenistan; KG – Kyrgyzstan; TJ – Tajikistan; UZ – Uzbekistan.

During the Spring survey conducted in March 2024 no herptile species were recorded. In addition, the survey did not record the Central Asian Tortoise, however, it was considered likely that this species is present in the project area, albeit in few numbers.

In May 2024, during more optimal survey period, 1 Central Asian Tortoise was recorded along the adjacent transect, giving a density estimate of 0.89 individuals/ha.

10.5.4 70-km OTL Site

10.5.4.1 Methodology

The herptile survey for the 70km OTL was undertaken on 30th August 2023, and employed a blend of stationary survey points and transect methodologies, to gather detailed ecological data across different biotopes. A total of 8 sample points and transects (PLN-1 to PLN-8) were selected along the 70km OTL footprint. Additional surveys were completed on 15th May 2024 to align with more optimal active periods for the Central Asian Tortoise. Three transects (70kmOTL_1-3) along the 70km OTL were surveyed during this period.

These points were chosen to capture a wide array of environmental parameters, including air and soil temperatures, and humidity levels, providing a snapshot of the local climatic and soil conditions which are vital for assessing the potential impact of the project on these ecosystems. Complementing the stationary points, transect surveys were carried out along paths that extended for 1 to 2 kilometers within both the deposited lands and the agricultural fields. This method facilitates the accurate measurement of the perpendicular distance from the transect axis to each observed individual, thereby allowing for the calculation of reptile density within the area.

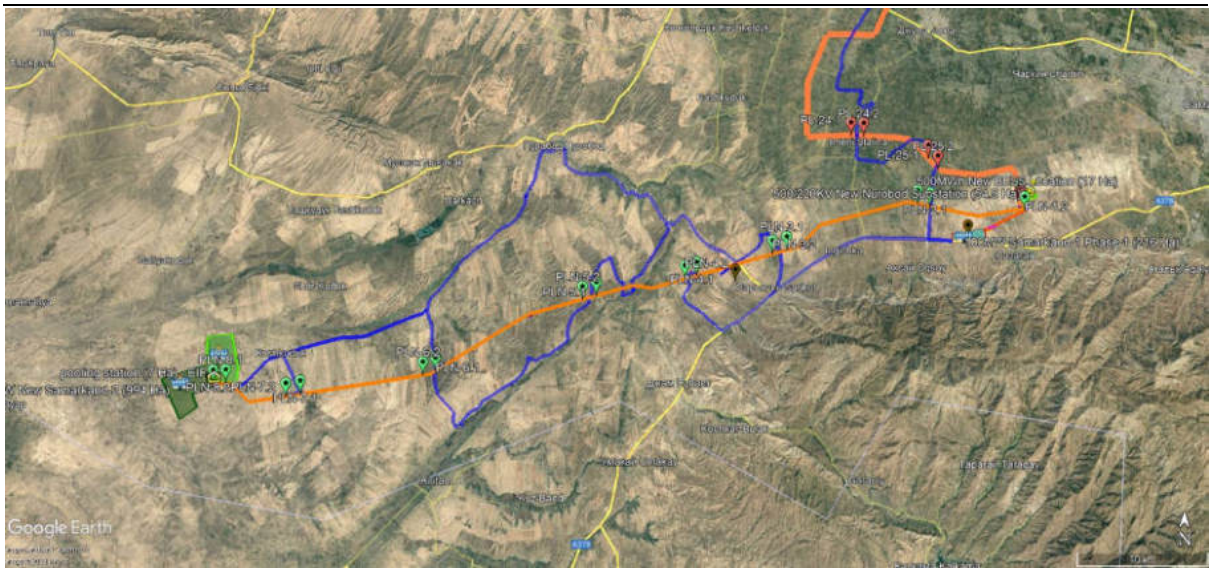

Figure 10-28 Survey transects on 70km OTL during the Summer 2023 Survey

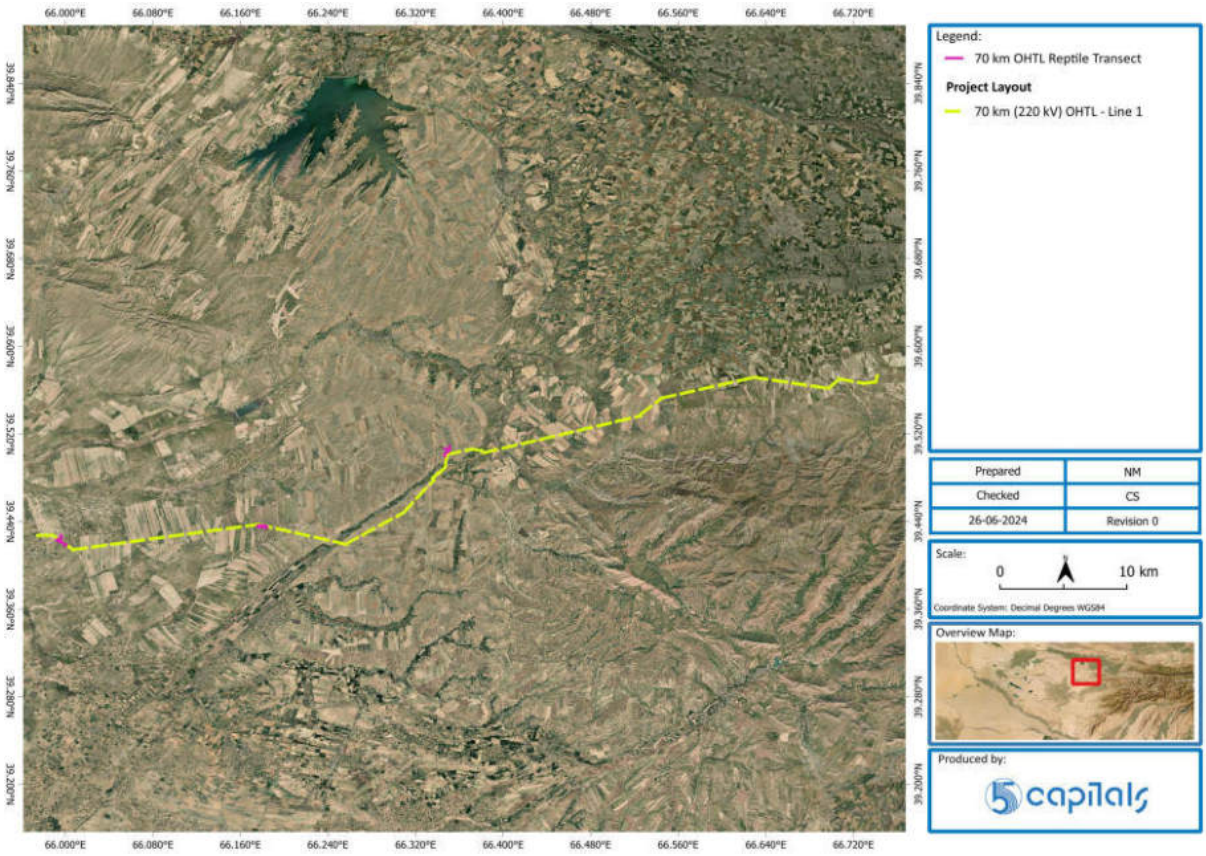

Figure 10-29 Survey transects on 70km OTL during the Spring 2024 Survey

Table 10-24 Survey transects on 70km OTL corridor (August 2023)

POINT	DATE	BEGIN OF TRANSECT	END OF TRANSECT	LENGTH KM	BIOTOPE	T AIR °C	T SOIL, °C	HUMIDITY, %
PLN-1	30/08/23	39.576059° 66.737745°	39.566393° 66.742018°	1.13	Sazagan site	24.6	26.8	32
PLN-2	30/08/23	39.568289° 66.651061°	39.569996° 66.639031°	1.06	Wheat fields, fallow land, ravine	28.3	47.7	32
PLN-3	30/08/23	39.533276° 66.512261°	39.530160° 66.498623°	1.26	A ravine, a scour	28.4	32.6	32
PLN-4	30/08/23	39.512995° 66.426383°	39.510381° 66.414994°	1.04	Bagara foothills through which the gas pipeline passes	28.4	31.9	30
PLN-5	30/08/23	39.504631° 66.367995°	39.503814° 66.361326°	1.06	The natural hilly landscape	25.4	37.8	30
PLN-6	30/08/23	39.439060° 66.180656°	39.435895° 66.169032°	1.07	The hills between the bagara	27.0	47.0	29
PLN-7	30/08/23	39.420389° 66.054487°	39.418424° 66.040842°	1.2	Small-scale transformation of the territory near the village, steppe area	29.2	38.9	32
PLN-8	30/08/23	39.427239° 65.983609°	39.426674° 65.971470°	1.05	Well-preserved steppe site with salinization	31.0	35.7	28

Table 10-25 Survey transects on 70 km OTL 15 May 2024

NAME OF POINT	DATE AND TIME	START OF TRANSECT N, E (DD FORMAT)	END OF TRANSECT N, E (DD FORMAT)	LENGTH, KM	BIOTOPE
70km OTL_1	15/05/24	39.499133 66.346217	39.505922 66.345690	2 km	Dry grassland
70km OTL_2	15/05/24	39.436137 66.175653	39.435445 66.175692	2 km	Dry grassland
70km OTL_3	15/05/24	39.427084 65.995941	39.423554 65.993406	3 km	Dry grassland and fallow lands

10.5.4.2 Results

Literary sources suggest the potential presence of 15 species, 6 of which are endemic to the region or of elevated conservation concern.

During the Herptile Surveys in August 2023, three species were confirmed to occur in the project area.

- A single Central Asian Tortoise was recorded along the 70km OTL route, in addition to a number of burrows (9) and 1 carapace during the survey. The habitat along the route is suitable, therefore higher densities of this species is considered likely in this area.
- Steppe Agama (*Trapelus sanguinolentus*) was observed at survey point PLN 3, 6, 7 and 8 indicating a population density of 1.4, 2.1, 4.6 and 2.2 individuals per hectare respectively.
- Rapid Racerunner (*Eremias volex*) was observed across survey points PLN-7 (3 individuals) and PLN-8 (2 individuals). The population density for this species was calculated at 7.4 individuals per hectare at PLN-7 and 3.2 individuals per hectare at PLN-8.

A comparison between literature sources and field survey results are shown in the table below.

Table 10-26 List of species potentially present at along the 70km OTLs

№	Species	Species presence acc. to literary sources	Species noted during surveys	Abundance	Endemism	Conservation status		
						UzRDB	IUCN	CITES
1	*Turan toad* *Bufotes turanensis*	+		Common	UZ, TJ, TM			
2	Central Asian Tortoise *Testudo horsfieldii*	+	+	Common		2 (VU)	VU	II
3	Turkestan thin-toed gecko *Tenuidactylus fedtschenkoi*	+		Common	UZ, TJ, TM, KZ			
4	Steppe Agama *Trapelus sanguinolentus*	+	+	Common				
5	Asian snake-eyed Skink *Ablepharus pannonicus*	+		Common				
6	Schneider's skink *Eumeces schneideri*	+		Not numerous				
7	Glass lizard *Pseudopus apodus*	+		Not numerous				

№	Species	Species presence acc. to literary sources	Species noted during surveys	Abundance	Endemism	Conservation status		
						UzRDB	IUCN	CITES
8	Rapid Racerunner *Eremias velox*	+	+	Common				
9	Steppe racerunner *Eremias arguta*	+		Not numerous				
10	Caspian Monitor *Varanus griseus caspius*	+		Rare		2 (VU: D)		I
11	Tatary sand boa *Eryx tataricus*	+		Rare		3 (NT)		II
12	Sand racer *Psammophis lineolatus*	+		Common				
13	Spotted whip snake *Hemorrhois ravergieri*	+		Common				
14	Spotted desert racer *Platyceps karelinii*	+		Not numerous				
15	Central Asian cobra *Naja oxiana*	+		Rare	UZ, TM, TJ, IR, AF, PK	3 (NT)	DD	II

Notes: UzRDB– species/subspecies listed in the Red Data Book of Uzbekistan (2019) (VU – vulnerable; NT – near-threatened); IUCN – species included in the Red List of the International Union for Conservation of Nature (VU - vulnerable); CITES I, II – species listed in the appendices (I, II) to the Convention on International Trade in Endangered Species of Wild Fauna and Flora; Endemism: AF – Afghanistan; CN – China; KZ – Kazakhstan; IR – Iran; TM – Turkmenistan; KG – Kyrgyzstan; TJ – Tajikistan; UZ – Uzbekistan.

During May 2024 surveys, no Central Asian Tortoise were observed, however, there are suitable habitat patches and based on local expert opinion, it is possible that the species can be found within the alignment.

10.5.5 400 MW PV plant, Pooling station and Access Road Sites

10.5.5.1 Methodology

The herptile survey for the 400 MW PV, Pooling station was undertaken via undertaken via a total of 5 Survey Points (P1-P5) and 5 transects (P1-P5) on June 27, 2023, during the Summer as well as April 2024 during the Spring (17, 18, 19 April 2024).

The environmental assessment incorporated both survey points and transects. Five survey points were strategically located to cover the variability within the biotopes of deposited lands and gravelly-clay plains. These points were crucial for measuring environmental parameters such as air temperature, soil temperature, and humidity, offering a granular view of the climate and terrain conditions prevalent in the project area. The precise locations of these points were chosen to ensure that the data collected was representative of the broader environmental characteristics of the Koshkuduk area, thereby providing an accurate account of the baseline conditions before the onset of project activities.

Complementary to the survey points, a series of transects were delineated, extending over distances ranging from 2 to 5 kilometers across the same biotopes. These transects were meticulously planned to traverse the varied landscape, enabling a comprehensive assessment of the area's ecological features over a wider expanse. The transects facilitated a dynamic examination of the environmental attributes, enhancing the understanding of spatial distribution patterns and potential ecological gradients within the surveyed biotopes.

The initial survey period did not align with the Central Asian tortoise's active period. This species was in a state of aestivation during the survey. Further herpetological surveying was carried out in Spring 2024 to ensure that the active period for this species is surveyed effectively.

Figure 10-30 Survey points and transects across the 400MW PV and Pooling station

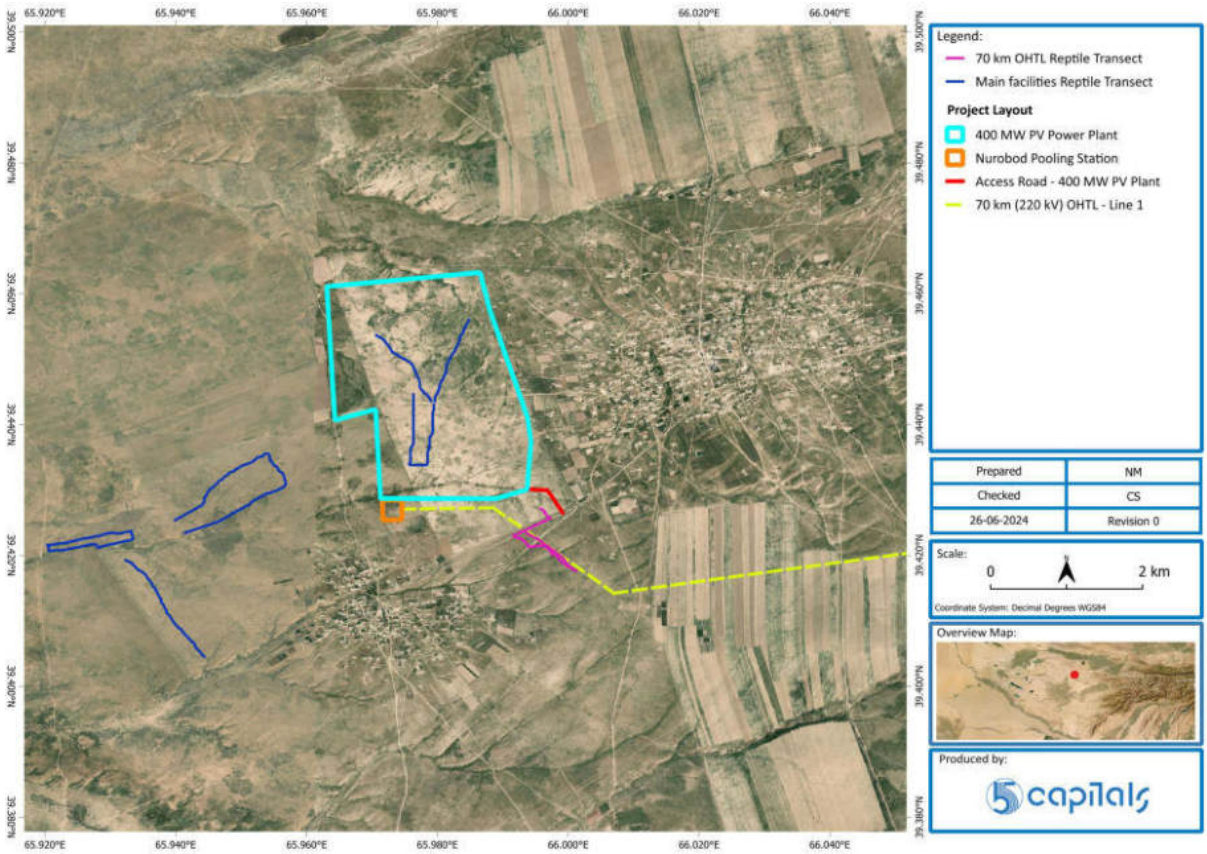

Figure 10-31 Survey points and transects at 400 MW PV and Pooling station in March 2024

Table 10-27 Survey Points on 400 MW PV and Pooling Station (June 2023)

No	Name of point	Date and time	N (dd format)	E(dd format)	Biotope	T air °C	T soil, °C	Humidity, %
1	P-1	27/06/23	39.443530°	65.977999°	Deposited lands	33,7	41,4	21
2	P-2	27/06/23	39.444009°	65.987181°	Deposited lands	33,5	40,6	21
3	P-3	27/06/23	39.426815°	65.966046°	Gravelly-clay plain	33,4	41,7	21
4	P-4	27/06/23	39.427411°	65.933010°	Gravelly-clay plain	31,2	38,6	22
5	P-5	27/06/23	39.419400°	65.944827°	Gravelly-clay plain	30,8	37,3	22

Table 10-28 Survey Transects on 400 MW PV and Pooling Station (June 2023)

No	Name of transect	Date and time	Length	Biotope	T air °C	T soil, °C	Humidity, %
1	P-1	27/06/23	5 km	Deposited lands	34,7	46,4	20
2	P-2	27/06/23	3,6 km	Deposited lands	33,5	40,6	21
3	P-3	27/06/23	2 km	Gravelly-clay plain	33,4	41,7	21
4	P-4	27/06/23	2,6 km	Gravelly-clay plain	31,2	38,6	22
5	P-5	27/06/23	4 km	Gravelly-clay plain	30,8	37,3	22

10.5.5.2 Results

The assessment identified a potential presence of 12 species according to literary sources. Key conservation statuses highlight the ecological importance of several species, particularly the Central Asian Tortoise and Tatary sand boa, both under CITES Appendix II and classified as Vulnerable (VU) and Near Threatened (NT) respectively by the IUCN and the Red Data Book of Uzbekistan.

During surveying it was noted that the area is under significant use but still hosts a variety of reptile species, suggesting resilience among these communities to the current levels of anthropogenic pressure. Four species were recorded during June 2023 surveys, all characteristic of the piedmont plains and foothills of Uzbekistan. The species recorded along with their population densities measured in individuals per hectare (inds/ha) at specified survey points and transects are as follows:

- Turkestan thin-toed gecko (*Tenuidactylus fedtschenkoi*): Found at survey point P-4 with a population density of 3.8 individuals per hectare (inds/ha).
- Steppe Agama (*Trapelus sanguinolentus*): Observed at survey points P-4 and P-5 with densities of 0.6 inds/ha and 1.0 inds/ha, respectively.
- Sunwatcher Toad-headed Agama (*Phrynocephalus helioscopus*): Detected at survey points P-3 and P-5 with population densities of 4.1 inds/ha and 2.1 inds/ha, respectively.
- Rapid racerunner (*Eremias velox*): Located across survey points P-3, P-4, and P-5 with densities of 2.9 inds/ha, 1.6 inds/ha, and 1.8 inds/ha, respectively.
- Zero Central Asian Tortoises were recorded in the project areas during the Herptile Surveys in June 2023. This is not considered unusual, however, as the survey was undertaken during the aestivation period of this species. However, presence of this species was confirmed in the 400MW through the observations of 3 carapaces during a scoping visit in July and August 2023.

During the April 2024 surveys, the following reptiles species were recorded in the project sites:

- Central Asian Tortoise (*Testudo horsfiedii*): 21 individuals were recorded adjacent to the project site while 7 individuals were recorded within the 400MW and Pooling Station area. The average density of this species in these areas is 0.63 individuals per hectare and 0.66 individuals per hectare respectively. The 696m access road to the 400MW Solar PV area recorded 7 individuals with at a density of 16.76 individuals/hectare.
- Steppe Agama (*Trapelus sanguinolentus*): Two individuals were recorded at and near the 400MW PV site

Table 10-29 List of herptile species potentially inhabiting 400 MW PV plant, Pooling Station

№	Species	Species presence acc. to literary sources	Species noted during surveys	Abundance	Endemism	Conservation status		
						UzRDB	IUCN	CITES
1	Turan toad *Bufotes turanensis*	+		Common	UZ, TJ, TM			
2	Central Asian Tortoise *Testudo horsfieldii*	+		Common		2 (VU)	VU	II
3	Turkestan thin-toed gecko *Tenuidactylus fedtschenkoi*	+	+	Common	UZ, TJ, TM, KZ			
4	Steppe Agama *Trapelus sanguinolentus*	+	+	Common				
5	Sunwatcher toad-headed agama *Phrynocephalus helioscopus*	+	+	Not numerous				
6	Rapid Racerunner *Eremias velox*	+	+	Common				
7	Steppe racerunner *Eremias arguta*	+		Not numerous				
8	Caspian Monitor *Varanus griseus caspius*	+		Rare		2 (VU:D)		I
9	Tatary sand boa *Eryx tataricus*	+		Rare		3 (NT)		II
10	Sand racer *Psammophis lineolatus*	+		Common				
11	Spotted whip snake *Hemorrhois ravergieri*	+		Not numerous				
12	Spotted desert racer *Platyceps karelinii*	+		Not numerous				

Notes: UzRDB– species/subspecies listed in the Red Data Book of Uzbekistan (2019) (VU – vulnerable; NT – near-threatened); IUCN – species included in the Red List of the International Union for Conservation of Nature (VU - vulnerable); CITES I, II – species listed in the appendices (I, II) to the Convention on International Trade in Endangered Species of Wild Fauna and Flora; Endemism: AF – Afghanistan; CN – China; KZ – Kazakhstan; IR – Iran; TM – Turkmenistan; KG – Kyrgyzstan; TJ – Tajikistan; UZ – Uzbekistan.

10.5.6 11-km LILO OTLs Sites

10.5.6.1 Methodology

The herptile survey for the 11km LILO OTL was undertaken via three sample points (LILO11km_1 to 3) on 11th March. Complementing the stationary points, transect surveys were carried out on 11th March and 6th April 2024 along paths that extended for 1 to 2 kilometers within both

the deposited lands and the agricultural fields. This method facilitates the accurate measurement of the perpendicular distance from the transect axis to each observed individual, thereby allowing for the calculation of reptile density within the area.

The following map shows the survey coverage of the project area.

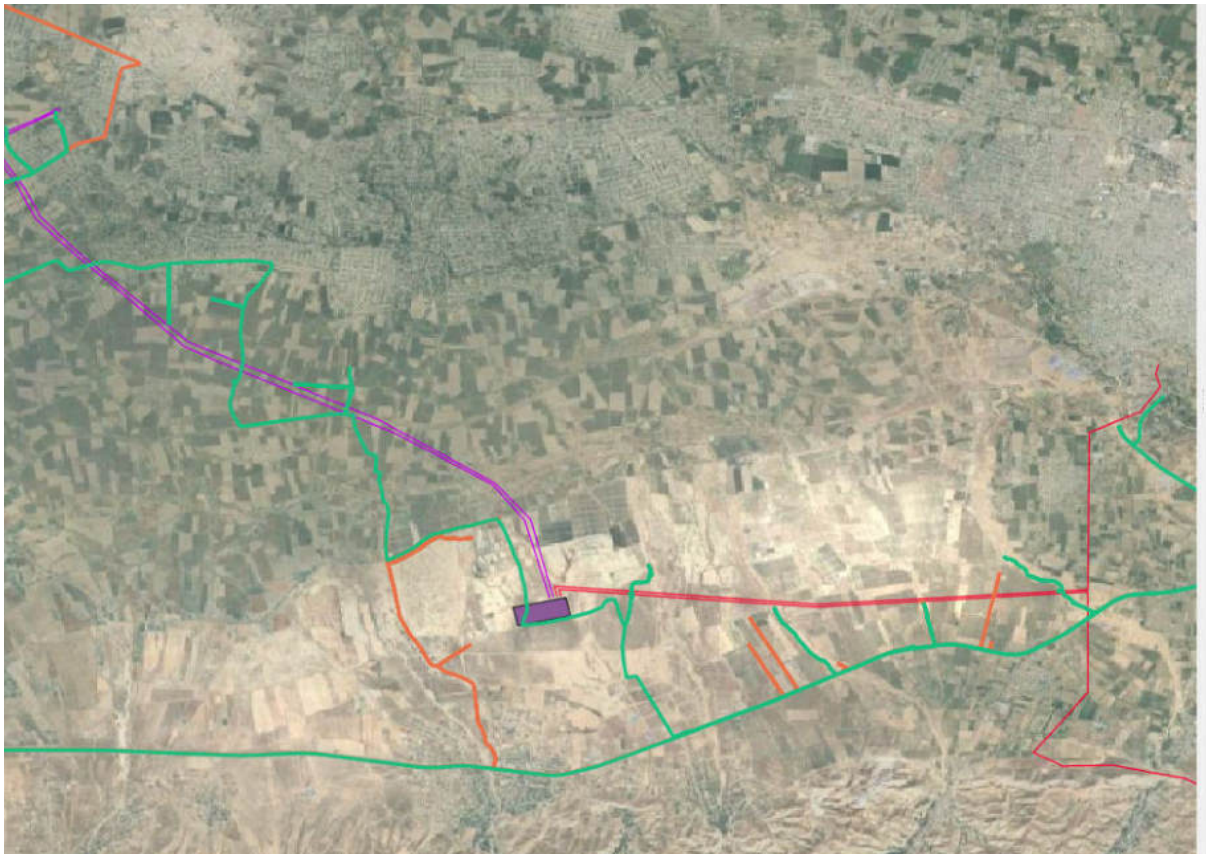

Figure 10-32 Survey Transects (Orange and Green) along 11km (Red) OTL

Table 10-30 Location of Survey Points

No	Name of point	Date and time	N	E	Biotope
1	LILO11km_1	11/03/24	39.579708	66.855531	Vineyard
2	LILO11km_2	11/03/24	39.579296	66.838477	Fallow lands
3	LILO11km_3	11/03/24	39.576897	66.802835	Temporary stream and riverbed

10.5.6.2 Results

The habitats along the proposed OTL route are dominated by highly modified landscapes i.e. agricultural fields. The route crosses two small temporary streams fed by rainwater. Heavy machinery was observed operating on both watercourses as a consequence of which the riverbeds are artificially altered and heavily degraded.

During the 2024 surveys, neither direct observations of reptile species nor signs of evidence of the same, such as tracks, were recorded onsite. Although no signs of the Central Asian Tortoise was observed in the project area, likelihood of presence remains high.

10.5.7 19-km LILO OTLs Sites

10.5.7.1 Methodology

The herptile survey for the 19km LILO OTL was undertaken via three sample points (LILO11km_1 to LILO11km_3) on 11th March. Complementing the stationary points, transect surveys were carried out on 11th March and 6th April 2024 along paths that extended for 1 to 2 kilometers within both the deposited lands and the agricultural fields. This method facilitates the accurate measurement of the perpendicular distance from the transect axis to each observed individual, thereby allowing for the calculation of reptile density within the area.

The following map shows the survey coverage of the project area.

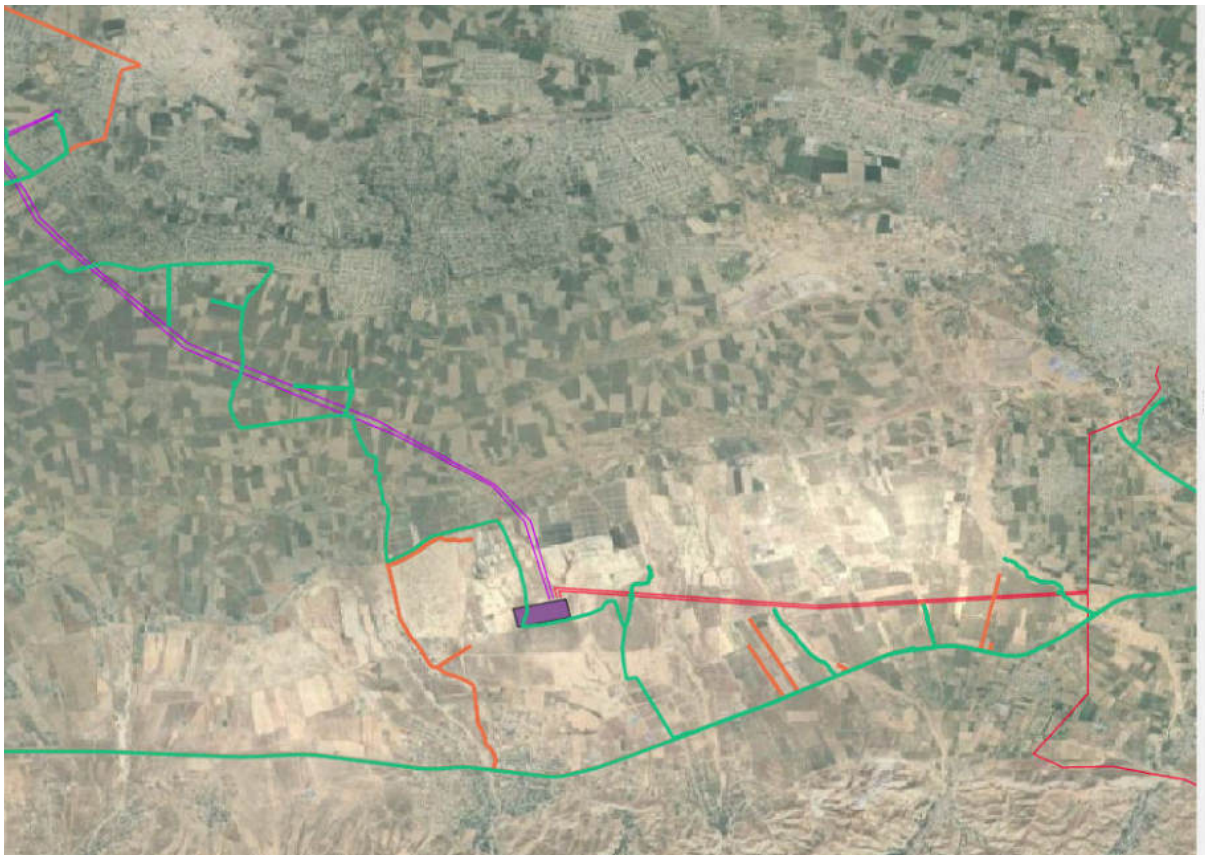

Figure 10-33 Survey Transects (Orange and Green) along 19 km (Purple) LILO

Table 10-31 Location of Survey Points

No	Name of point	Date and time	N	E	Biotope
1	LILO11km_1	11/03/24	39.579708	66.855531	Vineyard
2	LILO11km_2	11/03/24	39.579296	66.838477	Fallow lands
3	LILO11km_3	11/03/24	39.576897	66.802835	Temporary stream and riverbed

10.5.7.2 Results

During the 2024 surveys, neither direct observations of reptile species nor signs or evidence of the same, such as tracks, were recorded onsite. Although no signs of the Central Asian Tortoise was observed in the project area, likelihood of presence remains high due to suitable habitat.

10.6 Non-Volant Mammals

10.6.1 Methods

To assess and record the mammal populations present in the Project area and surrounding Areas of Influence, meticulous field surveys were employed, encompassing the 100 MW PV solar plant, Nurabad BESS, and 400MW PV Plant area. These surveys utilized a combination of walkover transect surveys and point observations to gather data on mammal activity and habitat use. Each walkover transect ranged from 0.5 to 1.5 kilometres in length, with a 3-meter width for recording mammal activity traces, and a 50-meter width for observing the mammals themselves. Binoculars were used for additional territory surveillance, and general observations were made from a moving vehicle. The data recorded during the walkover routes included tracks, burrows, animal droppings, and direct observations of the animals.

Coordinates of encounters were documented, and habitat areas, activity traces, and the animals themselves were photographed. The research took place on June 15, 29; July 26-27; August 29-30, 2023, covering a total of 15,000 meters of traversed transects and surveying an area of 3,190 hectares.

As part of a comprehensive mammal survey methodology, two camera traps were deployed on July 13 2023 across various project areas. This aimed to capture photographic evidence of mammalian presence and activity, supporting direct observational data with visual records. Deployment locations were carefully selected to encompass diverse habitats within the project vicinity, including the Pooling Station, and 400 MW PV plant, as detailed in the deployment log. Each Camera trap was assigned a unique identifier for precise tracking and data collection purposes. Unfortunately, the camera traps were stolen prior to August 2023, however, some information was retrieved prior to theft.

10.6.2 100 MW PV Plant

10.6.2.1 Methodology

Mammal biodiversity surveys of the Solar 100 MW PV Plant and its adjacent areas were executed on the 26th and 27th of July, 2023 and included 17 surveys points. These survey points included infrastructure elements such as overhead lines, electric line markers, gas pipe sections, a heritage buffer zone, chemical storage, and different phases and sections of the 100 MW Samarkand-1 project, among others. Each point was selected to provide a comprehensive understanding of the mammal species distributed across the project's landscape, taking into consideration the varying habitats that these infrastructures intersect or border. The geographic distribution of survey points, and sampling across 2 days, aimed to capture both the spatial and temporal variations in mammal species presence, accounting for daily and nocturnal activity patterns.

The methodological approach for the mammal survey entailed recording observations at each designated point, ensuring a wide coverage of the environmental gradients and anthropogenic features within the project area. This allowed for a detailed assessment of mammalian presence and activity patterns in relation to specific project components and natural features. The survey points ranged from the more disturbed areas, such as the vicinity of the chemical storage and the gas pipe buffers, to less disturbed sites like the heritage buffer zone and various segments of the Overhead Transmission Lines (OTL).

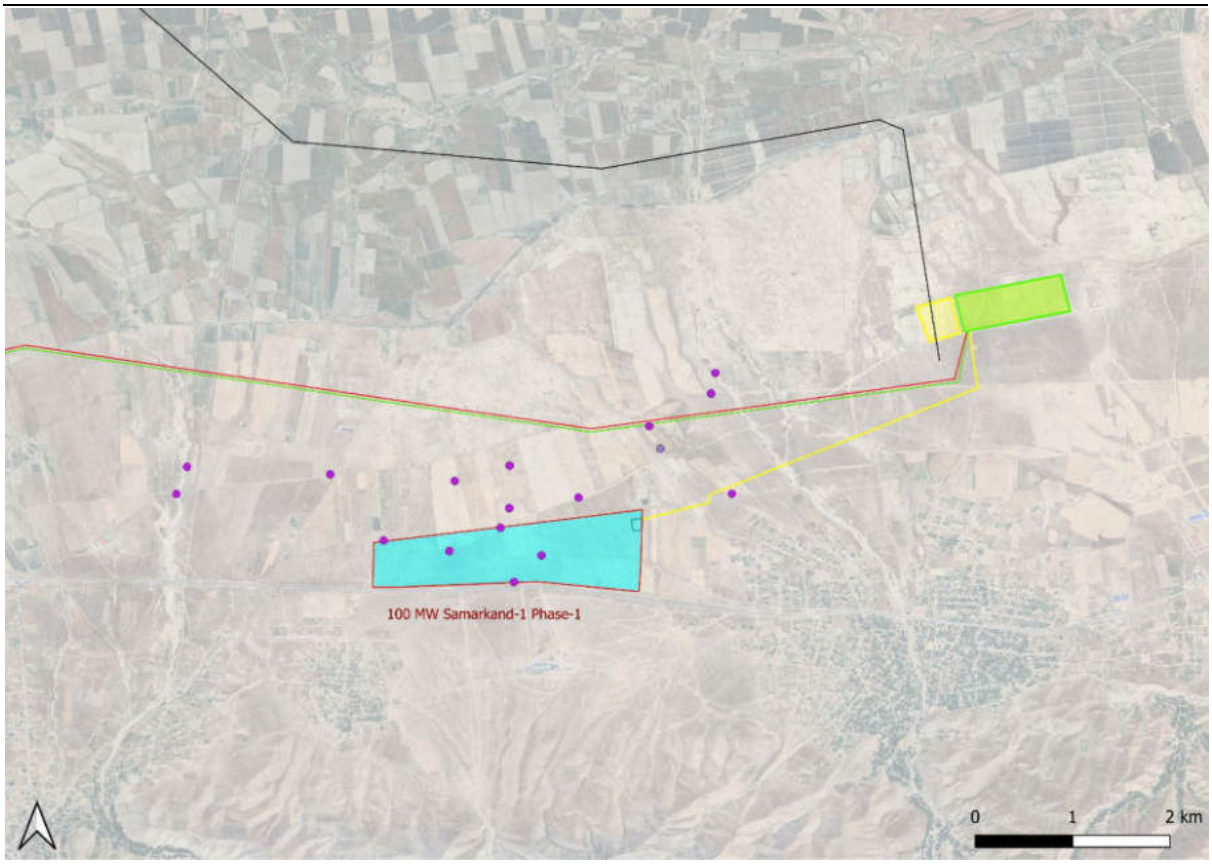

Figure 10-34 The survey points (violet points) on Solar 100 MW PV plant and its adjacent areas

Table 10-32 The survey points and coordinates on Solar 100 MW PV plant and its adjacent areas.

No.	Point	Date	N	E
1	Overhead line	26.07.2023	39.55709°	66.68725°
2	North South Electric Line North Marker	26.07.2023	39.54969°	66.68615°
3	Gas Pipe buffer – S	26.07.2023	39.56181°	66.70393°
4	Gas Pipe Western part	27.07.2023	39.55371°	66.64741°
5	Gas Pipe 2	27.07.2023	39.55606°	66.66579°
6	Gas Pipe (Central part)	27.07.2023	39.56571°	66.71132°
7	Overhead line	26.07.2023	39.55709°	66.68725°
8	North South Electric Line North Marker	26.07.2023	39.54969°	66.68615°
9	Gas Pipe buffer – S	26.07.2023	39.56181°	66.70393°
10	Gas Pipe Western part	27.07.2023	39.55371°	66.64741°
11	Gas Pipe 2	27.07.2023	39.55606°	66.66579°
12	Gas Pipe (Central part)	27.07.2023	39.56571°	66.71132°
13	Overhead Line 2	27.07.2023	39.55527°	66.68068°
14	100MW Samarkand-1 Phase-1 (216 Ha)	27.07.2023	39.54690°	66.68003°
15	100MW Samarkand-1 Phase-1	27.07.2023	39.54639°	66.69105°

No.	Point	Date	N	E
16	Heritage buffer	27.07.2023	39.55202°	66.68721°
17	OTL-S (eastern part)	27.07.2023	39.55374°	66.71382°

10.6.2.2 Results

The research documented nine mammal species, categorized into one insectivore, four rodents, and four predators, underscoring the varied ecosystem supported by the region. A list of recorded species is presented in the following table.

Table 10-33 Primary data of mammals recorded on 100 MW PV Plant

No	Species	Conservation Status			Observation	Inferred Abundance
		UzRDB	IUCN	CITES		
1	Long-eared hedgehog *Hemiechinus auritus*	-	-	-	Track	Common
2	Yellow ground squirrel *Spermophilus fulvus*	-	-	-	2 burrows	Numerous
3	Zaisan mole vole *Ellobius tancrei*	-	-	-	1 colony	Common
4	Tien Shan vole *Microtus ilaeus*	-	-	-	3 burrows nearby	Sparse
5	Libyan jird *Meriones libycus*	-	-	-	1 colony	Sparse
6	Corsac fox *Vulpes corsac*	2(VU:D)	LC	-	1 burrow	Rare
7	Red fox *Vulpes vulpes*	-	-	-	Burrow	Common
8	Steppe polecat *Mustela eversmanni*	2(VU:D)	LC	-	Burrow	Rare
9	Asiatic wildcat *Felis silvestris ornata*	-	-	-	Track, burrow	Sparse

Of the four predatory species documented, two are of elevated conservation concern. The Corsac Fox (*Vulpes corsac turmenicus*) and Steppe Polecat (*Mustela eversmanni*), were recorded as a rare and both listed in the Red Data Book for Uzbekistan as Vulnerable, declining 2(VU:D). The Steppe Polecat was notably associated with the habitats of the yellow ground squirrel, which may suggest a specific ecological interaction. Its presence was inferred from burrows found in the area that were characteristic of this species, however whilst indicative it is not conclusive, and no other spoor was noted (i.e. droppings, other signs of polecat presence). In addition to these were the Karagan Fox (*Vulpes vulpes karagan*), which was widespread across all biotopes, and the less numerous Asiatic Wildcat (*Felis silvestris ornata*), found exclusively in a dry riverbed.

Despite historical accounts from local residents of the Tolai Hare (*Lepus tolai*), it was notably absent from the findings, suggesting a decline or significant change in its population within the surveyed area.

Quantitative data from the survey provided detailed insights into the abundance and distribution of these species. The Yellow Ground Squirrel was notably numerous, with the presence of predators like the Red Fox (*Vulpes vulpes*), categorized as common, indicating a balanced predator-prey dynamic within the ecosystem. In contrast, species such as the Corsac Fox and the Steppe Polecat were rare.

10.6.3 Nurobod BESS, 11-km LILO OTL, 19-km LILO OTL

10.6.3.1 Methodology

Field surveys were conducted on the 15th of June and 26th of July, 2023, with three locations chosen based on their proximity to the project elements and potential habitats of interest within the Nurabad region.

On the 15th of June 2023, two transects were surveyed. The first was located within the Nurobod BESS facility footprint (0.5km in length), and one adjacent to the facility adjacent, approximately 0.8km from the facility (1km in length). Additionally, on the 26th of July, 2023, the gas pipe buffer-N (eastern part) was surveyed with a transect length of 1 kilometre.

The selection of these specific survey points and transects was driven by the objective to comprehensively assess the mammalian species' presence and activity patterns in relation to the Nurobod BESS development. By examining these areas with varying transect lengths, the survey aimed to capture a snapshot of the mammalian diversity, their density, and distribution in proximity to energy infrastructure and associated areas.

The results for the Nurobod area surveying are considered representative of the 11-km and 19-km LILO OTL alignments based on similar habitats and expert opinion.

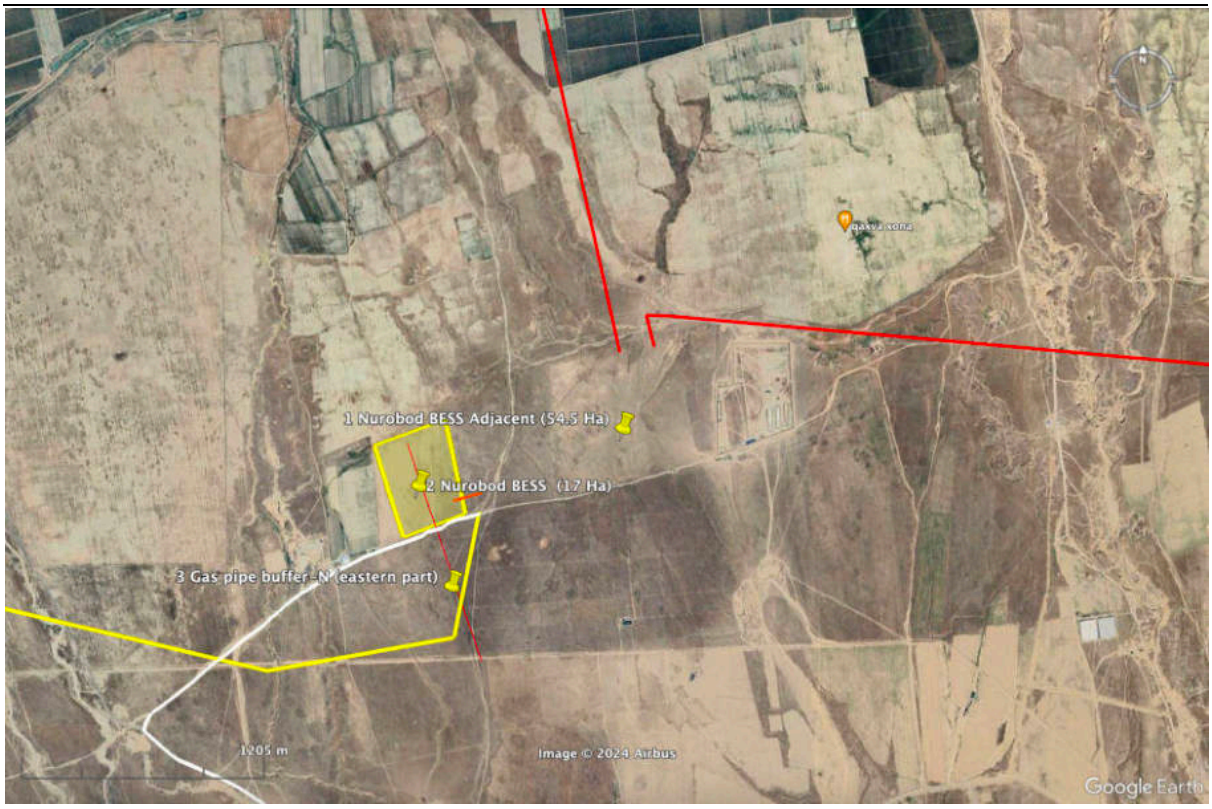

Figure 10-35 The survey points on Nurabad BESS (Yellow polygon) and adjacent areas, and their proximity to the 11km and 19km LILO (Red line)

Table 10-34 The survey points and coordinates on Nurobod BESS, and adjacent areas.

No.	Point	Date	N	E	Transect Length (km)
1	Adjacent to Nurobod BESS	15.06.2023	39.576222°	66.749989°	1
2	Nurobod BESS Location (17 Ha)	15.06.2023	39.573656°	66.738198°	0.5
3	Gas pipe buffer-N (eastern part)	26.07.2023	39.569192°	66.740091°	1

10.6.3.2 Results

The surveys conducted around the Nurabad BESS facility recorded a diverse array of mammal species at different trophic levels, integral to the local ecosystem. Based on field data and a specialist's expertise, supported by a literature review, abundance values were assigned. Signs of species activity along the survey tracks indicated 6 mammal species.

Table 10-35 Primary data of mammals recorded on Nurabad BESS

No	Species	Conservation Status			Observation	Inferred Abundance
		UzRDB	IUCN	CITES		
1	Long-eared hedgehog *Hemiechinus auritus*	-	-	-	Track	Common
2	Yellow ground squirrel *Spermophilus fulvus*	-	-	-	2 burrows	Common
3	Zaisan mole vole *Ellobius tancrei*	-	-	-	1 colony	Common
4	Red fox *Vulpes vulpes*	-	-	-	Burrow	Common
5	Steppe polecat *Mustela eversmanni*	2(VU:D)	LC	-	Burrow	Rare
6	Asiatic wildcat *Felis silvestris ornata*	-	-	-	Track, burrow	Sparse

The Long-eared hedgehog (*Hemiechinus auritus*) emerged as a fairly common species within the surveyed territory, marked by the visibility of its tracks and droppings, especially noted along dirt roads and the perimeters of barley fields. Notably, the once reported Lepus tolai (*Tolai hare*) has now become exceedingly rare, with no confirmatory evidence of its presence found during the survey.

The Yellow ground squirrel (*Spermophilus fulvus*) was the most frequently observed mammal, present across various biotopes ranging from flatlands and ravine slopes to the edges of fields and dirt roads. Their burrows and signs of activity were conspicuous throughout the survey area. Another commonly found species was the Zaisan mole vole (*Ellobius tancrei),* with colony excavations identified in sparsely vegetated flatlands and on terraces of what were once agricultural fields.

Predators such as the Red fox (*Vulpes vulpes karagan*) were common across all biotopes, evidenced by tracks, burrows, and droppings. The Asiatic wildcat (*Felis silvestris ornata*), though less common, was detected in a singular location - a dry riverbed. The diversity in the rodent population, including the abundant presence of Yellow Ground Squirrel, provides a food base for the predatory species recorded.

The Steppe polecat (*Mustela eversmanni*), listed as Vulnerable nationally (UzRDB), generally found near yellow ground squirrel settlements, was identified as possibly present through its burrows, although no other spoor was found.

10.6.4 70-km OTL

10.6.4.1 Methodology

The survey of the 70 km Overhead Transmission Line (OTL) was conducted in accordance with IFC's recommendations on assessing the impact of linear objects on biodiversity. This detailed study, carried out on August 30, 2023, aimed to evaluate the potential effects of the OTL infrastructure on the local wildlife and their habitats along its route.

The methodology employed for this survey was based on walking route surveys along designated transects. Each transect spanned a strip width of 50 meters on either side of the power line, facilitating an extensive examination of the mammal presence through direct visual encounters and indirect evidence such as burrows, tracks, and droppings. This approach drew upon established methodologies, including those outlined by Novikov (1949) and the recent methodological recommendations provided by the Ministry of Ecology (2020).

A total of 8 points were selected along the OTL corridor (PLN-1 to PLN-8), representing the start of each transect (1-8). The selection of transects and survey points was designed to encompass all types of landscapes affected by the OTL, ranging from agricultural fields and fallow lands to ravines and natural hilly landscapes, including areas with varying degrees of anthropogenic transformation and natural steppe sites with signs of salinization. In total, eight transects were surveyed, covering a total length of 8.87 kilometres, which corresponds to 10.1% of the OTL's total length. This strategic sampling was critical for capturing the ecological diversity along the route and providing a robust basis for assessing the OTL's potential impacts on biodiversity.

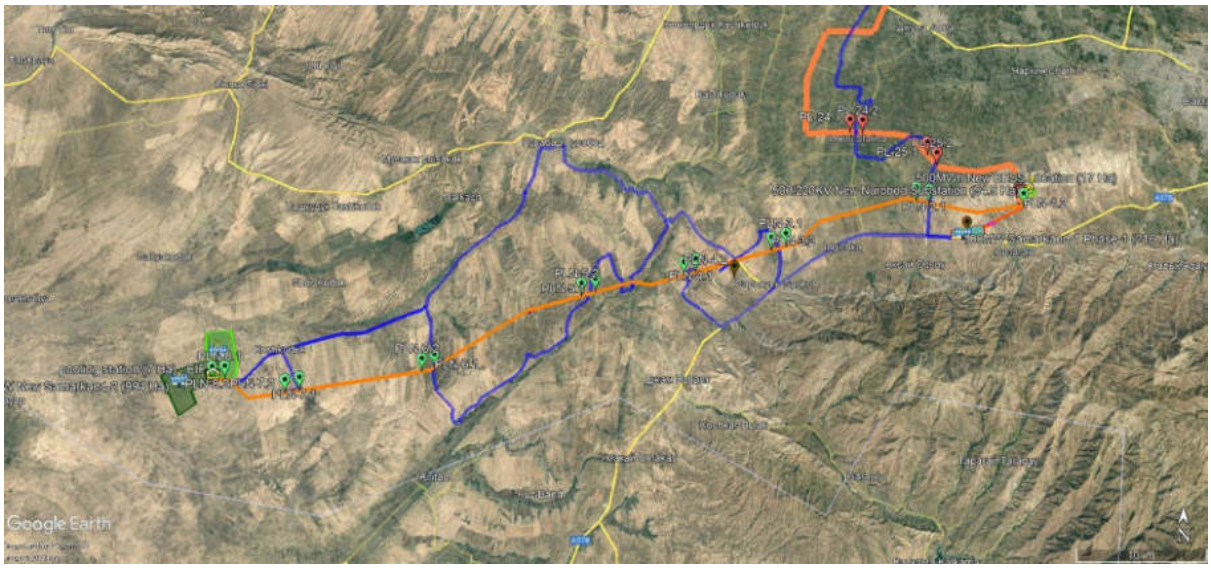

Figure 10-36 The survey points including survey points and transects of 70 km OTL

Table 10-36 The survey points and coordinates on70 km OTL

No.	Point	Date	Start of transect (N, E)	End of Transect (N, E)	Transect Length (km)
1	PLN-1	30/08/23	39.576059° 66.737745°	39.566393° 66.742018°	1.13
2	PLN-2	30/08/23	39.568289° 66.651061°	39.569996° 66.639031°	1.06
3	PLN-3	30/08/23	39.533276° 66.512261°	39.530160° 66.498623°	1.26
4	PLN-4	30/08/23	39.512995° 66.426383°	39.510381° 66.414994°	1.04
5	PLN-5	30/08/23	39.504631° 66.367995°	39.503814° 66.361326°	1.06
6	PLN-6	30/08/23	39.439060° 66.180656°	39.566393° 66.742018°	1.13
7	PLN-7	30/08/23	39.420389° 66.054487°	39.569996° 66.639031°	1.06
8	PLN-8	30/08/23	39.427239° 65.983609°	39.530160° 66.498623°	1.26

10.6.4.2 Results

Throughout the transects, a variety of species were recorded, highlighting the ecological richness of the Samarkand region along the 70 km OTL corridor. This was particularly true for the natural habitats along the survey territory; the minimal anthropogenic impact in these areas has allowed for a rich diversity of species, including the identification of rare species, although largely based on indirect signs rather than direct visual observations.

Table 10-37 Primary data of mammals recorded in Samarkand region along 70 km OTL

No	Species	Conservation Status			Location of Observation	Inferred Abundance
		UzRDB	IUCN	CITES		
1	Long-eared hedgehog *Hemiechinus auritus*	-	-	-	Transects 1, 2, 5, 7, 8	Common
2	Brandt's Hedgehog *Hemiechinus hypomelas*	3(NT)	LC	-	Transect 8	Rare
3	Yellow ground squirrel *Spermophilus fulvus*	-	-	-	All transects	Numerous
4	Small five-toed jerboa *Allactaga elater*	-	-	-	Transect 5	Rare
5	Severtzov's Jerboa *Allactaga severtzovi*	-	-	-	Transect 7 & 8	Rare
6	Grey Dwarf Hamster *Cricetulus migratorius*	-	-	-	Transect 1 & 2	Rare
7	Zaisan mole vole *Ellobius tancrei*	-	-	-	All transects except 3	Common
8	Libyan jird *Meriones libycus*	-	-	-	Transects 5 & 6	Sparse
9	Midday Jird *Meriones meridianus*	-	-	-	Transects 1, 4, 6, 7, 8	Rare
10	*House Mouse* *Mus musculus*	-	-	-	Transect 1	Sparse
11	Steppe polecat *Mustela eversmanni*	2(VU:D)	LC	-	Transect 3	Rare
12	Red fox *Vulpes vulpes*	-	-	-	Transects 1, 2, 3, 6, 7, 8	Common
13	Corsac fox *Vulpes corsac*	2(VU:D)	LC	-	Transects 3, 7, 8	Rare
14	African Wildcat *Felis libyca*	-	-	-	Transects 1, 2, 3, 6, 7	Common

The most significant observations were the possible presence of the Steppe Polecat (*Mustela eversmanni*), identified by the observation of burrows in Transect 3. The Steppe Polecat is listed as Nationally Vulnerable (UzRDB).

The Yellow ground squirrel (*Spermophilus fulvus*) was observed across all transects, underscoring its abundance and wide distribution across different biotopes. The Long-eared hedgehog (*Hemiechinus auritus*) was found across multiple transects, indicating its widespread presence in the area. Interestingly, Brandt's Hedgehog (*Hemiechinus hypomelas)* was noted on a single transect, suggesting either a habitat preference or lower population density. This species is of notable conservation concern, classified as Near Threatened in the Uzbekistan Red Data Book.

Other species such as the Lesser jerboa (*Allactaga elater*) and Severtzov's jerboa (*Allactaga severtzovi*) were noted in fewer transects, suggesting more specialized habitat requirements or lower detectability. The presence of the Migratory hamster (*Cricetulus migratorius*) and the

Zaisan mole vole (*Ellobius tancrei*) highlights the variety of rodent species that inhabit these areas, with *Ellobius tancrei* showing a gradient in abundance across the transects.

Several top tier predators were recorded Predatory species like the Red fox (*Vulpes vulpes*) and the Corsac fox (*Vulpes corsac*) were identified, reflecting the top predators' role in the ecosystem. The Asiatic wildcat (*Felis libyca*) was also present in multiple transects, indicating its adaptation to various habitats within the region.

10.6.5 400 MW PV plant, Pooling station

10.6.5.1 Methodology

The mammal survey at the Solar 400 MW PV plant, and pooling station, was conducted on the 29th and 30th of August 2023 and aimed to identify and document the presence and activities of mammalian species within these project areas and their adjacent environments. The survey encompassed a broad spectrum of observation points and transects, carefully chosen to cover a diverse range of biotopes and landscapes affected by these projects, from deposited lands and degraded plains to areas exhibiting signs of significant anthropogenic pressure, such as landfills and quarries.

The methodologies employed in these surveys enabled a thorough investigation of the mammal populations at the Solar 400 MW PV plant, including their pooling station and access roads. By systematically documenting the species present and their activity markers, the surveys provide valuable insights into the ecological impacts of these solar projects, guiding future conservation and mitigation strategies to ensure the coexistence of renewable energy development with local biodiversity.

A total of 19 observation points/transects were selected with the following IDs: 4004, 4005, 4009, 4015, 4030, 4092, 4007, 4012-4013, 4014, 4016, 4020, 4022-4023, 4024, 4025, 4026-4027, 4029, 4086-4087, 4088-4089, and 4095.

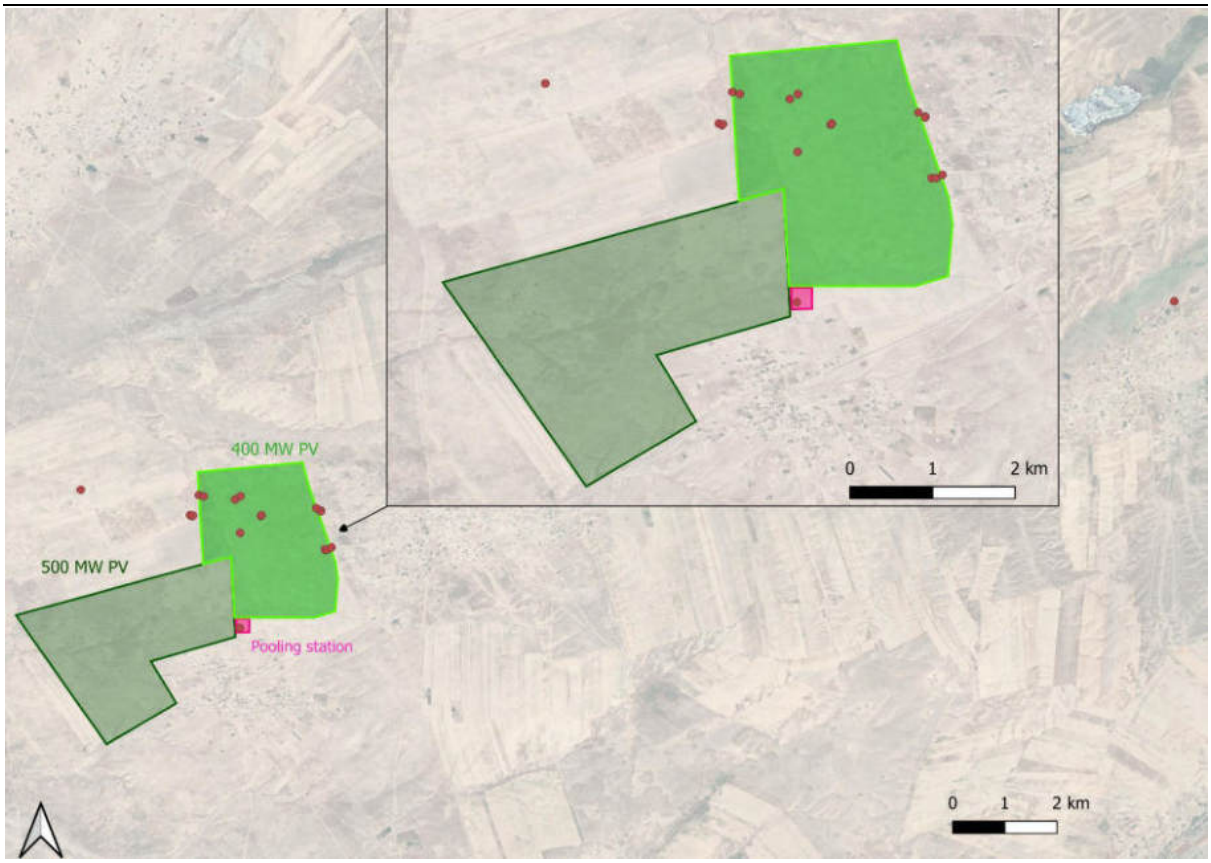

Figure 10-37 The survey points (red) on Solar 400 MW PV plant, pooling station, and adjacent areas

Table 10-38 The survey points and coordinates on Solar 400 MW PV plant, pooling station, and adjacent areas.

No.	Observation point/transect (Photo name)	Date	N	E
1	4004	29.08.2023	39.42827°	65.96511°
2	4005	29.08.2023	39.42841°	65.96503°
3	4009	29.08.2023	39.42916°	65.96394°
4	4015	29.08.2023	39.42982°	65.96483°
5	4030	29.08.2023	39.43549°	65.96428°
6	4092	29.08.2023	39.40108°	65.94357°
7	4007	29.08.2023	39.42877°	65.96455°
8	4012-4013	29.08.2023	39.42946°	65.96511°
9	4014	29.08.2023	39.42948°	65.96503°
10	4016	29.08.2023	39.42984°	65.96394°
11	4020	29.08.2023	39.43021°	65.96483°
12	4022-4023	29.08.2023	39.43046°	65.96428°
13	4024	29.08.2023	39.43046°	65.94357°
14	4025	29.08.2023	39.43019°	65.96455°

No.	Observation point/transect (Photo name)	Date	N	E
15	4026-4027	29.08.2023	39.43006°	65.96428°
16	4029	29.08.2023	39.42944°	65.96428°
17	4086-4087	29.08.2023	39.40074°	65.96484°
18	4088-4089	29.08.2023	39.40076°	65.96504°
19	4095	29.08.2023	39.42827°	65.96522°
20	Jerboa, fox, digging, hole 1 km, trace of a small fox	29.08.2023	39.42841°	65.96526°
21	Steppe polecat killed on the highway	29.08.2023	39.42916°	65.96531°
22	Degraded plain with virtually no vegetation	29.08.2023	39.42982°	65.96535°

10.6.5.2 Results

The mammalian surveys conducted at the Solar 400 MW PV plant, highlighted the presence of diverse mammalian species, including two that are listed in the Red Book of the Republic of Uzbekistan.

Table 10-39 Primary data of mammals recorded on Solar 400 MW PV plant and pooling station.

No	Species	Conservation Status			Observation	Inferred Abundance
		UzRDB	IUCN	CITES		
1	Brandt's hedgehog *Hemiechinus hypomelas*	3(NT)	LC	-		Rare
2	Yellow ground squirrel *Spermophilus fulvus*	-	-	-	Numerous burrows	Common
3	Corsac fox *Vulpes corsac*	2(VU:D)	LC	-	Recorded on Camera trap	Rare
4	Red fox *Vulpes vulpes*	-	-	-	Droppings and tracks	Common
5	Steppe polecat *Mustela eversmanni*	VU	-	-	1 kill road animal was found in 17 km to the East	

Five mammal species were identified. This includes Brandt's hedgehog (*Hemiechinus hypomelas*), which is rare and was notably found at the wet bottom of a riverbed. This species is of notable conservation concern, classified as Near Threatened in the Uzbekistan Red Data Book. The Yellow ground squirrel (*Spermophilus fulvus*), observed widely across various biotopes, emerged as the most numerous species. The Corsac fox (*Vulpes corsac turcmenicus*) and the Red fox (*Vulpes vulpes karagan*) were found in all surveyed biotopes, their presence

marked by droppings and tracks, highlighting their commonality in the area. Moreover, evidence of the Steppe polecat (*Mustela eversmanni),* another Red Book species, was discovered, indicating its potential presence despite being rare.

10.7 Bats

10.7.1 Context

Bats, mammals of the order Chiroptera, are generally split into overarching clades based on the use, or absence, of echolocation for communication and navigation.

Species of the group Megachiroptera, non-echolocating bats, such as Flying Foxes and Fruit Bats, are not present In the relevant landscapes and regions covered by the project elements. However, there are a number of Microchiroptera species, echolocating bats, that are known to roost, migrate, breed and reside in the greater region. Thus, two different types of bat surveying were undertaken with varying methodologies based on the appropriate coverage required at each site:

- Roost searches in suitable habitat/structures and features within the area of influence of project sites;
- Acoustic monitoring (passive long-term monitoring and active acoustic transects) undertaken in areas suitable for bat foraging and general flythrough activity.

A literature review on the subject of microchioptera in the region ascertained the following observations:

- **Species Diversity:** The literature highlights a diverse range of bat species potentially inhabiting the project area, with 17 species in the Samarkand region. This indicates a rich biodiversity of bats in the study area.
- **Habitat Preferences:** The identified bat species exhibit varying habitat preferences, including suitable habitats such as agricultural fields, ravines, riverbanks, and forests. Understanding these habitat preferences is crucial for designing effective conservation strategies and mitigating potential impacts of development projects on bat populations.
- **Conservation Status:** While most of the identified bat species are classified as Least Concern (LC) on the IUCN Red List, it is noteworthy that several species, including the Long-tailed Bat and Hemprich's Long-eared Bat, are listed under different categories of threat, such as Vulnerable (VU) and Data Deficient (DD). Additionally, three species are included in the Red Data Book of Uzbekistan, highlighting their conservation significance and the need for targeted conservation efforts.
- **Endemism and Legal Protection:** The presence of the Bukhara Horseshoe Bat, an endemic species of Central Asia, underscores the regional importance of bat conservation efforts. Furthermore, the inclusion of several bat species in international agreements such as the Convention on the Conservation of

Migratory Species of Wild Animals (CMS) reflects the global significance of their conservation.

10.7.2 Roost Search Method

The bat roost survey conducted in Spring 2024 combined desktop analysis of topographical maps and satellite imagery followed by on-the-ground fieldwork, to identify and assess potential bat roosting sites across the project area. Field surveys were understaken on 11th February 2024.

The initial stage involved an in-depth analysis of topographic maps (at scales of 1:100,000 and 1:200,000) and Google Earth satellite imagery to pinpoint locations of potential bat roosts, primarily focusing on buildings. These identified locations, complete with GPS coordinates, were then uploaded to the LocusPro smartphone application for field use, ensuring precise navigation and site verification during the subsequent field surveys. Field work included a survey of the potential roosts identified during the desktop stage. When a roost was found, it was thoroughly examined, both for the presence of bats and signs of bat activity such as guano and forage remains. All suitable bat habitat was surveyed, mapped and photographed. Each surveyed object was mapped, photographed; its brief description was made, including notes on the suitability of the objects for bats.

Navigational and data recording tasks were facilitated using a BV9900E smartphone equipped with the LocusPro app, preloaded with Google Hybrid maps for terrain navigation and track recording. The same smartphone model was used for photographic documentation. Additional field equipment included a torch, thick gloves, and a tape measure, essential for the safe and thorough examination of bat roosts. All findings and observations were systematically recorded in a notebook, with the LocusPro app serving to map surveyed roosts and bat sighting locations.

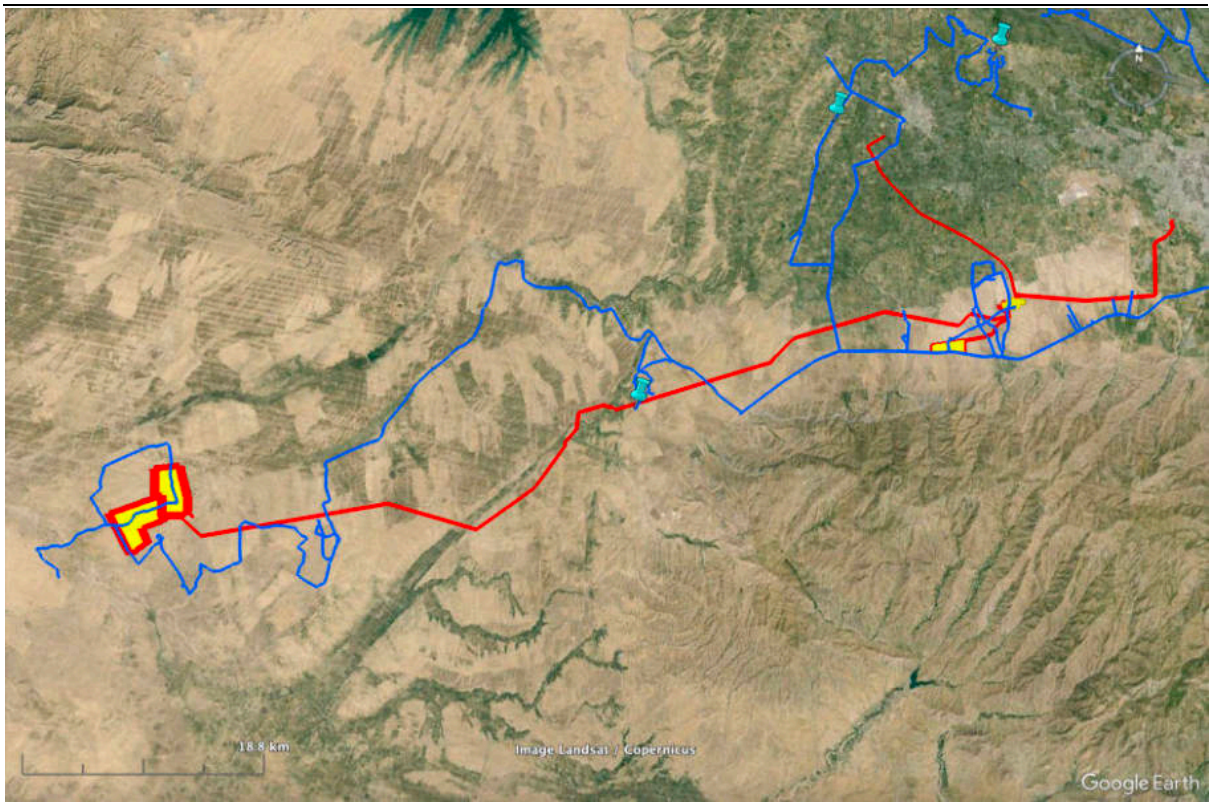

Figure 10-38 Survey tracks (Blue line) along project main and interconnection facilities and potential roosting sites as determined by desktop analysis (blue pins)

10.7.3 Acoustic Recording and Analysis Method

Bat activity was monitored using mobile bat detectors Echo Meter Touch (Wildlife Acoustics, USA) along two transects, one at each of the 100 MW, 400 MW and Nurobod BESS. The transects were surveyed twice, once in April (25th and 27th) in May (13th and 15th).

The transect passed along the route at registration points with a step of about 400 m. A stop was made at each registration point, during which the bat ultrasonic calls were recorded for approximately 10 minutes. After this, the recording was stopped, and started again at the next point. Surveying continued in this manner until the survey transect was finished. The detector recorded data from 19:50 to 23:40.

Due to the migratory patterns of bats in the area, the survey was conducted across two months. It was assumed that bats migrating above the survey sites would be counted in April, and sedentary species feeding above the survey sites would be counted in May.

100 MW PV Plant

10.7.3.1 Methodology

During desktop analysis, no suitable roosting sites were identified within the footprint of the 100MW PV Plant or surrounding area of influence. However, to confirm these conclusions, field

surveys were conducted on 11th February 2024. The survey tracks covered during investigations are shown in the figure below.

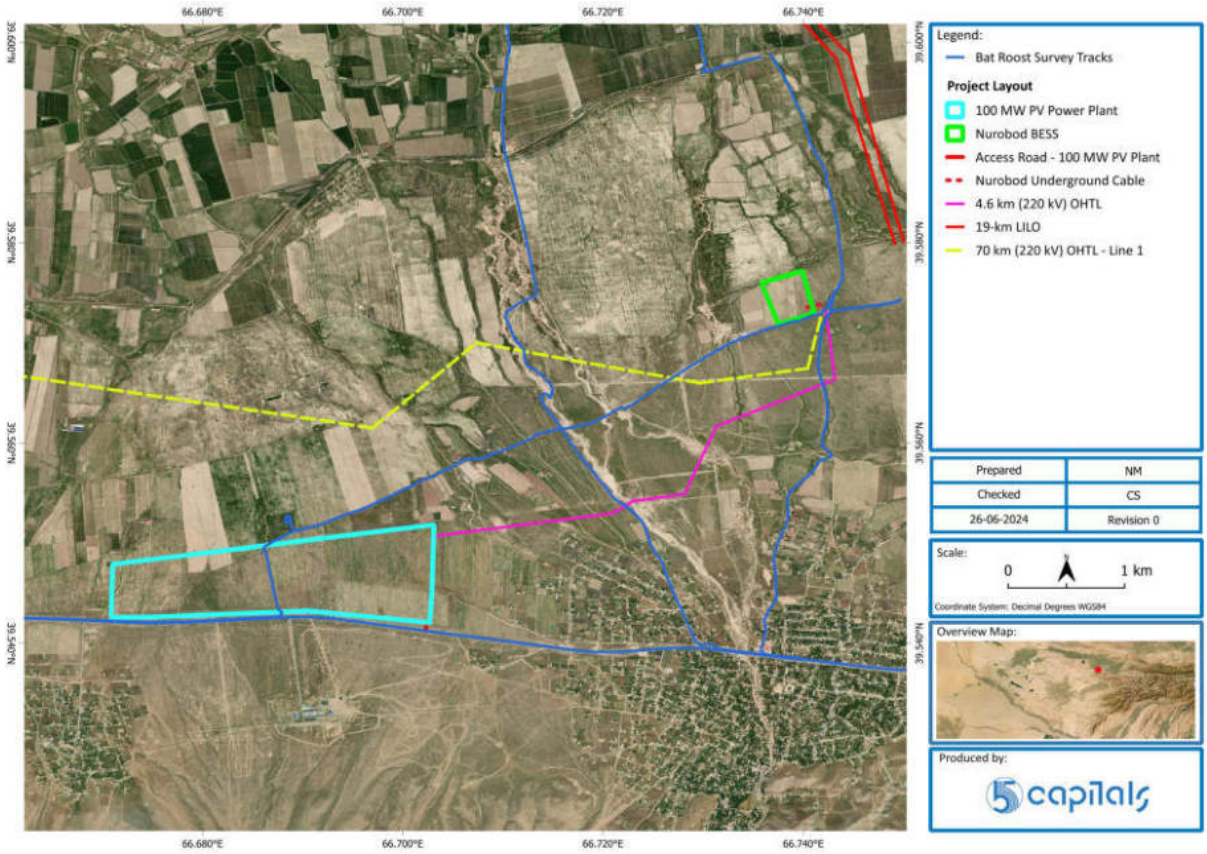

Figure 10-39 Survey tracks along 100 MW PV Plant and surroundings

Active acoustic monitoring was conducted to assess the presence of bat species at the site that oculd not be observed during roost searches. One transect was chosen to cover the 100MW PV Plant, and surveyed across two deployments; April (25th and 27th) and May (13th and 15th). Recordings were taken at stops every 400m along the transect. Each recording lasted for 10 minutes.

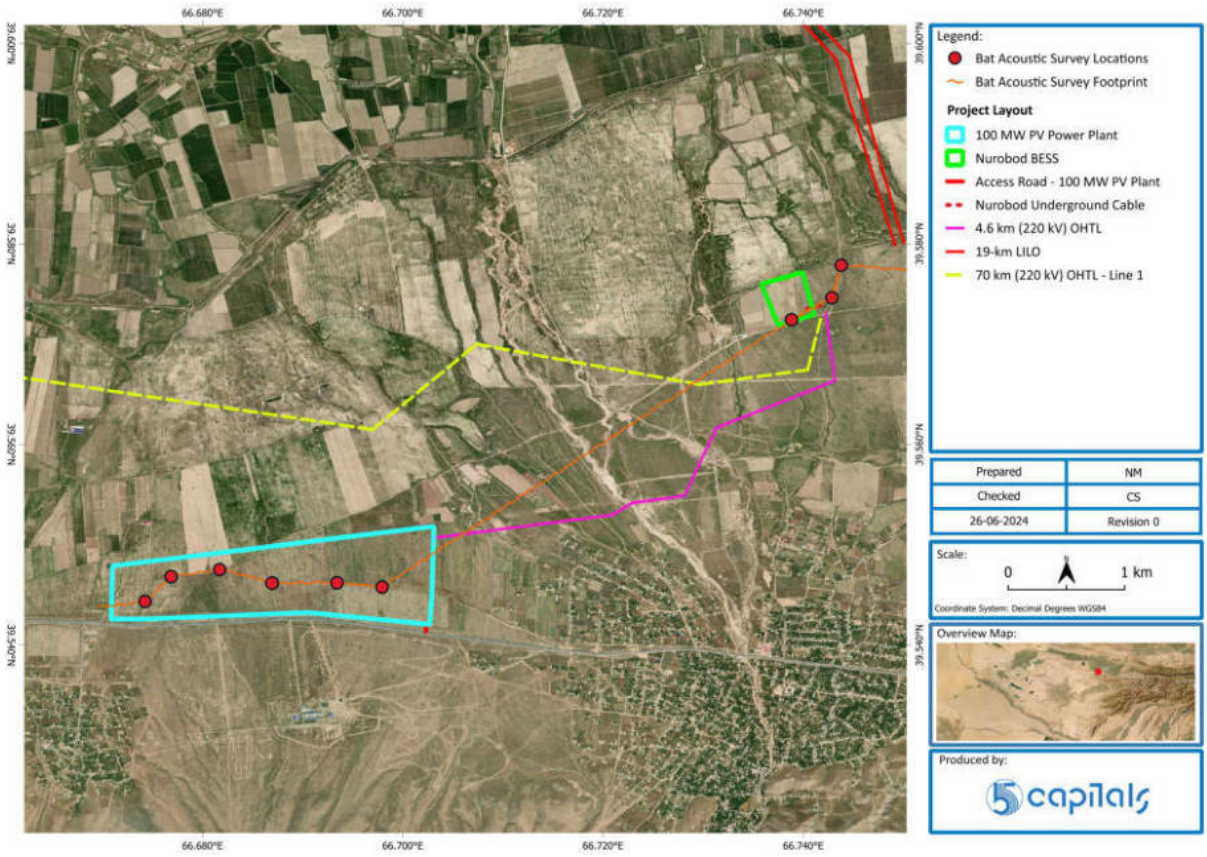

Figure 10-40 Transect and Registration Points across the 100MW PV Plant

Table 10-40 The total duration of recordings at the 100MW Plant

PROJECT FACILITY	MONTH	DURATION, S	DURATION, H
100 MW PV Plant	Apr	3674	1.02
	May	4071	1.13

10.7.3.2 Results

The survey of the Koytash ridge within the project area for the 100 PV Plant revealed diverse terrains including rocky areas, sloping hills, agricultural fields, and loess walls of ravines. The investigation focused on identifying potential bat habitats, particularly natural refuges such as cliffs and loess walls, while also considering shepherd's huts as possible roosts. However, these huts were located more than 1 km away from the proposed power line, diminishing their relevance as bat habitats in this context.

Interviews with local shepherds indicated an absence of caves or significant grottos that could serve as bat colonies within the area. Although four small grottos were discovered and examined, none showed signs of being utilized as hibernation or breeding sites by bats, lacking any evidence of bat feces. These findings suggest that while the grottos may offer temporary

shelter to migrating or summering bats, they do not function as significant habitats for bat colonies.

Calls for 3-4 bat species were registered in the study area. Among all 70 orientation calls, the majority (35 calls, or 50%) belong to the common pipistrelle bat (*Pipistrellus pipistrellus*). The second most abundant species is the genus *Eptesicus* bat (33 calls, 43%). The recorded calls were similar to the calls of the serotine bat (*Eptesicus serotinus*) and Ognev's serotine bat (*Eptesicus ognevi*). Currently, there are no clear criteria for separation of these species based on calls (Benda, 2012; Barataud, 2015; Dietz, Kiefer, 2016) and both species ranges include the surveyed territory, so it is unclear which of these species, or perhaps both, were recorded at the site. In addition, rare calls of the genus *Myotis* were recorded (2 calls, 3%). The calls of *Myotis* bats cannot always be attributed to a single species. Only two calls of this type were recorded at the site, and they were of low quality, making identification past genus level not possible.

Table 10-41 Calls recorded at 100MW during April and May Active Acoustic surveys.

	APRIL	MAY
Duration of recordings, s	3674	4071
Duration of recordings, h	1.02	1.13
Calls of *Eptesicus sp.*(*serotinus+ognevi*)	0	33
Calls of *Myotis sp.*	0	2
Calls of *Pipistrellus pipistrellus*	2	33
Calls of all species	**2**	**68**
Number of species	**1**	**3**
Activity of all species, calls/hour	2.0	60.1
Activity of *Eptesicus sp.*(*serotinus+ognevii*)	0.0	29.2
Activity of *Myotis sp.*	0.0	1.8
Activity of *Pipistrellus pipistrellus*	2.0	29.2

10.7.4 Nurobod BESS

10.7.4.1 Methodology

Based on early reconnaissance as well as expert experience in the region, the sites where the Nurabad BESS, and associated underground cabling, will be located do not include any features within a reasonable area of influence that are thought to be suitable roosts for bats. Therefore, specific roost searching in these areas has not been conducted. However, during surveys of other taxon, any important observation related to bats would have been recorded and integrated into the assessment. No such observations were made relating to bat roosting (active or potential) during other biodiversity surveying of these sites.

Active acoustic monitoring was conducted to assess the presence of bat species at the site that oculd not be observed during roost searches. One transect was chosen to cover the Nurobod BESS, and surveyed across two deployments; April (25th and 27th) and May (13th and 15th). Recordings were taken at stops every 400m along the transect. Each recording lasted for 10 minutes.

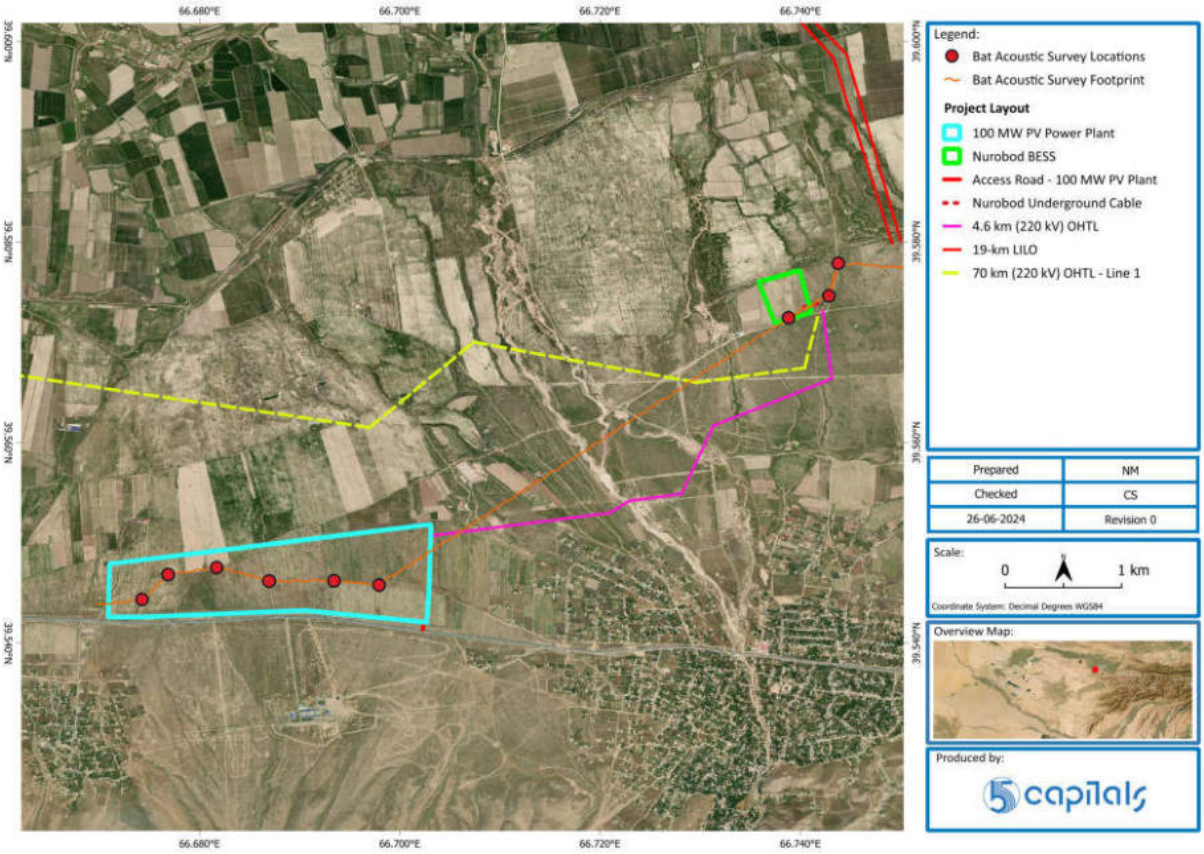

Figure 10-41 Transect and Registration Points across the Nurobod BESS

Table 10-42 The total duration of recordings at the Nurobo BESS

Project Facility	Month	Duration, s	Duration, h
Nurabad BESS	April	612	0.17
	May	662	0.18

10.7.4.2 Results

Calls of 3-4 bat species were recorded at the study area. Among all 29 orientation calls, the majority (21 calls – 72%) belong to genus *Eptesicus* bats. As discussed above (100 MW Pant) the calls likely belong to the serotine bat (*Eptesicus serotinus*) and/or Ognev's serotine bat (*Eptesicus ognevi*), however they could not be distinguished at this time. The second species in terms of the number of recorded calls was *Pipistrellus pipistrellus* (7 calls - 24%). A single call

attributed to the genus Myotis was recorded in April, however, the calls of genus *Myotis* bats cannot always be attributed to one or another species.

The majority of calls were recorded in May, in line with the period thought to represent sedentary bats feeding in their home ranges.

Table 10-43 Bat calls recorded by detector at Nurobod BESS

	APRIL	MAY
Duration, s	612	662
Duration, h	0,17	0,18
Eptesicus sp. (serotinus or ognevii)	8	13
Myotis sp.	1	0
Pipistrellus pipistrellus	0	7
Calls all species	**9**	**20**
Species	**2**	**2**
Activity all species, calls/hour	52,9	108,8
Activity of *Eptesicus sp. (serotinus+ ognevii)*	47,1	70,7
Activity of *Myotis sp.*	5,9	0
Activity of *Pipistrellus pipistrellus*	0,0	38,1

10.7.5 400MW PV Site

10.7.5.1 Methodology

Based on early reconnaissance as well as expert experience in the region, the sites where the 400 MW PV Plant will be located do not include any features within a reasonable area of influence that are thought to be suitable roosts for bats. Therefore, specific roost searching in these areas has not been conducted. However, during surveys of other taxon, any important observation related to bats would have been recorded and integrated into the assessment. No such observations were made relating to bat roosting (active or potential) during other biodiversity surveying of these sites.

Active acoustic monitoring was conducted to assess the presence of bat species at the site that could not be observed during roost searches. One transect was chosen to cover the 400MW Plant, and surveyed across two deployments; April (25th and 27th) and May (13th and 15th). Recordings were taken at stops every 400m along the transect. Each recording lasted for 10 minutes.

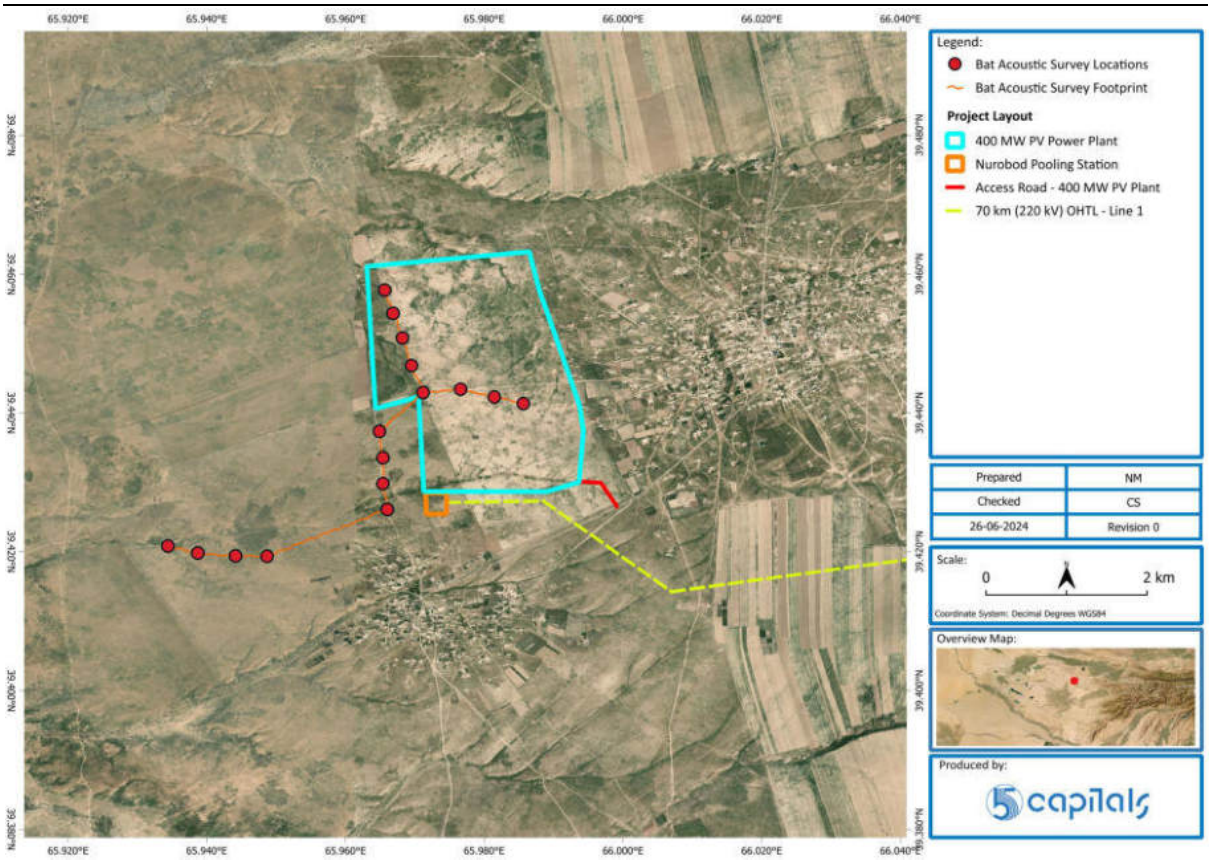

Figure 10-42 Transect and Registration Points across the 400 MW Plant

Table 10-44 The total duration of recordings at the 400 MW Plant

PROJECT FACILITY	MONTH	DURATION, S	DURATION, H
400 MW PV Plant	April	4878	1.36
	May	5841	1.62

10.7.5.2 Results

Calls of 2-3 bat species were recorded at the study area. Notably, species such as *Pipistrellus pipistrellus* and *Myotis sp.* recorded at the 100MW and Nurobod BESS were absent here, whilst species such as the *Tadarida teniotis* were recorded only at this site. In April, just 8 recordings of *Eptesicus sp.* were documented. However, as discussed above, it is not possible to distinguish the calls of *E. serotinus* and *E. ognevi* therefore the calls may indicate the presence of either, or both, species. In May, just a single species *Tadarida teniotis* was recorded, with a total of 51 calls recorded across the survey period. *Tadarida teniotis* is a nationally protected species, listed as Vulnerable in the Uzbekistan Red Data Book.

Table 10-45 Bat calls recorded by detector at 400MW Plant (* - species from Red Book of the Republic of Uzbekistan (2019).

DATE	APRIL	MAY
Duration, s	4878	5841
Duration, h	1,36	1,62
Eptesicus sp. (*serotinus+ ognevii*)	8	0
Tadarida teniotis*	**0**	**51**
Calls all species	8	51
Species	1	1
Activity all species, calls/hour	5,9	31,4
Eptesicus sp. (*serotinus+ ognevii*)	5,9	0
Myotis sp.	0	0
Pipistrellus pipistrellus	0	0
Tadarida teniotis*	**0**	**31,4**

10.7.6 OTLs (70km, 4.9km, 11km, 19km)

Insectivorous bats species that occur in the region are not expected to face any direct impacts from the project's OTL, therefore, acoustic monitoring was not undertaken. However, bat roosts could be impacted during construction, so the roost search ensured coverage of all OTL alignments via the desktop survey and sampling method of transect surveys.

10.7.6.1 Methodology

During desktop analysis of the Samarkand region encompassing the main Project facilities and OTLs, four potential roosting sites were located. Ground truthing surveys were undertaken on the 11th February. This included the investigation of these four pre-determined sites and the broader surveying of suitable habitats across the Project footprint and area of influence. The tracks covered during surveys, and the locations or potential roosting sites, are shown in the figure below.

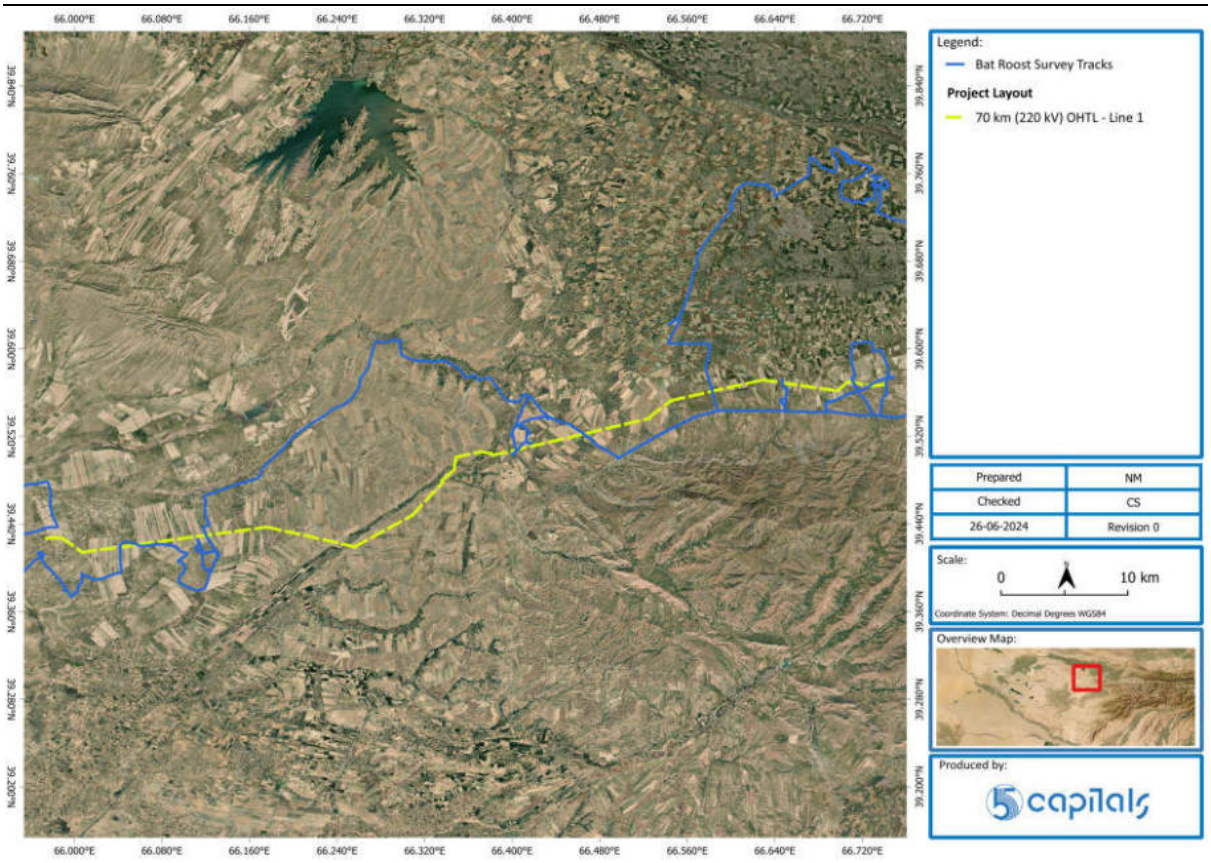

Figure 10-43 Survey tracks along project OTL alignments

10.7.6.2 Results

The bat roost survey identified four potential roosting sites; a canal bridge along the 70km OTL, a canal bridge near the 11km LILO and a clay house and clay cave Northwest of the LILO's. Field surveys, including inspections of these pre-determined roosting sites, found additional suitable habitats (e.g. ravines, caves and concrete bridges). However, no evidence of bats was recorded either from direct observation or traces such as faeces or food remains. On the project site near the planned LILO's, there are attics of utility buildings and residential houses, which are potential roosting and hibernation sites for bats. However, the species of bats that may inhabit there are not rare or endemic and do not require protection. On the banks where bats could potentially dwell, sand extraction works are taking place, making it unlikely for bats to inhabit the area

Temporary roosting by bats during seasonal migrations or summering periods in car passages, drainages, and grottos is possible, but permanent colonies were not found. Large concrete structures feature deep slits that, while not conducive to hibernation due to low temperatures, might host breeding colonies in summer. Among two clay caves discovered, one along the Dargom canal presents a potential for breeding or hibernation; however, its full assessment was constrained by the narrow entrance.