Environmental and Social Impact Assessment

PUBLIC

Project Number: 57342-001
Draft
December 2023

Uzbekistan: Kungrad 1 Wind Power BESS Project

PART 6

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

23.5.2 Impacts

Economic Displacement – Agriculture

- 203 formal farmers with land leases and estimated 20 informal farmers (estimate based on triangulation of cadastral data with secondary information sources).
- Minimal agricultural impact along 109.76km (14%) of the total 786.6km due to routing the maximum length of the OHTL through desert.
- Minimal permanent impact on arable land of 0.29 km^2 (estimated 0.23% of total arable land) by the tower bases.
- Minimal temporary impact on arable land of 5.46km^2 (estimated 4.5% of total arable land) by loss of access during 1-year of construction.

Construction Phase		
Type	Negative	N/A
Duration	Short-term	Based on issues provided above.
Magnitude	Medium	
Reversibility	Reversible	
Sensitivity	Medium	
Likelihood	High	
Significance	**Moderate**	

Physical Displacement

Minimal potential physical displacement of estimated 5 households (estimate based on satellite imagery), which was achieved through careful route selection. There is a high likelihood that these structures are for economic use and not residential, evidenced by the residential settlement patterns in the area. Accordingly, the Livelihood Restoration Plan (LRP) assumes minimal or no physical displacement. The assets inventory will confirm if these are residential households.

Construction Phase		
Type	Negative	N/A
Duration	Short-term	Based on issues provided above.
Magnitude	Low	
Reversibility	Reversible	
Sensitivity	High	
Likelihood	Low	
Significance	**Minor**	

Economic Displacement: Grazing

The permanent and temporary impact will be insignificant on the grazing land use of desert land due to the small permanent and temporary impact on land relative to the grazing area available.

Construction Phase		
Type	Negative	N/A
Duration	Short-term	Based on issues provided above.
Magnitude	Low	
Reversibility	Reversible	
Sensitivity	High	
Likelihood	Low	
Significance	**Minor**	

23.5.3 Mitigation

The Developer will develop and implement a Livelihood Restoration Plan (LRP) in accordance with Uzbekistan legislation, ADB, EBRD and IFC safeguards for involuntary resettlement. The LRP will involve the following key tasks: stakeholder engagement and grievance management, assets inventory, valuation study, socio-economic baseline census, drafting and disclosing livelihood restoration planning measures, drafting the LRP document, presenting, disclosing and finalizing the LRP document. Thereafter, the developer will implement the LRP in full. These key tasks are detailed in the sections that follow:

Task 1 - Stakeholder Engagement Phase 1

The LRP development will commence with an initial phase of stakeholder engagement. A grievance mechanism will be established prior to this initial phase of engagement and run by the consultant during the LRP phase, and thereafter will become the responsibility of the Developer. This initial phase of engagement will disclose the following to the stakeholders:

- Explaining the proposed project.
- Explain the potential impacts on land and livelihoods.
- Explain the livelihood restoration planning process, step by step.
- Establish and communicate the cut-off date and related conditions.
- Inform Project-Affected Parties (PAPs) about the assets inventory, valuation and socio-economic survey.
- Explain and provide contact details and access points for the grievance mechanism.

Stakeholders will include regional government officials, district government officials, mahalas of project-affected communities, and PAPs themselves. A background information document will be developed and distributed to stakeholders prior to the disclosure, containing the information that will be disclosed. The background information document will be in a language and non-technical format that is understandable to all the stakeholders. Stakeholders will be given the opportunity to clarify any aspect of the livelihood restoration planning process and provide their input into the process. This phase of engagement will be documented through meeting records, attendance registers and photographs. Key issues will be summarized and considered, and adjustments made to the livelihood restoration planning process taking

into consideration the input of the stakeholders. Express opportunities for meaningful input from women, and vulnerable groups will be enabled during the phase of engagement, documented, and considered, and the process adjusted as required.

Task 2 – Assets inventory, valuation, and socio-economic baseline census

The assets inventory, valuation and socio-economic baseline census will immediately follow the first phase of engagement. Land, buildings, and trees within the entire RoW will be surveyed. Crops will only be surveyed within the temporary impact zone (15m from the centerline of each powerline, and a rectangular buffer of 7.5m from each side of the powerline tower bases).

The valuation study will be undertaken by government-accredited valuers. The valuation study includes the following key tasks:

- Collecting cadastral data for all land parcels along the OHTL route.
- Collecting three years of financial records from the agricultural department to assist in calculating lost profit.
- Undertaking market rates research to gather input rates into full replacement value rate calculations. This will involve triangulation of primary data with existing government compensation rates.
- An inventory of affected assets within the RoW, temporary impact zone and permanent impact zone will be undertaken, and the data used in valuation, in tandem, with the cadastral and financial records. As explained, the inventory will be phased, with the temporary impact zone undertaken pre-financial close and submission of the LRP, and the permanent impact zone modelled prior to submission of the LRP and updated based on final tower locations after submission of the initial draft of the LRP to the lenders.
- A valuation report will be produced for each PAP, showing detailed calculations of their compensation.
- Each farmer will be explained their valuation in detail and be requested to sign-off on their respective valuations at the point when the valuation reports are finalized after final tower locations are sited.

Market rates and average yields will be localized to the respective districts, and current, to ensure accurate calculation of full replacement value. Compensation rates and formulas will include all components to enable full restoration of an asset including new materials, labor, transport, transaction costs, taxes and any other incidental costs. Where transitional losses occur during the period it takes to restore assets, these losses will be calculated and included in the valuation report.

Task 3 – Draft livelihood restoration planning measures

After the data collection and valuation phase, the livelihood restoration planning measures will be drafted based on the data collected. These planning measures will be including the eligibility and entitlement framework, livelihood restoration programs, gender and vulnerable people's measures. The livelihood restoration planning measures will be workshopped internally with the Developer to ensure alignment prior to disclosure.

Task 4 – Stakeholder Engagement Phase 2

A second phase of stakeholder engagement will be undertaken to disclose the draft livelihood restoration planning measures including the eligibility and entitlement framework, livelihood restoration programs, gender measures, and vulnerable people's measures.

This phase of engagement will include individual PAP validation forms, signed by each PAP, indicating their understanding of the livelihood restoration planning process, the draft livelihood restoration measures, the valuation process, the cut-off date, and the grievance mechanism. These validation forms will serve as evidence of the PAPs being adequately informed, meaning they are receiving full information about the resettlement in a manner and format that is understandable to them, to enable them to effectively engage in the process.

Stakeholders will include regional government officials, district government officials, mahalas of project-affected communities, and PAPs themselves.

Prior to disclosure, an information document will be developed and distributed to stakeholders, containing the draft livelihood restoration planning measure content for disclosure. The background information document will be in a language and non-technical format to be understandable to all the stakeholders.

During this phase of engagement, stakeholders will be given meaningful opportunities to provide their input into the draft livelihood restoration planning measures. Express opportunities for meaningful input from women, and vulnerable groups will be enabled during the phase of engagement, documented, and considered.

This phase of engagement will be documented through meeting records, attendance registers and photographs. Key issues will be summarized and considered, and adjustments made to the livelihood restoration planning measures taking into consideration the input of the stakeholders.

Task 5 – Implementation

The Developer will implement the measures of the LRP in full. This may take place in a phased manner in accordance with the LRP schedule, which will be carefully aligned with the construction schedule of the Project to avoid and minimize displacement impacts. The LRP will be considered as having been completely implemented after this is confirmed by a third-party completion audit.

23.6 Archeology and Cultural Heritage

23.6.1 Baseline Conditions

As explained earlier under "Section 23.3.2", as part of the initial OHTL route development process, the Developer, through a technical consultant, undertook consultations with the following entities and obtained secondary data on archeology and cultural heritage sites of importance.

- Ministry of Cultural Heritage of the Republic of Karakalpakstan;
- Agency of Cultural for Khorazm Region; and
- Agency of Cultural Heritage of Bukhara Region

The table below proves list of these along with their coordinates and distance to the OHTL

Site	Latitude	Longitude	Distance to OHTL (km)
Unknown Tomb	39.5924	63.84383	0.26
Abdurahman Vali maqbarasiasjid	39.59264	63.8436	0.25
Masjid	39.59256	63.8431	0.21
Castle house	41.22682	61.73916	4.18
Tashmozor mound	41.22858	61.73318	4.42
Tomb of Tashmozor	41.23067	61.72882	4.57
Group of rock mounds	41.25509	61.69477	4.91
Dungeldji (Noble house)	41.70961	61.15497	1.36
Kargatishkan kala	41.71508	61.11697	3.62
Adamli kala (Bazergen)	41.74073	61.1223	1.5
Koykirilgan kala	41.75519	61.11697	0.87
Kozirbhbkufy kala 1	41.74557	61.16443	1.21
Kozirbhbkufy kala 2	41.74794	61.19287	3.53
Angka kala	41.75867	61.15117	1.47
Group of rock mounds	41.80701	61.06391	4.91
Uy Kala	41.86786	61.07883	3.83
Atsiz rala	41.93828	61.12594	1.44
Yakka Porsan	41.92106	61.01831	4.51
Ayazkala 1	42.01419	61.029	3.97
Ayazkala 2	42.01084	61.02718	3.58
Ayazkala 3	42.0055	61.03056	3.24
Kojakul ding minaret (Signal tower)	42.21985	60.22922	4.43
Chilpik burial mound	42.26401	60.06959	4.31
Group of rock mounds	42.56881	59.55728	2.17
Azler Baba shrine	42.56881	59.55243	2.55
Grieving Mother monument	42.59289	59.54536	2.28
Poet`s park	42.59589	59.53469	3.03
Edige monument	42.59599	59.5344	3.05
Tokk`alla	42.582	59.51486	5.06
K`azy Maylik shrine	42.65277	59.55243	3.52
Kyrantau	42.64467	59.32009	3.92
Imam Eashan Baba shrine	42.63843	59.32029	4.54
Ajiniyoz Qosibay og`li bust	42.66815	59.19324	3.97
Otesh batyr shrine	42.71685	59.09707	2.72
Zana Castle	42.7072	59.01269	4.54
Balf auliyo shrine	42.87657	58.70355	4.86

The initial routes developed avoided all areas provided from the above entities except for one (1) site known as “Kyrantau Cultural Heritage Site”. The Ministry provided detailed coordinates for this site and required that the OHTL avoid the entire site (80 hectares). Based on the above, the final route has taken this into consideration as noted in the figure below.

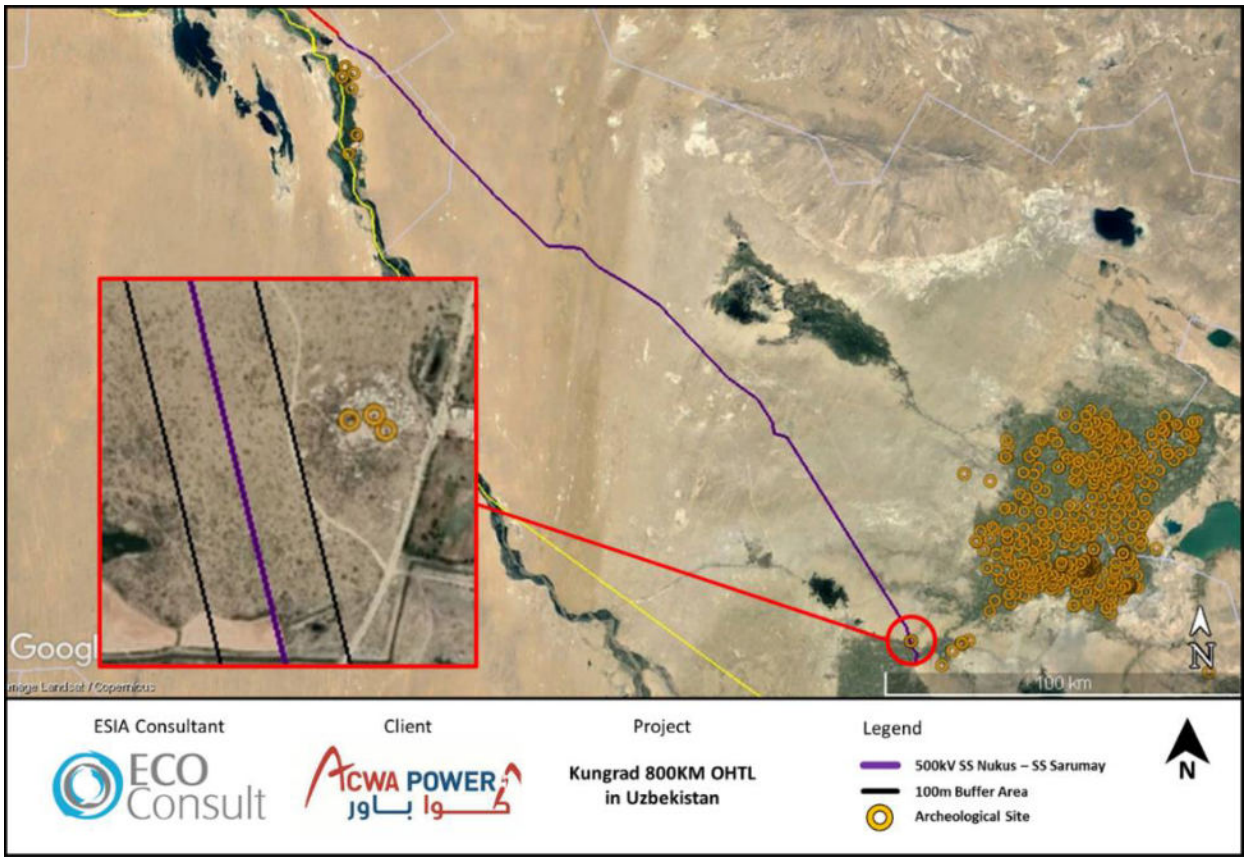


Figure 140: Archeological Site Surrounding the 500kV SS Nukus - SS Sarymay Part of the Project

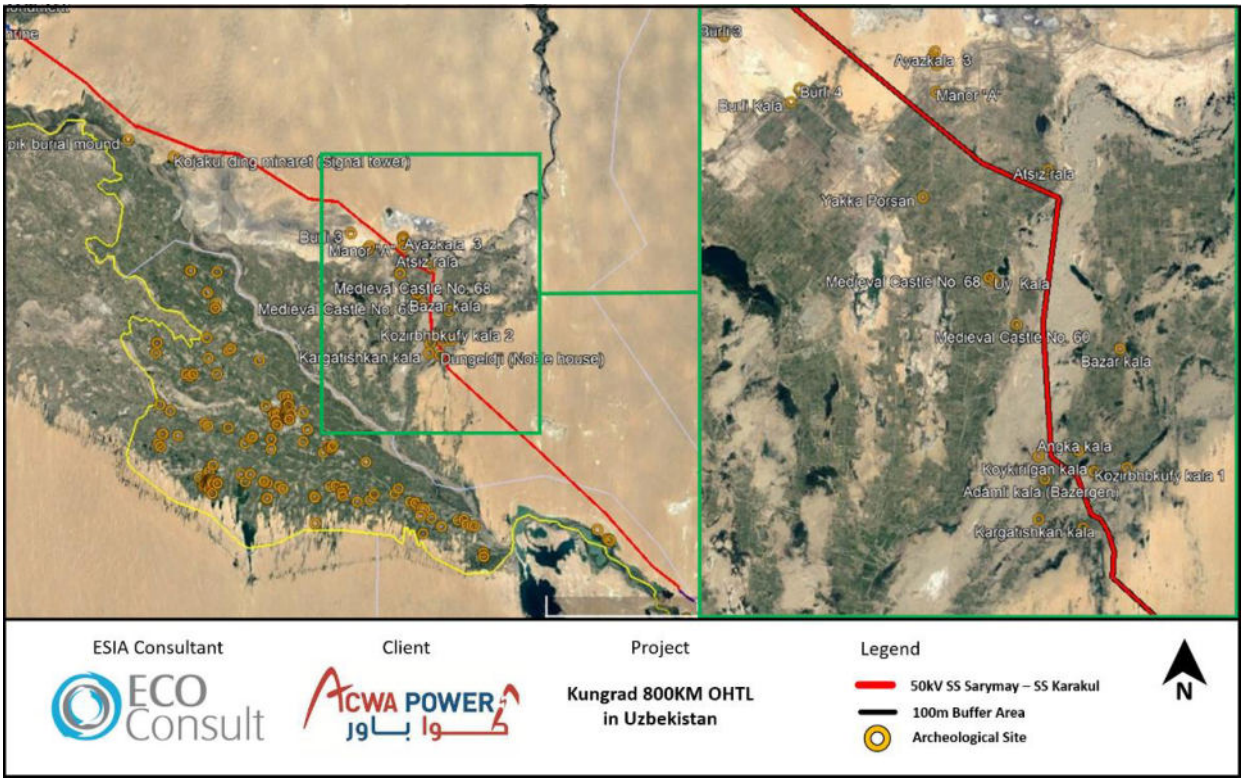


Figure 141: Archeological Site Surrounding the 500kV SS Sarymay - SS Karakul Part of the Project

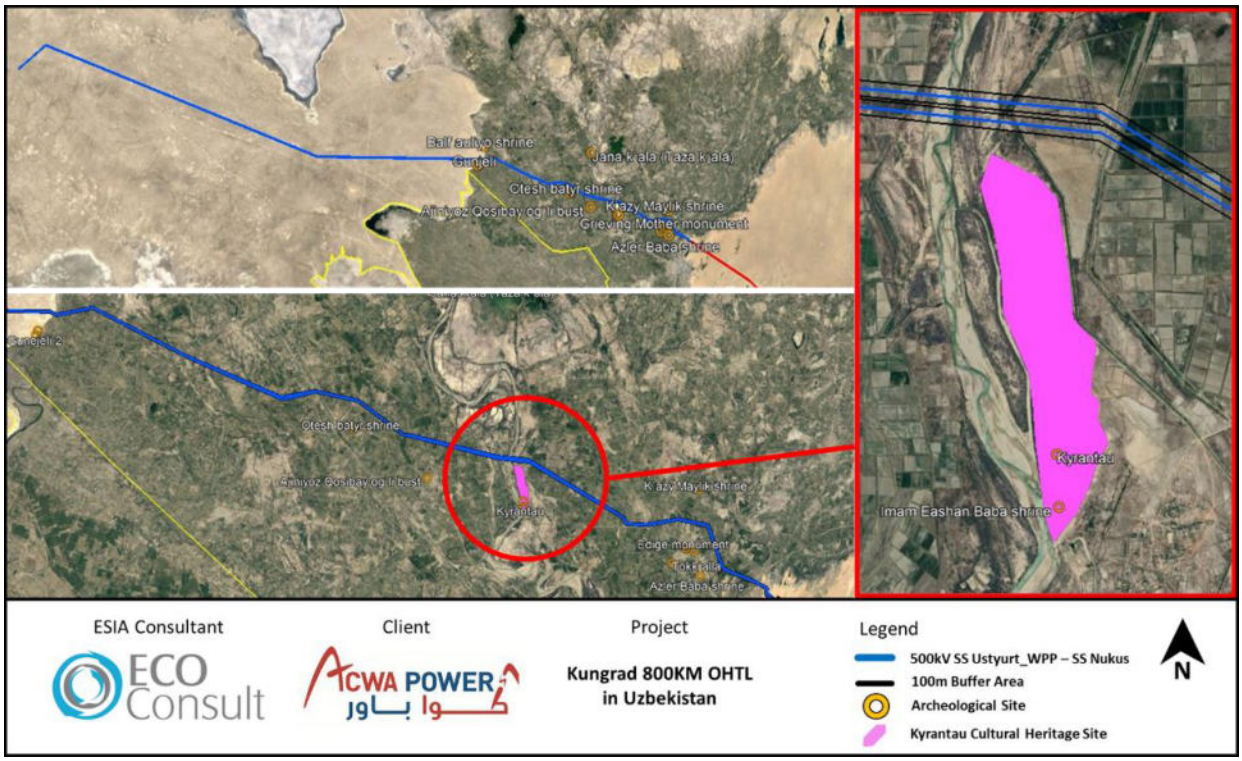


Figure 142: Archeological Site Surrounding the 500kV SS Ustyurt_WPP - SS Nukus Part of the Project

The 'E&S Team' undertook further consultations with the Department of Archeology at the Karakalpak Research Institute of Humanities. Objective was to obtain further information on any other potential sites of interest that should be avoided. The Department provided list of the sites that are identified in the table below. As noted, none are located within or near the OHTL Route.

Table 102: List of Archeological Sites of Importance from the Department of Archeology

Name	Latitude	Longitude	Distance to OHTL (km)
Gunjeli	42.811703	58.676286	2.55
Gunejeli 2	42.816106	58.679283	2.06
Krantau	42.644639	59.320139	3.95
Tok-kala	42.581581	59.515969	4.62
Burli	41.982000	60.904778	5.42
Burli 2	41.989692	60.880608	5.89
Burli 3	42.024236	60.847589	4.57
Burli 4	41.990806	60.912336	4.14
Ayaz-kala 1	42.014108	61.029108	3.94
Ayaz-kala 2	42.010889	61.027139	3.59
Ayaz-kala 3	42.005389	61.031064	3.33
Yakkeparsan	41.921056	61.018306	4.53
Manor "A"	41.988469	61.029889	1.79
Medieval Castle No. 60	41.839639	61.098500	1.84
Medieval Castle No. 68	41.869719	61.074778	4.20

Uy-kala	41.867858	61.078831	3.83
Atsiz-kala	41.938278	61.125942	1.44
Koy-kirilgan-kala	41.755192	61.116969	0.87
Anka-kala	41.758667	61.151167	1.46
Adamli-kala	41.740831	61.122278	1.49
Kozi-kirilgan-kala	41.745572	61.164431	1.21
Kargatishkan-kala	41.715075	61.116975	3.60
Mansion "Dingilje"	41.709608	61.154969	1.07

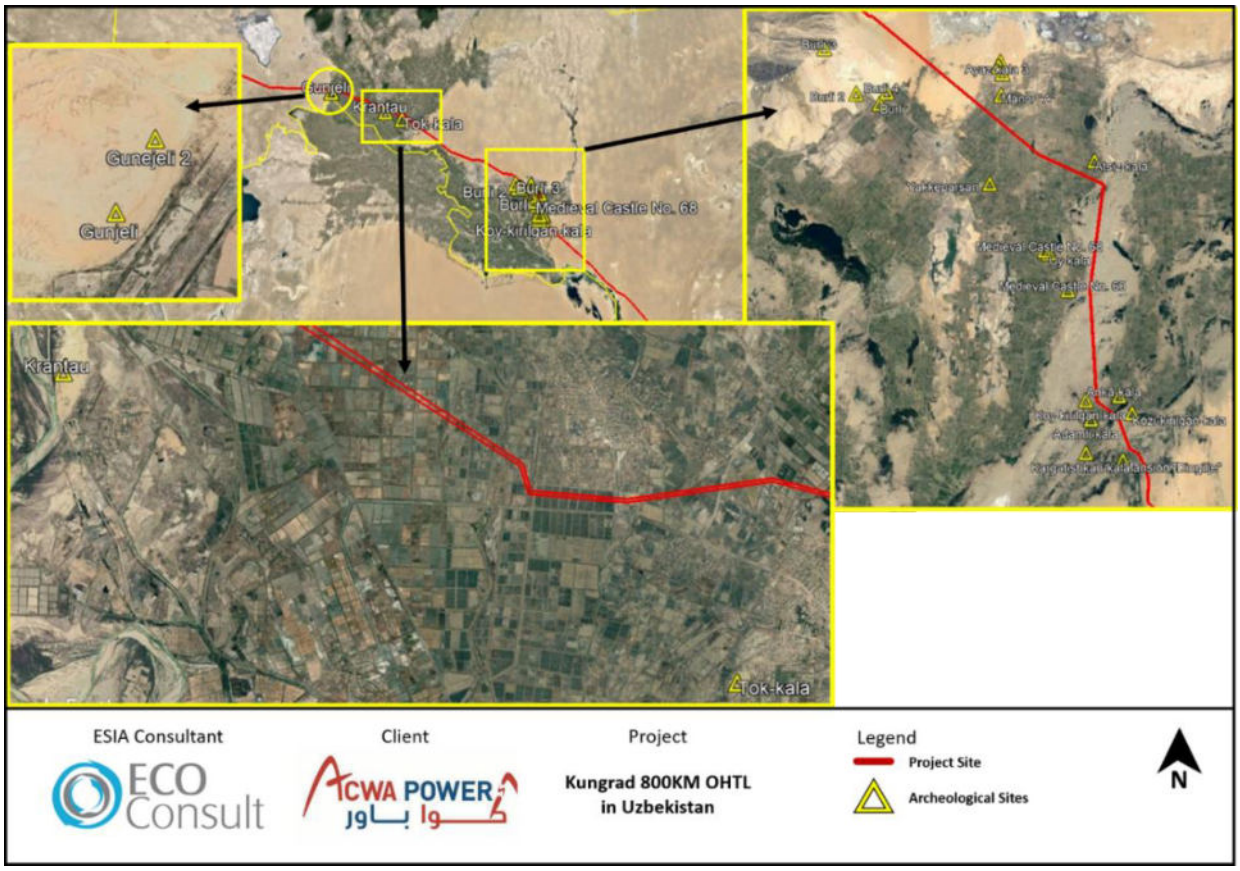


Figure 143: Archeological Sites Avoided by the Project

23.6.2 Key Risks and Impacts during Construction

Key impacts are mainly limited to the construction phase. Site preparation activities which are to take place onsite by the EPC Contractor for installation of the OHTL are expected to include land clearing activities, levelling, excavation, grading, etc.

Although such activities are limited to the relatively small individual footprints of the towers and the actual area of disturbance is relatively minimal, if such activities are improperly managed, they could damage or disturb archaeological remains present on the surface of the Project site.

In addition, there is a chance that throughout such construction activities, archaeological remains buried in the ground are discovered. Improper management (if such sites are discovered) could potentially disturb or damage such sites which could potentially be of importance.

Construction Phase		
Type	Negative	N/A
Duration	Short-term	Limited to construction
Magnitude	High	Given that there are sites within the area in general and activities could damage these sites in inappropriately managed.
Reversibility	Irreversible	
Sensitivity	Medium	
Likelihood	Medium	Based on the fact that there are sites within the area in general
Significance	**Moderate**	

No key impacts are anticipated during the operation phase, given that O&M activities will be minimal and target for specific tower areas that require either corrective or preventive maintenance.

23.6.3 Additional Studies

Currently, archeology and cultural heritage experts from the Department of Archeology at the Karakalpak/Samarkand/Khorazm Research Institute of Humanities are undertaking an archeology and cultural heritage survey for the OHTL route. This includes the experts travelling by car along the entire OHTL route and 100m buffer area on each side and travelling at an average speed of 20 km per hour. In specific areas that are not accessible by car, the specialists are undertaking a walking survey within those areas.

Through the survey the ground surface are being inspected, and any sites of interest will be recorded and photographed as appropriate. The results of the survey will be analyzed by categorizing the sites and making an assessment of their significance. Finally, any areas of archaeological importance will be clearly identified (if any).

23.6.4 Mitigation and Monitoring Measures

Mitigation Measures

- In the case the site survey identifies any archeology or cultural heritage sites within the OHTL route and its buffer areas, the following should be considered:
  - As a first step, the site coordinates will be identified in detail along with buffer distance requirements that should be maintained to ensure protection during construction and operation activities;
  - The above results will be provided to the EPC Contractor for consideration as part of the detailed design (i.e. preservation of resource in-situ). In the case that these sites could be impacted by actual project footprint (e.g. location of towers or conductor lines) or by construction activities (e.g. access route) then detailed design should be adjusted to take this into account;
  - In the case the EPC Contractor cannot feasibility avoid these area, alternative mitigation measures can be investigated in consultation with Archeology and Cultural Department of Karakalpakstan/

Khorazm – such as relocation of the site of interest. If this cannot be undertaken, then the detailed design will have to be adjusted as a final measure to avoid these identified areas.

- Should any site be located within the OHTL route and a 200m area, it must be demarcated along with signage in English, Russian, Uzbek and Karakalpak indicating "Site of Archaeological / Cultural Heritage Importance – No Access Allowed".
- Induction training and Toolbox Talks (TBT) should be delivered to all workers to emphasize the presence and location of the sites and their overall importance.

- Driving will only be permitted on formal site roads and off-road driving is prohibited.
- Workers are only permitted within authorized working areas and moving to any offsite area is prohibited. This includes in particular movement into the sites recorded under any circumstances at any time of the day.
- Ensure all workers read, understand and sign the worker code of conduct which includes specific requirements related to such an issue and which include:
  - Respect religious sentiments and customs and traditions of co-workers.
  - Respect the local religious and/or traditional days of celebration and their restrictions.
  - Respect the religious shrines and burial sites and practices of the local population.
  - Do not disturb shrines and other religious monuments.
  - Recognize that shrines and sacred sites may include trees, sheds, piles of pebbles, and piles of offerings.
- No worker may possess or withdraw any archaeological item or remains from the Project Area (to include above or below ground) such as ceremonial jars, pottery, or similar objects. If a worker were to find such a piece inside the Project, he/she shall immediately stop working and notify his supervisor to implement the chance find procedure.
- Throughout the construction phase, and as the case with any Project development that entails such construction activities, there is a chance that potential archaeological and/or cultural heritage remains in the ground might be discovered. It is expected that appropriate measures for such chance find procedures are implemented. Those mainly require that construction activities be halted and the area fenced along with proper signage, while immediately notifying the Ministry of Culture and Tourism. No additional work will be allowed before the Ministry of Culture and Tourism assesses the found potential archaeological site and grants a clearance to resume the work. Construction activities can continue at other parts of the site if no potential archaeological remains were found. If found, same procedures above apply.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring Requirements

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

- Submission of final detailed design along with results of archeology and cultural heritage survey
- In the case that a suspected site is discovered, a report should be prepared that includes the following to be submitted to Developer and upon approval it is to be submitted to the Ministry of Culture and Tourism:
  - Photo documentation of the site including photos for delineation markers and signage
  - Location (GPS coordinates)
  - Site estimate
  - Topographical description
  - Description of nature and conditions of the site
- After the Ministry of Culture and Tourism concludes their assessment of the discovered site, the above report should be updated with the findings of the Ministry with supporting formal letters to include: (i) formal letter with mitigation to be implemented as required by the Ministry (if required and applicable); (ii) formal letter from the Ministry granting permission to commence with construction work within the discovered site.
- Submission of Induction Training records of workers that includes archeology and cultural heritage model.

23.7 Water Resources

23.7.1 Baseline Conditions

As explained earlier in "Section 23.3.2", from the start and as part of the preliminary route mapping undertaken by the Developer, through their Technical Consultant, secondary information was collected on water bodies to include lakes, reservoirs, marshlands, water canals, rivers, etc. in order to avoid all these features.

Based on that it was indicated that only two (2) key water resources intersect with the OHTL, which is the Amu Darya River and Zarafshan stream. Refer to figure below.

However, as part of the scoping survey undertaken by the 'E&S Team' another water resource was noted to cross within the OHTL route that includes a small saltwater body that is around 0.016km^2 in area. Refer to figure below.

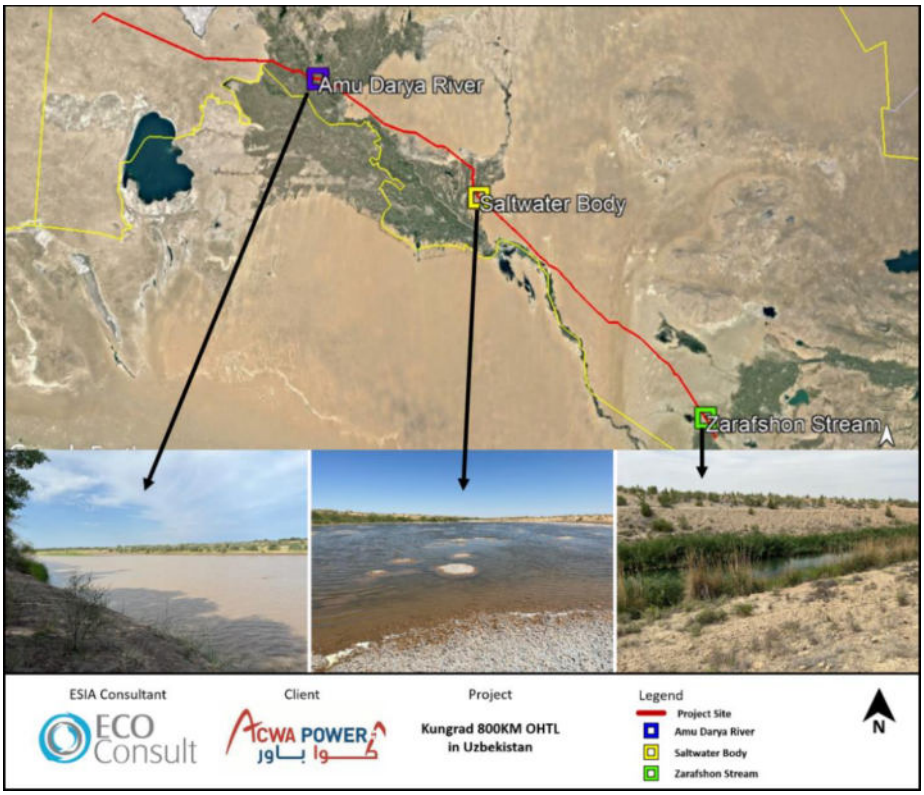


Figure 144: Key Water Resources that Cross the Project

In addition, the OHTL crosses and intersects with several water canals that are used by the agriculture areas as noted in the figure below.

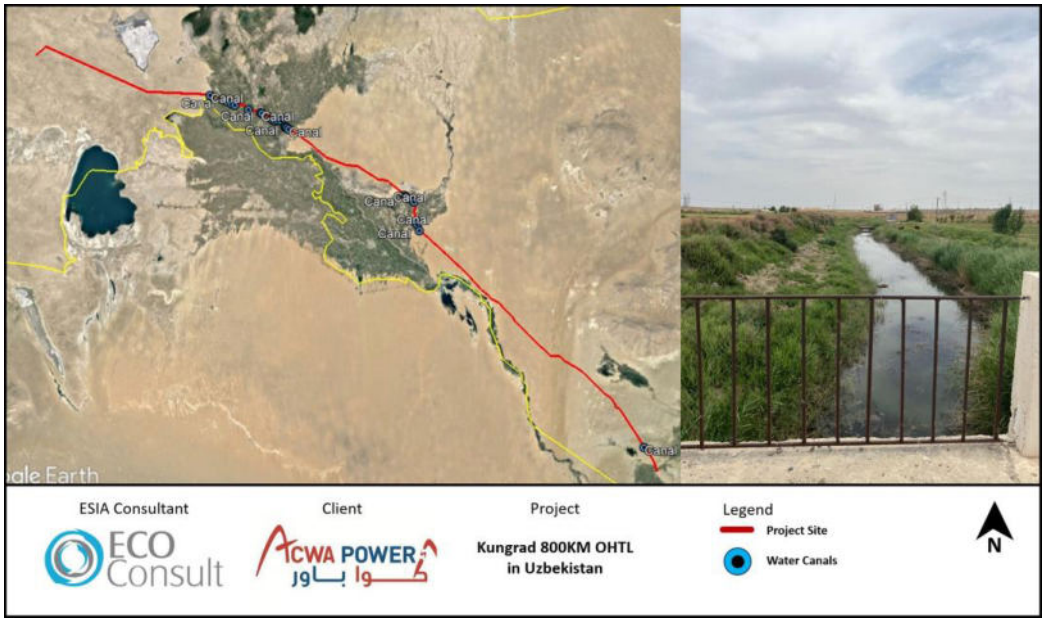


Figure 145: Water Canals within the Project Site and Example Figure

23.7.2 Key Risks and Impacts during Construction

The following key risk and impacts are noted in relation to the construction phase of the Project only:

- Site preparation activities which are to take place onsite by the EPC Contractor for installation of the OHTL are expected to include land clearing activities, levelling, excavation, grading, etc. Although such activities are limited to the relatively small individual footprints of the towers and the actual area of disturbance is relatively minimal, such activities could disturb soil, and result in erosion and runoff which could result in siltation of surface water and impacting its water quality. This is particularly important at the Amu Daya River crossing, saltwater body, Zarafshan stream and the water canals.
- Siting of transmission towers within these water bodies could result in direct impacts on water resources to include impacts on water quality (e.g. increase in turbidity) and/or impacts on water environment (as applicable – e.g. benthic communities).
- Improper management of construction activities (through for example improper waste management, hazardous material management) could reach and pollute such water bodies through impacts on water quality (e.g. dissolved oxygen) and/or impacts on water environment (as applicable – e.g. benthic communities).

Construction Phase		
Type	Negative	N/A
Duration	Short-term	Limited to construction
Magnitude	Medium	Given the small project footprint of tower components, impact is considered of medium magnitude and sensitivity.
Reversibility	Irreversible	
Sensitivity	Medium	
Likelihood	Medium	
Significance	**Moderate**	

No key impacts are anticipated during the operation phase, given that O&M activities will be minimal and target for specific tower areas that require either corrective or preventive maintenance.

23.7.3 Additional Studies

The Developer will be undertaking a detailed drone survey for the OHTL route. The drone images will be reviewed by the 'E&S Team' to verify that there are no additional water bodies / water resources. Should any additional sources be identified, they will be mapped out.

23.7.4 Mitigation and Monitoring Measures

Mitigation Measures

- Final detailed design by the EPC Contractor will ensure that no towers are placed within any of the identified water streams above, or any additional water bodies identified as part of drone survey review.
- The following erosion and sediment control measures should be implemented and in particular for all construction activities to be undertaken within 1km from any water body / stream:

- Scheduling to avoid construction activities during heavy rainfall periods (i.e., during the wet season) to the extent practical. In addition, this will include modifying or suspending activities during extreme rainfall and high winds to the extent practical;
- Salvage and store topsoil and subsoil before areas are excavated, with topsoil stripped and stockpiled separately;
- Place clear markers indicating stockpiling area of excavated materials to restrict equipment and personnel movement, thus limiting the physical disturbance to land and soils in adjacent areas;
- Erect sediment control barriers around work sites during site preparation and construction to prevent silt runoff where applicable. This could include but not limited to silt fences, gravel bag berms, fiber rolls, or other similar applications;
- Erect wind erosion control that could include: (i) water application on disturbed soil areas of the project to control dust; (ii) minimizing removal of topsoil; (iii) avoid deposits of loose spoils; and
- Return surfaces disturbed during construction to their original (or better) condition to the greatest extent possible.

- Ensure all waste streams including hazardous waste and material is managed in accordance with measures identified earlier in “Section 10.2.2”.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring Requirements

Visual inspections to be undertaken by the EPC Contractor in areas within 1km radius to ensure proper erosion and sediment control measures are implemented.

23.8 Infrastructure Elements

23.8.1 Baseline Conditions

As explained earlier in “Section 23.3.2”, from the start and as part of the preliminary route mapping undertaken by the Developer, through their Technical Consultant, secondary information was collected on infrastructure and utility elements through which the OHTL can cross or intersect with. This included the following:

- Oil and gas infrastructure and pipelines
- Railways
- Other OHTLs
- Roads and highways

As part of the scoping process undertaken by 'E&S Team', additional unknown / unmarked infrastructure elements were noted that were not reported within the Technical consultant above. The points of intersection are provided in the figure and table below.

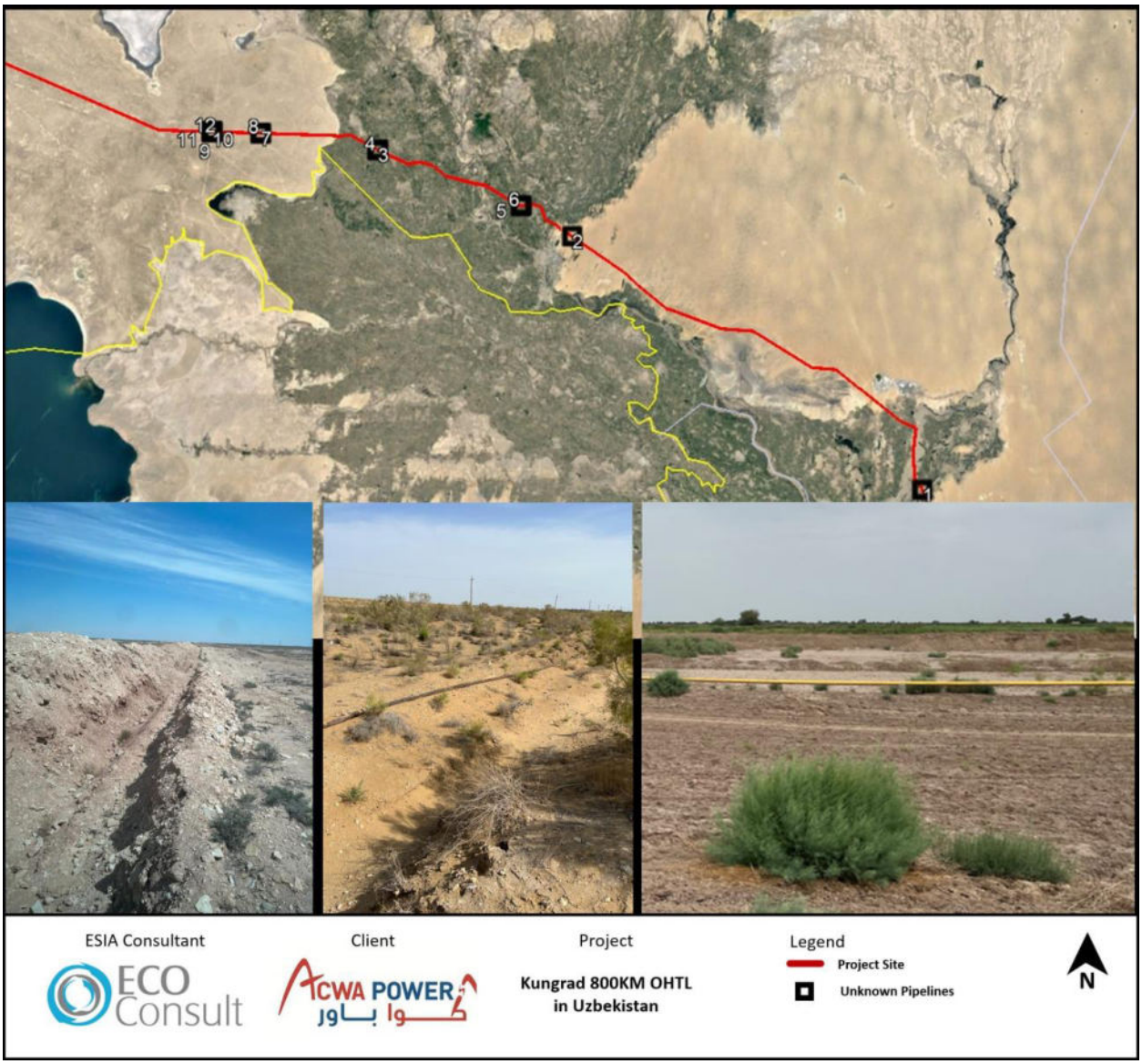


Figure 146: Observed Unknown Pipelines

Table 103: Project's Points of Intersection with Oil and Gas Infrastructure

Point	Latitude	Longitude	Description
1	41.7276578	61.1569578	Unknown Pipeline
3	42.5252304	59.6958130	Unknown Pipeline
3	42.7914931	58.8726263	Unknown Pipeline
4	42.7911009	58.8714594	Unknown Pipeline
5	42.6201911	59.4807785	Unknown Yellow Pipeline
6	42.6194742	59.4809040	Unknown Yellow Pipeline
7	42.8392514	58.3732083	Unknown Pipeline with Sign that indicates the presence of a pipeline nearby

8	42.8399583	58.3727251	Unknown Pipeline with Sign that indicates the presence of a pipeline nearby
9	42.8418893	58.1639456	Buried Pipeline
10	42.8427103	58.1640950	Buried Pipeline
11	42.8426596	58.1654069	Previous Pipeline that appears to be in the process of being removed
12	42.8419191	58.1652771	Previous Pipeline that appears to be in the process of being removed

23.8.2 Key Risks and Impacts during Construction

Improper planning and site selection of the Project could damage/disturb existing infrastructure and utility elements, and which could impact the level of services of such elements and could also cause serious health and safety risks to workers and the public.

Construction Phase		
Type	Negative	N/A
Duration	Short-term	Limited to construction
Magnitude	Medium	Given the small project footprint of tower components, impact is considered of medium magnitude and sensitivity.
Reversibility	Irreversible	
Sensitivity	Medium	
Likelihood	Medium	
Significance	**Moderate**	

23.8.3 Additional Studies

The Developer will be undertaking a detailed drone survey for the OHTL route. The drone images will be reviewed by the 'E&S Team' to verify that there are no additional infrastructure and utility elements. Should any additional sources be identified, they will be mapped out.

In addition, EPC Contractor will also be responsible for review of the detailed drone survey based on which (as well as other means – such as site verification study) confirm the outputs of any infrastructure and utility elements within the OHTL and an appropriate buffer area.

23.8.4 Mitigation and Monitoring Measures

Mitigation Measures

- Consultations / engagement activities will be undertaken by EPC Contractor as part of the detailed design with infrastructure and utility operators to present design and take into account any requirements (e.g. setbacks) as part of the detailed design to be prepared. All consultations will include formal communications.
- Final detailed design by the EPC Contractor will ensure that any restrictions or requirements from the infrastructure and utility operators are considered.

- Detailed design will take into account all design requirements that should be considered for infrastructure and utility elements in accordance with the "Electrical Installation Rules".

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring Requirements

- Submission of formal communications with infrastructure and utility operators
- Submission of final detailed design

23.9 Biodiversity

23.9.1 Ecological Impact Assessment Methodology

Ecological Area of Influence

The Ecological Area of Influence (AoI) was determined to include the areas directly and permanently affected by the Project and areas which will be temporarily affected during construction as follows:

- Project Area of Interest encompasses the route of the OHTL and the proposed substations (outside of those within the wind farm area) and 500m buffer around them.
- It is anticipated, based on current design, that a total of 4,632 transmission towers and 221 angle towers will be required. This would require the total footprint for all towers to be 1.475 km^2. Each substation will have a footprint of around 0.3km^2.
- Any required access roads to the transmission tower locations, construction areas and laydown areas, etc. It is anticipated that this would require a total footprint of around 31.66 km^2.
- Any site facilities including site offices, laydown areas, batching plant and site worker accommodation.
- The total AoI is 33.14 km^2

The assessment of impacts on valued ecological receptors follows the methodology as set out in "Section 11" of this ESIA. The sensitivity of the identified valued ecological receptors has been determined by the parameters as set out in the table below.

Table 104: Criteria for Determining the Sensitivity of Valued Ecological Receptors

Conservation Value (Sensitivity)	Species Criteria	Habitat or Site Criteria
High	IUCN Critically Endangered, Endangered and Vulnerable species. UzRDB Critically Endangered or Endangered species. Nationally protected species of significant population size and importance. Local endemic flora species.	Internationally designated sites (or equal status). Nationally designated sites (or equal status). Critical habitats of significant international or national ecological importance.

Conservation Value (Sensitivity)	Species Criteria	Habitat or Site Criteria
	Bird species with elevated conservation concern; species with declining local population; breeding residents.	
Medium	IUCN Near Threatened species. Nationally protected species or rare species, but not a significant population size and not of national importance. Regional endemic flora species.	Regionally important natural habitats. Priority habitats listed under Annex I of the Habitats Directive. Modified habitats with high biodiversity or under significant threat of loss within the region.
Low	IUCN Least Concern. Widespread species. Non-breeding and non-resident bird species.	Undesignated sites and habitats of natural habitats of some local biodiversity and cultural heritage interest. Modified habitats with limited ecological value. Other sites with little or no local biodiversity and cultural interest. Modified habitats with limited biodiversity value.
Negligible	Species of no national importance / no relevance to the site.	Highly modified habitats of no biodiversity value.

23.9.2 Baseline Conditions

(i) Desktop Review

For the biological environment, an initial desk-top screening of the site and surrounding areas was carried out based on a detailed desk study of available information, including in-country databases and supporting literature including for example A Guide to the Plants of Central Asia, the Flora of Uzbekistan and numerous other scientific papers. This exercise was undertaken for habitats and botany, mammals, reptiles and invertebrates, to highlight areas of more important habitats or where species of conservation concern could be present along the route of the OHTL.

Additional information regarding species conservation status was taken from the Uzbekistan Red Data Books and IUCN Red List. Information pertaining to protected sites was sourced from in-country databases and supplemented by information contained on the BirdLife Datazone (http://datazone.birdlife.org/home). A PS6 IBAT report was downloaded for the AoI which identified all legally protected sites and Key Biodiversity Areas (KBAs) as well as all possible IUCN Critically Endangered, Endangered, Vulnerable and Near-threatened species and range restricted species from a search area of 50 km from the OHTL (including a 5 km buffer of the original proposed route).

Protected Areas

The location of Protected Areas within 50 km from the OHTL (including a 5 km buffer of the original proposed route) are as follows and are shown in figures below:

- 12 Protected Areas, with two within 1 km, one within 10 km and a further 9 within 50 km. Within 1 and 10 km are:
  - Khorazm National Nature Park
  - Lower-Amudarya State Biosphere Reserve
  - Paykent Natural Monument
- 8 KBAs, with four within 10 km and a further four within 50 km. Within 10 km are:
  - Karakyr Lakes IBA
  - Gorelde IBA (Turkmenistan)
  - Muskinata IBA (Turkmenistan)
  - Soltansanjar – Duyeboye IBA (Turkmenistan)

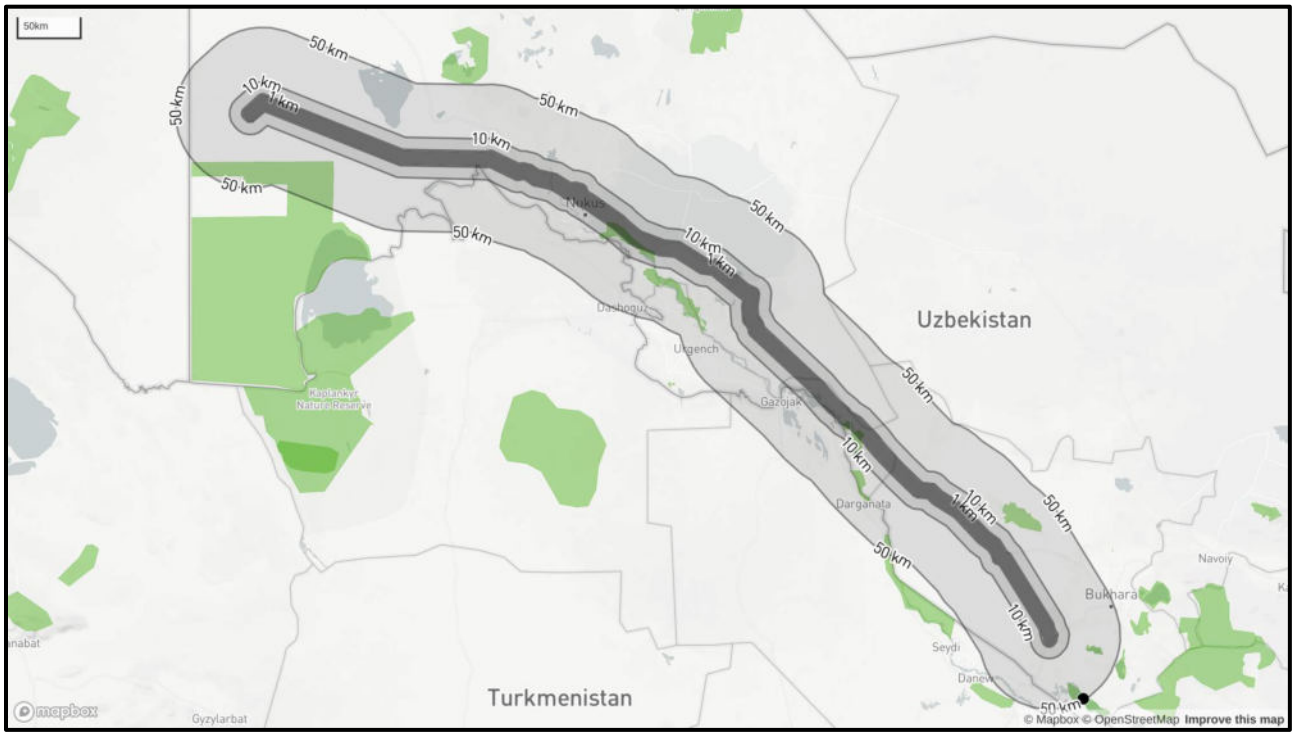


Figure 147: IBAT results protected areas within 50 km

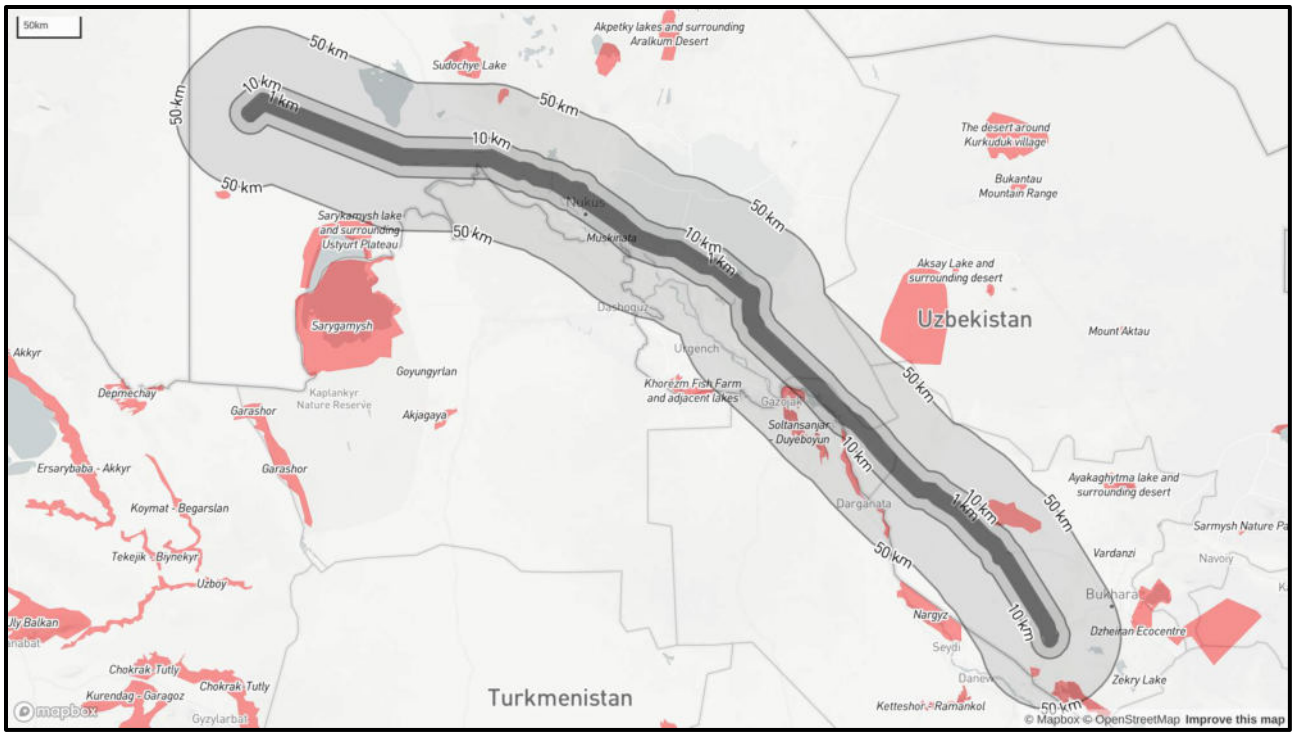


Figure 148: IBAT results key biodiversity areas within 50 km

Khorazm National Nature Park

This protected area is within 2 km south of the OHTL. The National Nature Park (NNP) is legally protected by the Law of the Republic of Uzbekistan on Protected National Territories. The Khorazm National Park is created for protection of the Tugai forest natural resources in the Amudarya delta. The Tugai forests are formed by willow (Salix) and comb (Tamarix) plant species.

Lower-Amudarya State Biosphere Reserve

This protected area is within 2 km south of the OHTL route and is designated for:

- Lower Amudarya State Biosphere Reserve (LABR) in Uzbekistan is located in the northern part of the lower reaches of the Amu Darya, southeast of the former coast of the Aral Sea. The site is one of the largest areas of natural Tugai in Central Asia which, from a global perspective, is a unique and threatened ecosystem.
- The reserve provides an important habitat for plant and animal life and contains the highest biodiversity in the desert regions of Central Asia. The natural vegetation is composed of Tugai, a form of riparian forest or woodland, endemic to Central Asia. It is also the natural and protected environment of the threatened Bukhara Deer (*Cervus hangul bactrianus*) included in the Red List of IUCN.

Paykent Natural Monument

Although it is noted to have some ecological interest, it is not of particular significance. In the area of the monument species listed in the Red Book of the Republic of Uzbekistan that have been recorded are MacQueen's Bustard (*Chlamydotis macqueenii*), Desert Monitor (*Varanus griseus*), Central Asian Tortoise (*Testudo horsfieldi*), Desert Sand Boa (*Eryx miliaris*) and Tatar Sand Boa (*Eryx tataricus*).

Karakyr Lakes[112]

This site is included as an Important Bird Area and is approximately 9 km north-west of the OHTL route at its closest point. Karakyr was created in the 1970s and consists of two large wastewater lakes and a large area of floodplain located along the collector channel supplying the lakes. The lakes have open water areas surrounded by reed. Seepage and flooding of the sandy desert surrounding the lakes and floods is resulting in the growth of grassy vegetation and the sands are becoming fixed. The main period of inflows is in March-April. Karakyr lakes system consists of three separate lakes: Big Karakyr, Small Karakyr and Aquarium. The general area (with a buffer zone) is about 50,000 ha. In summer due to the high rate of evaporation and a reduction of water inflows most of the reservoir (40-50 %) dries up and there is eutrophication.

The avifauna of Karakyr is typical of similar ecosystems of the region. According to literature data and observations made about 200 species of birds have been recorded at the site. Of these 122 species are waterfowl and waterbirds, with numerous overwintering waterfowl and nesting waterbirds. In 2006 White-headed Duck (*Oxyura leucocephala*) was confirmed to have nested on site and in 1987 just in one area a large nesting colony was confirmed consisting of 1,000 nests of Great Cormorant (*Phalacrocorax carbo*) and 400 pairs of Black-crowned Night Heron (*Nycticorax nycticorax*) as well as small numbers of other cormorants and herons. Winter counts of the lakes have recorded 43 species of bird.

Table 105: Populations of IBA Trigger Species

Species		IUCN Category	Season	Year(s) of Estimate	Population at Site	IBA Criteria Triggered
Common Name	**Scientific Name**					
White-headed Duck	*Oxyura leucocephala*	EN	winter	2004-2006	30-5,000 adults	A1, A4i
Greylag Goose	*Anser anser*	LC	winter	2000-2005	115-27,695 adults	A4i
Lesser White-fronted Goose	*Anser erythropus*	VU	winter	2005	30 adults	A1
Common Goldeneye	*Bucephala clangula*	LC	winter	2000-2004	1-790 adults	A4i
Smew	*Mergellus albellus*	LC	winter	2000-2005	2-491 adults	A4i
Red-crested Pochard	*Netta rufina*	LC	winter	2000-2005	1,102-41,700 adults	A4i
Common Pochard	*Aythya ferina*	VU	winter	2000-2005	184-34,050 adults	A4i
Ferruginous Duck	*Aythya nyroca*	NT	winter	2004	50 adults	A1
Mallard	*Anas platyrhynchos*	LC	winter	2000-2005	917-12,332 adults	A4i
Red-necked Grebe	*Podiceps grisegena*	LC	winter	2004-2005	1-300 adults	A4i
Egyptian Nightjar	*Caprimulgus aegyptius*	LC	breeding	1998-2006	2-14 individuals	A3
Common Coot	*Fulica atra*	LC	winter	2000-2005	5,206-46,000 adults	A4i

[112] BirdLife International (2023) Important Bird Area factsheet: Karakyr Lakes. Downloaded from http://datazone.birdlife.org/site/factsheet/karakyr-lakes-iba-uzbekistan on 19/07/2023.

Species		IUCN Category	Season	Year(s) of Estimate	Population at Site	IBA Criteria Triggered
Common Name	**Scientific Name**					
MacQueen's Bustard	*Chlamydotis macqueenii*	VU	breeding	1998-2000	2-14 individuals	A3
Dalmatian Pelican	*Pelecanus crispus*	NT	winter	2004	44 adults	A1
Pygmy Cormorant	*Microcarbo pygmaeus*	LC	winter	2000-2005	23-5,560 adults	A4i
Great Cormorant	*Phalacrocorax carbo*	LC	winter	2000-2005	3-2,040 adults	A4i
Turkestan Ground-jay	*Podoces panderi*	LC	resident	1998-2006	1 individuals	A3
Sykes's Warbler	*Iduna rama*	LC	breeding	1998-2006	3-20 individuals	A3
Streaked Scrub-warbler	*Scotocerca inquieta*	LC	breeding	1998-2006	1-5 individuals	A3
Desert Finch	*Rhodospiza obsoleta*	LC	resident	1998-2006	2-6 individuals	A3
Red-headed Bunting	*Emberiza bruniceps*	LC	breeding	1998-2006	1-7 individuals	A3
A4iii Species group - waterbirds		n/a	winter	2000-2004	85,070-144,173 individuals	A4iii

Non-bird biodiversity includes various mammals in the adjacent desert including Goitered Gazelle (*Gazella subgutturosa*) and reptiles including Desert Monitor (*Varanus griseus*).

During the 2023 site survey completed by Turnstone Ecology, a visit to the Karakyr Lakes was undertaken to the south-western edge of the area on the 1 May 2023. During the site visit it was noted that the viewable area of the lake/s was a large open area of water, however, it was surrounded by tall and thick reedbed vegetation meaning viewing the open water is very difficult. As a result, only a small number of wildfowl was observed but there were numerous Western Marsh Harriers (*Circus aeruginosus*), cormorants and ciconiiformes present in the area, species that could be at greater risk of impacts from the OHTL.

Gorelde[113]

This site is included as an Important Bird Area and is in Turkmenistan approximately 8 km south-west of the OHTL route at its closest point. The IBA covers the Amu Darya valley and adjoining sites to the west and extends from Lebap to Uchkersen. The eastern border follows the course of the Amu Darya, and the western border, includes small tugai sites, flood areas and lakes. The small tugai sites - Borli, Jigerbent, Karaygyr, Harrat, Birata, Gerelde and Dayahatyn - are located along the course of the Amu Darya. Part of the former Tugai forest is now occupied by agricultural fields and settlements. In the valley there are meadows and floodlands on alluvial soils, and extensive salt marshes. The dominant vegetative cover is psammophyte with ephemeral herbs. Bushes include Haloxylon, Calligonum, Ephemera and Salsola richteri, with Artemisia and Salsola thickets in places. The woody-shrubby Tugai vegetation comprises

[113] BirdLife International (2023) Important Bird Area factsheet: Gorelde. Downloaded from http://datazone.birdlife.org/site/factsheet/gorelde-iba-turkmenistan on 19/07/2023.

Populus, Elaeagnus, Tamarix, Halimodendron and Halostachys. In unflooded Tugai sites there is reed, licorice, shorthear and dogbane.

The avifauna includes 160 species have been recorded from the IBA, but this number is not definitive. Passerines are the most numerous (more than 60 species), followed by birds of prey (20), Anseriformes (16) and Charadrii (14). Waterbirds comprise 58 species. The site is part of the major migratory flyway of waterbirds and waterfowl along the Amu Darya valley. Confirmed or possible breeding species: Eagle Owl (*Bubo bubo*), Stone Curlew (*Burhinus oedicnemus*) and Short-toed Snake Eagle (*Circaetus gallicus*). Migrating and wintering species: Great White Pelican (*Pelecanus onocrotalus*), Dalmatian Pelican (*Pelecanus crispus*), Eurasian Spoonbill (*Platalea leucorodia*), Black Stork (*Ciconia nigra*), Marbled Duck (*Marmaronetta angustirostris*), Osprey (*Pandion haliaetus*), Pallas's Fish Eagle (*Haliaeetus leucoryphus*), Imperial Eagle (*Aquila heliaca*), Golden Eagle (*Aquila chrysaetos*) and Peregrine Falcon (*Falco peregrinus*). Passage Common Crane (*Grus grus*) use the islands.

Table 106: Populations of IBA Trigger Species

Species		IUCN Category	Season	Year(s) of Estimate	Population at Site	IBA Criteria Triggered
Common Name	**Scientific Name**					
Great White Egret	*Ardea alba*	LC	passage	2004-2007	28-549 individuals	A4i
Dalmatian Pelican	*Pelecanus crispus*	NT	passage	2004-2007	1-220 individuals	A1, A4i
Great Cormorant	*Phalacrocorax carbo*	LC	breeding	1998-2007	40-1,600 individuals	A4i
White-winged Woodpecker	*Dendrocopos leucopterus*	LC	resident	1998-2007	8-12 breeding pairs	A3
Saker Falcon	*Falco cherrug*	EN	breeding	2004-2007	1 individuals	A1
Great Tit	*Parus major*	LC	resident	1998-2007	200-300 individuals	A3

Muskinata[114]

This site is included as an Important Bird Area and is in Turkmenistan approximately 10 km south-west of the OHTL route at its closest point. The IBA is situated on the border between Turkmenistan and Uzbekistan 25 km to the north-east of Boldumsaz and 50 km from Dashoguz. The site is a small Tugai forest "Muskinata" (901 ha) on the left bank of the Amudarya river. There is also Tugai forest on the right bank of the Amudarya but this lies within Uzbekistan. The majority of the IBA are floodplain ecosystems. More than 80 species of plant have been recorded in the Tugai forest, with 12 species being common.

The avifauna includes more than 200 species: resident - 16, nesting - 63, wintering - 30, passage - 113. The dominant groups are passerines, birds of prey, Anseriformes and Charadrii. Resident, passage and wintering species include Eurasian Spoonbill, Osprey, Short-toed Snake Eagle, Lesser Kestrel (*Falco naumanni*), Stone Curlew, Eagle Owl and European Roller (*Coracias garrulus*).

[114] BirdLife International (2023) Important Bird Area factsheet: Muskinata. Downloaded from http://datazone.birdlife.org/site/factsheet/muskinata-iba-turkmenistan on 19/07/2023.

Table 107: Populations of IBA Trigger Species

Species		IUCN Category	Season	Year(s) of Estimate	Population at Site	IBA Criteria Triggered
Common Name	Scientific Name					
Pygmy Cormorant	*Microcarbo pygmaeus*	LC	breeding	2007	1,000 individuals	A4i
Pallid Scops-owl	*Otus brucei*	LC	breeding	2007	2 individuals	A3
White-winged Woodpecker	*Dendrocopos leucopterus*	LC	resident	2007	1 individuals	A3
Great Tit	*Parus major*	LC	resident	2007	20-40 individuals	A3
Sykes's Warbler	*Iduna rama*	LC	breeding	2007	6-8 individuals	A3
Streaked Scrub-warbler	*Scotocerca inquieta*	LC	resident	2007	6 individuals	A3
Desert Finch	*Rhodospiza obsoleta*	LC	breeding	2007	14 individuals	A3
Red-headed Bunting	*Emberiza bruniceps*	LC	breeding	2007	4 individuals	A3

Soltansanjar - Duyeboyun[115]

This site is included as an Important Bird Area and is in Turkmenistan approximately 10 km north-west of the OHTL route at its closest point. The IBA is located in the north-eastern part of Turkmenistan in the Birata district of the Lebap region. The site includes lakes, a system of water reservoirs (Duyeboyun, Soltansanjar and Koshbulak), part of the Amudarya river (68 km in length), the Duyeboyun reservoir floods and lakes, and adjoining parts of the Pitnyakskaya uplands with patches of sandy and stony-clayey desert and saline depressions. Young Tugai forests are present along the Amu Darya at Syuduktugay, Saduar and Hanyan and appeared after filling of the Duyeboyun reservoir. Meadows, alluvial soils and saline depressions occur in the Amu Darya valley. The reservoirs and floods freeze if winters are unusually cold. There are no settlements in the site, but there are huts for fishmen and shepherds. Biratinsky district is a border zone and the river Amu Darya is the border between Turkmenistan and Uzbekistan.

180 species of birds have been recorded in the IBA, but this number is not definitive. The most diverse are Passeriformes, Falconiformes, Anseriformes and Chardriidae. There are many waterbirds. The cliffs and outlying parts of the Pitnyakskaya upland is a nesting place for raptors and Ruddy Shelduck (*Tadorna ferruginea*) (23 pairs in 2007). The variety of waterbodies provide favorable conditions for the stopover of many species, with more than 20,000 individual waterbirds during migration and in winter. Eagle Owl, MacQueen's Bustard, Stone Curlew, Golden Eagle, Saker Falcon (*Falco cherrug*) and Short-toed Snake Eagle breed or possibly breed. Great White Pelican, Dalmatian Pelican, Eurasian Spoonbill, Greater Flamingo (*Phoenicopterus roseus*), Pallas's Fish Eagle and Cinereous Vulture (*Aegypius monachus*) are migrants and winter visitors. Flocks of Common Crane (up to 200 individuals) make stopovers in the desert part of the site.

[115] BirdLife International (2023) Important Bird Area factsheet: Soltansanjar - Duyeboyun. Downloaded from http://datazone.birdlife.org/site/factsheet/soltansanjar--duyeboyun-iba-turkmenistan on 19/07/2023.

Table 108: Populations of IBA Trigger Species

Species		IUCN Category	Season	Year(s) of Estimate	Population at Site	IBA Criteria Triggered
Common Name	Scientific Name					
Red-crested Pochard	*Netta rufina*	LC	passage	2007	5,000 individuals	A4i
Great Crested Grebe	*Podiceps cristatus*	LC	passage	2007	900 individuals	A4i
Dalmatian Pelican	*Pelecanus crispus*	NT	passage	1986-1993	120 individuals	A1, A4i
Saker Falcon	*Falco cherrug*	EN	resident	2007	2 individuals	A1
A4iii Species group - waterbirds		n/a	passage	2007	min 20,000 individuals	A4iii

Species of Conservation Concern

The table below shows the species of global conservation concern (IUCN Critically Endangered, Endangered and Vulnerable) considered to be present within the 50 km IBAT search area.

Table 109: Species of Global Conservation Concern

Species		IUCN Category
Common Name	Scientific Name	
Small Amu-Darya Shovelnose Sturgeon	*Pseudoscaphirhynchus hermanni*	CR
Amu Darya Shovelnose Sturgeon	*Pseudoscaphirhynchus kaufmanni*	CR
Sociable Lapwing	*Vanellus gregarius*	CR
Saiga	*Saiga tatarica*	CR
Pike Asp	*Aspiolucius esocinus*	EN
Chu Sharpray	*Capoetobrama kuschakewitschi*	EN
White-headed Duck	*Oxyura leucocephala*	EN
Pallas's Fish-eagle	*Haliaeetus leucoryphus*	EN
Egyptian Vulture	*Neophron percnopterus*	EN
Saker Falcon	*Falco cherrug*	EN
Steppe Eagle	*Aquila nipalensis*	EN
Tiger	*Panthera tigris*	EN
Uzbekistan Toadhead Agama	*Phrynocephalus rossikowi*	EN
Eurasian Carp	*Cyprinus carpio*	VU
Aral Barbel	*Luciobarbus brachycephalus*	VU
Bulatmai Barbel	*Luciobarbus capito*	VU
Swan Goose	*Anser cygnoid*	VU
Lesser White-fronted Goose	*Anser erythropus*	VU
Common Pochard	*Aythya ferina*	VU
Yellow-eyed Pigeon	*Columba eversmanni*	VU
Greater Spotted Eagle	*Clanga clanga*	VU
Eastern Imperial Eagle	*Aquila heliaca*	VU
European Turtle Dove	*Streptopelia turtur*	VU
Great Bustard	*Otis tarda*	VU

Species		IUCN Category
Common Name	**Scientific Name**	
MacQueen's Bustard	*Chlamydotis macqueenii*	VU
Cheetah	*Acinonyx jubatus*	VU
Goitered Gazelle	*Gazella subgutturosa*	VU
Marbled Polecat	*Vormela peregusna*	VU
Urial	*Ovis vignei*	VU
Szczerbak's Even-fingered Gecko	*Alsophylax szczerbaki*	VU

* Tiger and Cheetah are extinct in Uzbekistan and are not discussed further in this assessment.

Range Restricted Species

The table below shows the range restricted (endemic or near-endemic) species considered to be present within the 50 km IBAT search area.

Table 29: Range Restricted Species

Species		IUCN Category	Biome
Common Name	**Scientific Name**		
Sattar Snowtrout	*Schizothorax fedtschenkoi*	LC OR LR/LC	Freshwater
A species of ray-finned fish	*Dzihunia ilan*	LC OR LR/LC	Freshwater
A mollusc	*Bithynia oxiana*	DD	Freshwater
Uzbekistan Toadhead Agama	*Phrynocephalus rossikowi*	EN	Terrestrial
Heptner's Pygmy Jerboa	*Salpingotus heptneri*	DD	Terrestrial

Three of the species inhabit freshwater habitats, with *Schizothorax fedtschenkoi* and *Dzihunia ilan* found in the Zarafshan river area and *Dzihunia ilan* found in a very small area of the Amu Darya. These habitats will not be impacted by the proposed project.

The Uzbekistan Toadhead Agama is found in a small area along the Amu Darya near the Turkmenistan border. The Reptile specialists working on the project have confirmed that this species would not be found along the route of the OHTL. Further to this, it should be noted that as a result of recent studies and numerous field trips in recent years, specialists of the Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan have not found a single individual of Uzbekistan Toadhead Agama *Phrynocephalus rossikowi*, even in places where it was previously observed and in their vicinity, which confirms that unfortunately this species is probably extirpated on the territory of Uzbekistan.

Heptner's Pygmy Jerboa is found in isolated areas of the Kyzylkum desert in Uzbekistan and Kazakhstan. The range of this species shown on the IUCN Red List website is approximately 25 km to the north, however the mammal specialists working on the project have confirmed that this species is actually only found further north than that. Additionally, the habitat in this area where the OHTL is proposed is different to the area to the north, and this species would not be found along the route of the OHTL.

With the exception of the Uzbekistan Toadhead Agama, whilst all of the above are range-restricted they have been discounted from the Critical Habitats Assessment, as they are considered to be very unlikely to be present within the AoI or the habitats in which they are found will not be impacted by the proposals.

During the scoping stage of the project the potential presence of and potential impact on two range restricted (and IUCN EN) plant species, *Calligonum matteianum* and *C. mole*, was raised by ADB. These species were not identified through the IBAT search but the known range is around Lake Dinguzkul to the

southeast near the Turkmenistan border which is approximately 40km away from the Karakul substation. The range of these species is further evidenced in a recent CHA for the Nur Bukhara Solar Project[116] which indicates presence in habitats to the east of Bukhara, which is outside of the Project AoI. Additionally, the botanical specialists working on the project have confirmed that they have been involved in survey for these species in recent years and are aware of the species range and habitat requirements and that these species were not found during the survey for the OHTL and are not present in the area or habitats where the OHTL is proposed. Therefore, both are considered very likely absent from the AoI.

(ii) Turnstone Ecology Scoping Site Visit

In 2023 Turnstone Ecology completed a three-day rapid Scoping Visit from 29 April to 1 May to the Project AoI as well as visiting some parts of the adjacent wetlands where possible.

During the Scoping Survey all bird Vantage Points (VPs) were visited and viewsheds verified. Any baseline survey data collected as part of the Scoping Visit has been used within this assessment.

(iii) Biodiversity Surveys

Surveys for biodiversity have been undertaken at the site since April 2023 and the surveys will be completed up to summer 2024 (July 2024).

Due to the scale of the project the OHTL route was divided into four sections (figure below), defined where appropriate by geological features or obvious changes in broad habitat type. These sections were considered for the herpetofauna, mammal and invertebrate surveys as discussed in further details below.

[116] Critical Habitat Assessment Nur Bukhara Solar PV and BESS, UZB-MAS ESIA for Solar PV Bukhara – CHA v 2.0 (final draft), Juru Energy, August 2023

Figure 149: Sections for Biodiversity Assessments

Table 110: Description of Sections

Section	Description
Section 1	Ustyurt Substation to the western edge of Agriculture Area. Section length approximately 170 km. Section is within the Ustyurt Platea, from the start of the OHTL (near the wind farm area) to the edge of the Agricultural Area.
Section 2	Agriculture Area to Nukus Substation. Section length approximately 80 km. Section is entirely through the Agricultural Area and urbanised habitats (Kanlikul, Shumanay, Akmangit and Nukus).
Section 3	Nukus Substation to Land to the north-east of Taza-Kel'teminar. Section length approximately 175 km. Section is mostly through desert habitats with some agricultural areas. The section is heavily urbanised, being close to main roads and numerous settlements.
Section 4	Land to the north-east of Taza-Kel'teminar to Karakul Substation. Section length approximately 320 km. Section is almost entirely desert habitats (including the Kyzylkum) but is parts is close to main roads and settlements.

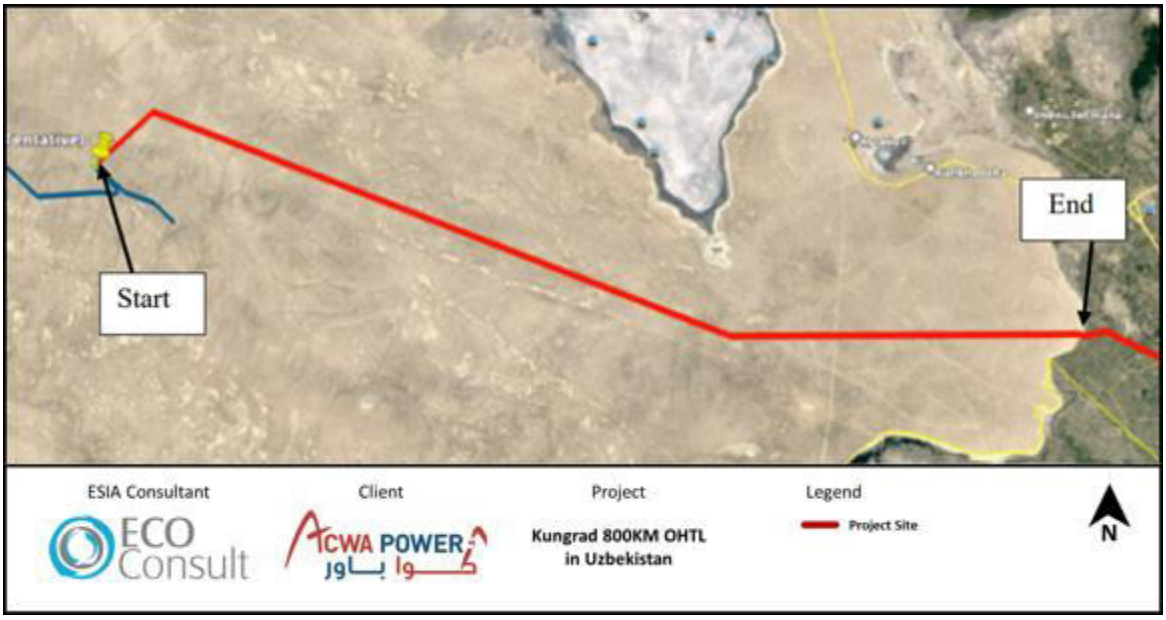


Figure 150: Section 1 – Ustyurt Substation to the western edge of the Agriculture Area

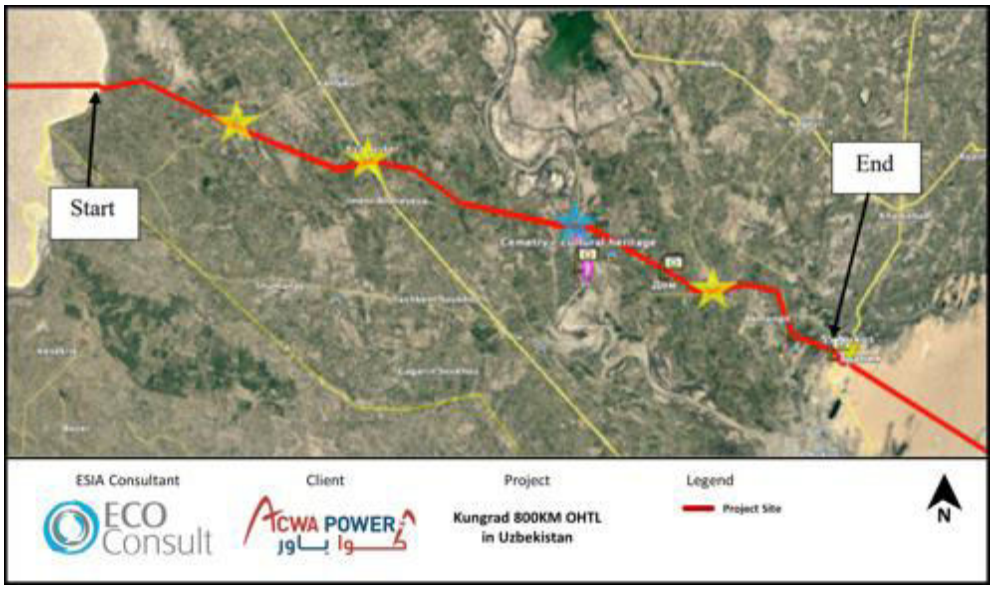


Figure 151: Section 2 – Agriculture Area to Nukus Substation

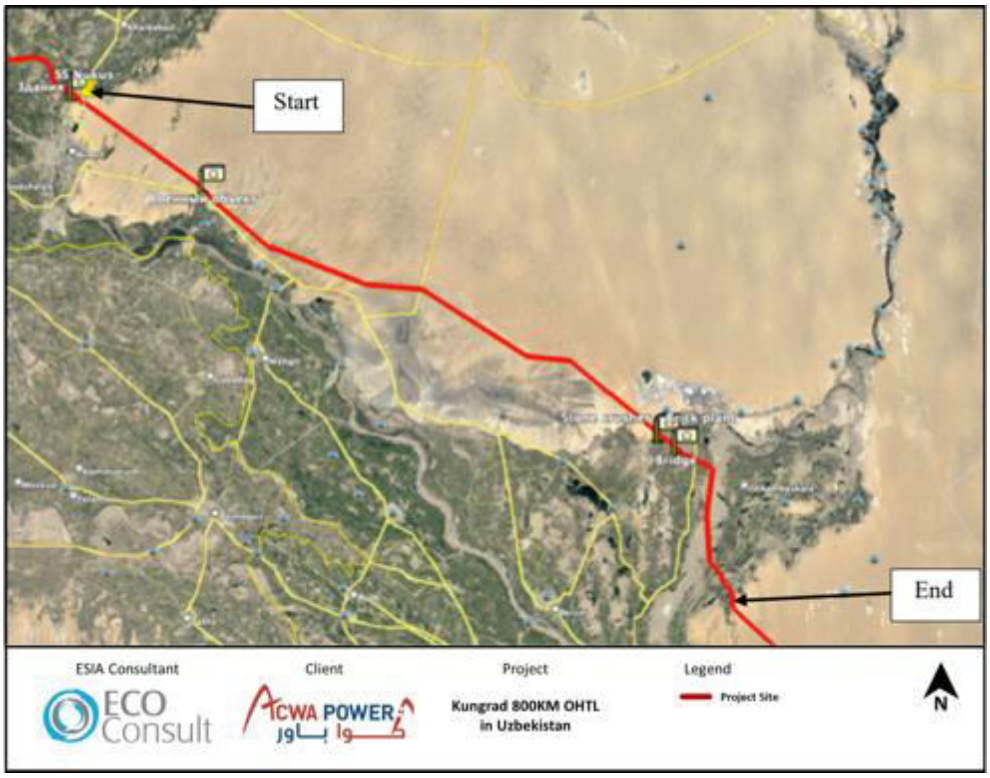


Figure 152: Section 3 – Nukus Substation to Land to the north-east of Taza-Kel'teminar

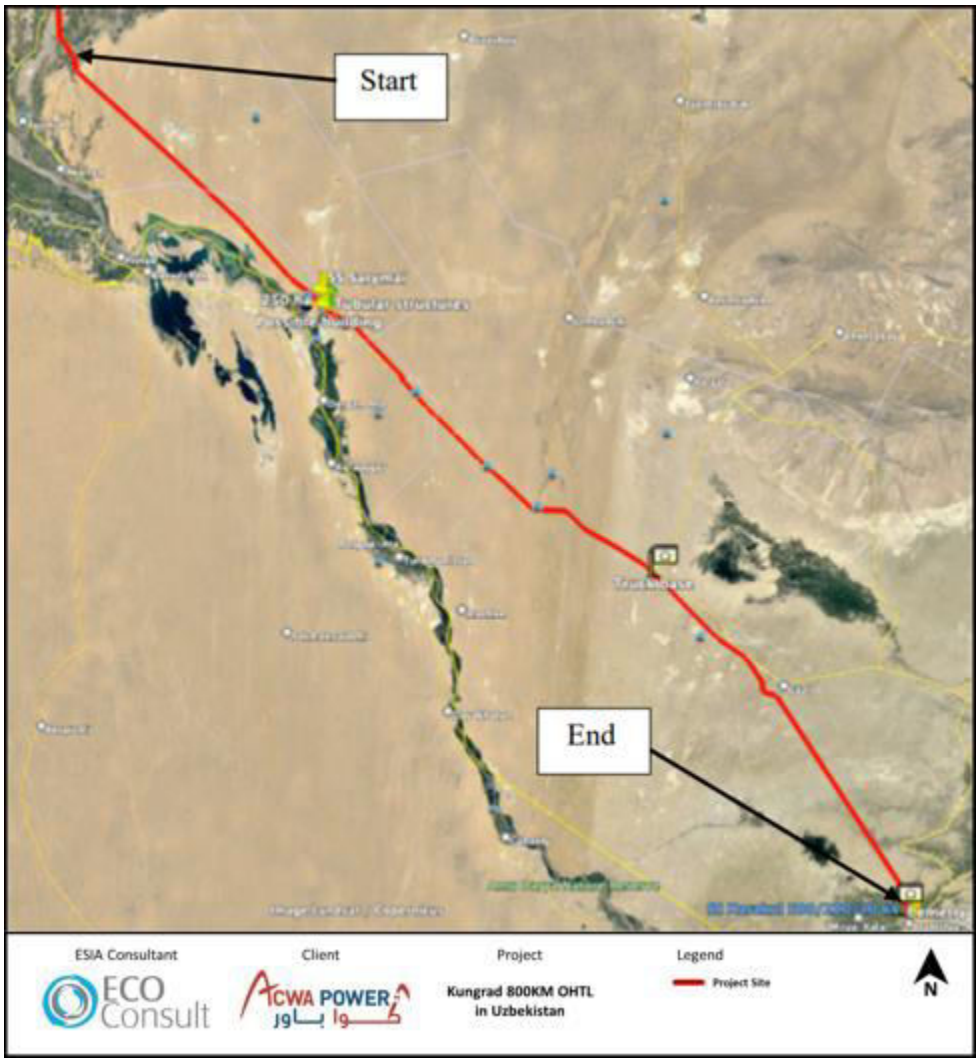


Figure 153: Section 4 – Land to the north-east of Taza-Kel'teminar to Karakul Substation

23.9.3 Habitats and Flora

Methods

The field surveys to record habitats, flora and vegetation were undertaken 9 to 13 June 2023 by experienced in-country botanists. A survey protocol was devised by Turnstone Ecology and the surveys consisted of a full drive/walkthrough of the whole OHTL route and 85 2x2 m sample plots (quadrats) at representative habitats through Sections 1 to 4. All plant species present within each quadrat were recorded (including their abundance and % of cover), in particular, threatened species, weeds and invasive species.

Identification of species was based on literature such as 'Определитель растений Средней Ази' - A Guide to the Plants of Central Asia, 'Флора Узбекистан' - The Flora of Uzbekistan and others. Herbarium specimens of each plant species present within the Project area were collected and identified in the National Herbarium of Uzbekistan (TASH) using special literature, including Nikitin, 1983; CABI: Invasive

Species Compendium, 2017; Sennikov et al., 2018 and the herbarium collections of TASH, and a summary check-list of the flora was compiled.

The results of the survey were used to categorize the habitats present as Modified or Natural and a Condition Score was determined based on the parameters set out in the table below. Habitat condition scores will be used to inform net loss / gain calculations.

Table 111: Calculation of Habitat Condition Scores

Habitat	Condition Rating	Condition Score	Summary
Site Habitat Definition	Habitat Lost	0.0	Habitat that is irreversibly damaged. For example, by concrete, roads, hard standing quarrying etc. Habitat indicator species are not present
	Very Poor	0.2	Habitat that has been significantly damaged by anthropogenic factors (e.g. agriculture / construction / vehicle). Low number of species present, 10 % of expected coverage for the habitat type present, presence of invasive / non-native species. Habitat indicator species are rare.
	Poor	0.4	Poor quality habitat. Some evidence of anthropogenic factors (e.g. presence of herders or livestock droppings). Low plant species composition and 25% of expected vegetation coverage for the habitat type present. Very low rates of invasive /non-native species. Habitat indicator species are occasional.
	Moderate	0.6	Habitat is improved from Poor but still not supporting a diverse community of plants and coverage 40 – 60% of the expected vegetation coverage for the habitat type present. Invasive / non-native species absent. Habitat indicator species frequent.
	Good	0.8	Site supports a more diverse community of plants with a good 60 - 80% of the expected vegetation coverage for the habitat type present. Habitat indicator species are abundant.
	Very good	1.0	Represents the best quality habitat in the region. 80 – 100% of the amount of plant cover expected for the habitat type present. Habitat indicator species are dominant.

Dominant, Abundant, Frequent, Occasional and Rare are taken from the DAFOR scale which is a quantitative measurement of the abundance of plant species within the quadrats.

Results

General

Uzbekistan is characterized by diverse landscapes, including vast plains, desert regions, and mountain ranges. Nearly four-fifths of Uzbekistan's territory, the sun-dried western area, has the appearance of a wasteland. In the north-west the Turan Plain rises 60 to 90 meters above sea level around the Aral Sea in Karakalpakstan. This terrain merges to the south with the Kyzyl Kum (Uzbek: Qizilqum) Desert and farther west becomes the Ustyurt Plateau, a region of low ridges, salt marshes, sinkholes, and caverns. Southeast of the Aral Sea, small hills break the flatness of the low-lying Kyzyl Kum Desert, and, much farther east, a series of mountain ridges partition Uzbekistan's territory. The central part of Uzbekistan is occupied by the Kyzyl Kum desert, covering the area between the largest rivers of Central Asia, Amu Darya and Syr Darya. This area, usually designated on maps as "Kyzl Kum sands", actually represents a complicated and diverse mosaic of stony and clayey plateaus, hilly sands, undrained hollows, isolated mountain heights, salt-marshes and takyrs.

The OHTL begins from the area of the proposed Kungrad 1.5GW Wind Farm and continues to the Karakul district of the Bukhara region.

The habitats of the OHTL route through Section 1, the Ustyurt Platea, are currently not used. The climate of the region is dry. Currently, most of the territory has been degraded. Section 2 of the OHTL route goes through the Kungrad, Khojaly and Nukus city regions, where anthropogenic activities have changed the landscape.

As a result of the botanical-geographical zoning, the territory of Uzbekistan was divided into 2 provinces, 16 districts and 38 botanical geographical regions (Figure 154). The OHTL route passes through several of these regions as follows:

- II-8-a North Ustyurt botanical-geographical district of II-8 Ustyurt district of Turon province,
- II-6 South Orololdi district; II-6-b botanical geographical region of Amudarya delta,
- II-3-a Kyzylkum botanical geographical region of II-3 Kyzylkum district,
- II-4-b passing through the botanical-geographical regions of Kyzylkum remains II-4 of Bukhara district and it ends in II-4-c the lower Zarafshan botanical geographical region.

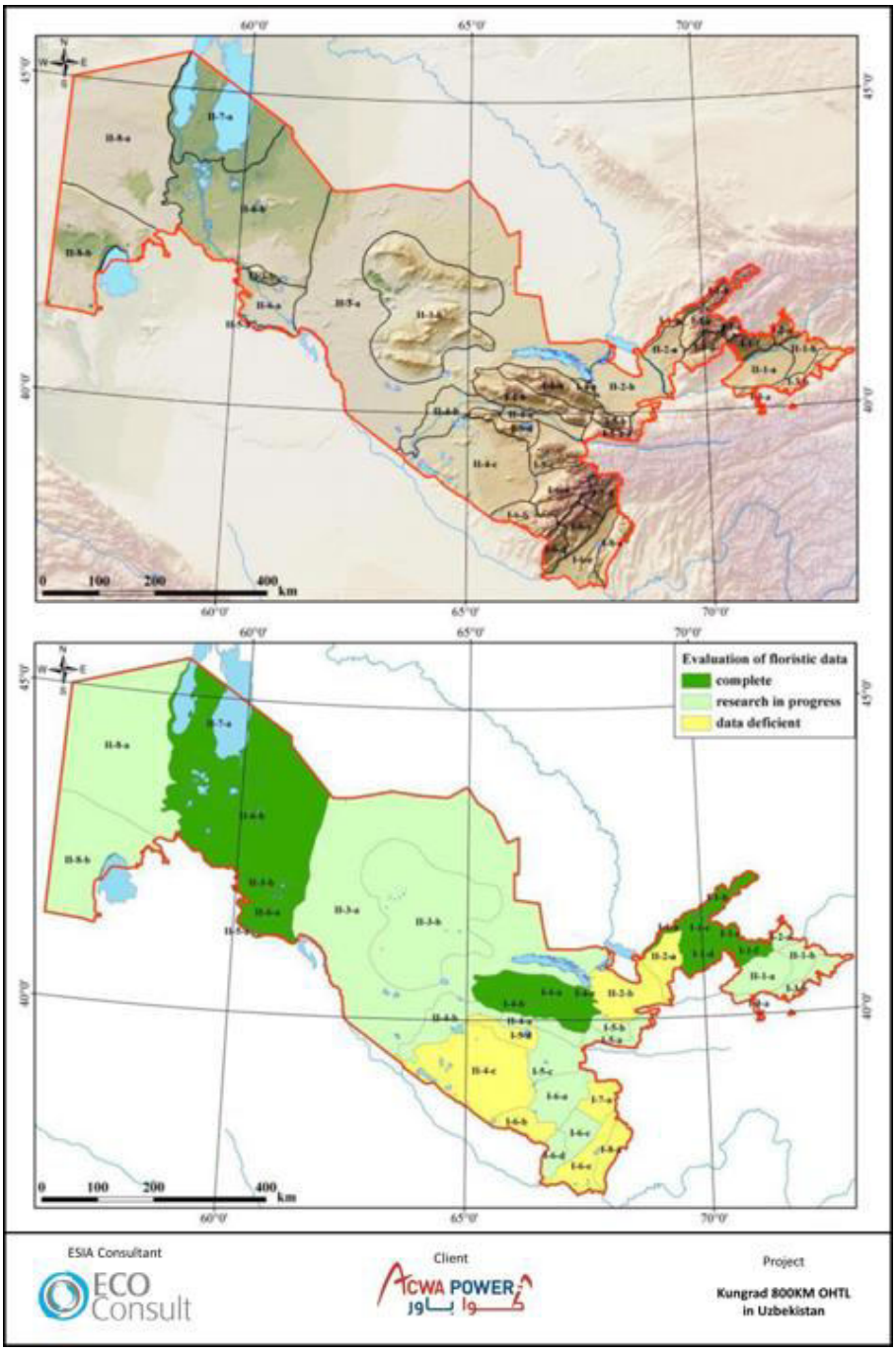


Figure 154: Scheme of Uzbekistan's botanical and geographical regions (by Tojiboyev. K., Sh. Beshko. N.Yu., Popov. V.A.)

The OHTL is long and passes through variety of habitats, including desert, agricultural and other areas. The habitats are broadly natural habitats and belong to the Type 8 (Desert) and Sub-type 8.2 (Temperate Desert) according to IUCN Habitats Classification Scheme, with smaller areas of Type 14 (Artificial – Terrestrial) and Sub-type 14.1 (Arable Land), Type 4 (Grassland) and Sub-type 4.5 (Subtropical/tropical dry), and Type 3 (Shrubland) and Sub-type 3.5 (Subtropical/tropical dry).

Based on the literature review of the OHTL route, the complete flora of habitats along the OHTL is composed of 295 species of vascular plants from 23 families.

During the survey 43 species were recorded during the surveys. Details of the species recorded in the different sections and therefore different habitat conditions are given below.

Section 1

Landscape Characteristics

Section 1 covers geographical point of Karabaur Uval, Karakalpak Ustyurt. Karabaur is a discontinuous chain of sloping hills often almost merging with one another with gravel-loamy undulating plain desert, stretched from west-north-west to east-south-east. The surface is mostly flat, almost plateau like. Outcrops of bedrock are rare, and on the surface of the hills there is more or less developed soil cover, characterized by high gypsum content.

Vegetation

According to botanical and geographical zoning, the territory belongs to the South Ustyurt district of the Ustyurt district of the Turan province. According to geobotanical zoning, it is part of the Karabaur-Muzbel region.

The territories are characterized by an abundance of ravines, hollows and valley-like depressions with shrub (*Atraphaxis spinosa, Caragana grandiflora, Convolvulus fruticosus*) thickets, small areas of *Stipa caspia, S. richteriana, S. hohenackeriana* and fragments of *Alhagi pseudalhagi* thickets indicating the presence of perennials in the gully sediments. On the gentle slopes of ridges that form watersheds between ravines, a typical combination of communities of habitat-forming species of territories, such as *Anabasis salsa, Artemisia terrae-albae, Salsola arbusculaformis* on heavily gravelly thin grey-brown soils. Large, well-defined turtkul with a typical set of extreme gypsophytes are rare and only in the axial part of the ridges. There are very numerous small bosygen spots on the slopes of the ridges, occupied by communities of *Anabasis brachiata* and which are the results of the local accumulation of gypsum carried out from large tyurtkuls. In the axial part of the ridges, pseudo-takyrs are quite common, i.e. outcrops of limestone and marl layers, imitating the physiognomic appearance of takyrs. *Anabasis brachiata, Nanophyton erinaceum, Zygophyllum fabago, Zygophyllum turcomanicum* grow along cracks on them: the arrangement of specimens of these plants in the form of chains makes it possible to recognize the location of cracks (usually masked by rubble). Only the eastern outskirts of Karabaur and especially its southeastern spurs represent a certain originality. Here, along the hills, zaisan saxaul (Haloxylon ammodendron) appears in large numbers, forming small dews.

Survey Results

OHTL section-1 territory located parallel to the project site and included quadrats 1-12. Survey results along Kungrad part of OHTL reflected the existing botanical description in literature. The survey showed that the vegetation is mainly similar to the wind farm project site and includes survey quadrats 1-28. It has large vegetation complex of white-earth wormwood-biyurgun (Anabasis salsa, Artemisia terrae-albae) communities, the association of white earth sagebrush-biyurgun (Anabasis salsa, Artemisia terrae-albae with the participation of keireuk (Salsola orientalis)) on saline solonetzic soils; Anabasis brachiata, Nanophyton erinaseum, Atraphaxis spinosa on rubble flat elevations; and association of white earth wormwood (Anabasis salsa, Salsola orientalis, Artemisia terrae-albae) with shrubs (Atraphaxis spinosa, Convolvulus fruticosus, Salsola arbusculiformis) and kermek (Limonium suffruticosum) on bedrock outcrops of gentle slopes dissected by dry ravines and, in places, pure thickets of Artemisia terrae-albae on alluvial fans, with spots of takyrs (dried crust with fissures forms on the surface). Mainly Anabasis eriopoda and Artemisia terrae-albae.

Based on the literature the UzRDB listed species Euphorbia sclerocyathium (UzRDB 2 – Rare species) and Salsola chiwensis (UzRDB 3 – Reducing species) should be present in Section 1. These species are not listed on the IUCN Red List.

Section 2

Landscape Characteristics

Section 2 of the OHTL route passes through the cities of Kanlikul, Shumanay, Akmangit and Nukus of Karakalpakstan.

This territory is well studied by scientists and occupied by agricultural landscapes and urbanized areas. Typical tugai vegetation is partially conserved in the floodplain of the Amu Darya river.

Vegetation

It is characterized by a large concentration of tugai stands growing in the area of the modern and ancient Amu Darya delta. Representatives of tree-shrub and herbaceous vegetation such as poplars (*Populus aiana*, *P. pruinosa*), Tamarisk (*Tamarix ramosissima*), Common Reed (*Phragmites australis*), Licorice (*Glycyrrhiza glabra*) and Cattail (*Typha angustifolia*) formations are common at the studied area. Other vegetation of the Amu Darya river is represented by Common Reed, fodder, medicinal, dye and essential oil plants.

Survey Results

The territory of Section 2 consists mainly of agricultural crops, including farm lands. The area is highly saline and there are almost no ephemeral plants. Mainly *Haloxylon persicum* and bushes (saxaul belyy, white saxovul, Haloxylon); Alhagi pseudalhagi and Tamarix laxa grows.

Section 3

Landscape Characteristics

Section 3 of the OHTL route begins from Nukus and ends in Boston District, Khorazm Region. Part of the route runs parallel to the A380 road (Guzor – Beyneu road) and this section mostly corresponds to the desert habitat and another section runs parallel to the Karatog (Sultan Uwais mountains).

Section 3 is located in an area of ancient alluvial deposits; however, the main part crosses the plumes of the Sultanuizdak landscape region. The area of ancient alluvial deposits is a low plain. It is composed of alluvial sandy-argillaceous sediments associated with the activity of former channels that connected with the Amu Darya. For the most part, the alluvial plain of the territory is a takyr-like surface, on which there are individual mounds of loose steel-gray micaceous sand, and near the outskirts of the region - yellow "Kyzylkum" sand. The area has been heavily urbanized. Closer to the border of the cultural zone, near settlements and roads, takyrs are replaced by areas of gray dunes, and also takyr surfaces are interrupted by low hollows with tugai areas.

The plumes of Sultanuizdag are a wide strip located at the foot of the northern slope of the Sultanuizdag mountains, representing a flat, slightly sloping area to the north. Its surface is covered with lush saltwort vegetation, confined to the ancient soil that comes to the surface. In some places there are areas covered with small gravel of crystalline rocks taken out of the mountains.

Vegetation

The vegetation of ancient alluvial deposits is poor and sparse due to anthropogenic activities. Near buildings, on plots of irrigated land, sometimes *Alhagi pseudalhagi* develops in masses. Tugai areas with reed-comb (*Tamarix hispida*, *T.ramosissima*, *Phragmites australis*) thickets with abundant development of Karelinia capsica are developed in the territory. A significant role in the landscape of the territory is played by hillocks and small ridges of sands with Kuyansuyak-saxaul-rank (*Carex physodes*, *Haloxylon persicum*, *Ammodendron conollyi*) vegetation, occupying 30-40% of the surface. Here, *Tamarix ramosissima* and a number of semishrubs like *Convolvulus karelinii*, *C. divaricatus*, *Astragalus unifoliatus*, *Artemisia santolina* are present.

The proluvial plumes of Sultanuizdag are dense rubble deposits with rubble of crystalline rocks. A sparse keireuk-wormwood group (*Artemisia terrae-albae*, *Salsola orientalis*) usually develops here, with a significant admixture of saltworts, among which Halomonemis species stand out especially and sometimes with various ephemera. On pebble-rubbly trails in the immediate vicinity of the mountains, against the background of *Artemisia terrae-albae* and *Salsola orientalis*, *Atraphaxis spinosa*, *Salsola arbuscula*, *Calligonum aphyllum* are abundant with a mixture of a number of other species, such as *Anabasis salsa*, *Stipa barbata*, *Ferula foetida*. On the northern border, where plumes merge with the sandy deposits of Kyzylkum, there are communities of wormwood (*Artemisia terrae-albae*), keireuk, in places with saxaul (*Salsola orientalis*, *Artemisia terrae-albae*, *Haloxylon persicum*), sagebrush-saxaul (*Artemisia terrae-albae*, *Haloxylon persicum*); Red Data Book species are not localized on the proluvial trails of Sultanuizdag. The territory is actively used for pasture cattle breeding and camel breeding is developed. In this regard, local areas of vegetation degradation with the dominance of *Peganum harmala*, *Alhagi pseudalhagi*, *Cousinia dichotoma* are widespread.

Survey Results

The sand of khududud is white partially mixed with saline sand, the sand migrates because it is very light and contains salt, and in this desert, it is mainly White Saxaul (*Haloxylon persicum* Bunge ex Boiss. & Bohse.); Ammodendron (*Ammodendron conollyi* Bunge ex Boiss.); *Heliotropium argusioides* Carr. & Dirt.) *Convolvulus erinaceus* Ledeb.) have been found to grow well.

Section 4

Landscape Characteristics

Section 4 of the OHTL route is located in the landscapes of the eolian plains of Uzbekistan - South-Western Kyzylkum. This section starts from Turtkul District of the Republic of Karakalpakstan going through to Karakul District of Bukhara region.

This section has a complex landscape structure, including landscapes of sandy and gravelly deserts, and closed solonchak depressions. The landscapes of large ridge-cellular sands on ancient alluvial deposits, small-hilly sands with outcrops of Paleogene deposits, and dune hilly sands stand out in particular.

Vegetation

According to the botanical and geographical zoning, Section 4 is located in the Kyzylkum district of the Turan provinces. The majority of section 4 is occupied by hilly and ridge sands with their characteristic psammophilous tree and shrub vegetation (*Ammodendron conollyi*, *Calligonum aphyllum*, *C. arborescens*, *C. caput-medusae*, *C. eriopodum*, *C. leucocladum*, *C. macrocarpum*, *C. microcarpum*, *Ephedra strobilacea*, *Haloxylon persicum*, *H. aphyllum*, *Salsola richteri*, *S. paletzkiana*). Rubble deserts with wormwood

(*Artemisia diffusa*, *A. terrae-albae*, *A. turanica*) and perennial saltwort vegetation are found mainly in the southwestern part of the territories. Large and small drainless depressions scattered throughout the region are occupied by groups of halophytes (*Salicornia europaea*, *Suaeda sp*., *Halocnemum strobilaceum*, *Halostachys belangerianus*, *Tamarix hispida*). The area has a peculiar flora with a large number of stenotopic psammophilic species (genus Ammodendron Fisch., astragalus of the section Eremophysa).

The vegetation cover is dominated by associations of jungun (Calligonum sp.sp.) formations, such as partheca-singren-jungun (*Calligonum microcarpum* + *C. microcarpum* - *Astragalus vilosissimus* + *Convolvulus divaricatus*), sagebrush-boylyshevo-jungun (*Calligonum microcarpum* + *C. eriopodum* + *Salsola arbuscula* - *Artemisia diffusa*); association of formations of white saxaul (*Haloxylon persicum*) - seline-ilac-dzhungun-saxaul (*Haloxylon persicum* + *Calligonum setosum* + *C. eriopodum* - *Carex physodes* - *Aristida pennata*); associations of singren formations (*Astragalus vilosissimus*), as parthec-syngraine (*Astragalus vilosissimus* - *Convolvulus hammadae*), parthec-iris-syngrin (*Astragalus vilosissimus* - *Iris songorica* - *Convolvulus hammadae*), jungun-ephemeral-syngrin (*Astragalus vilosissimus* - ephemeretum - *Artemisia diff usa*) ; association of formations of the white boletus (*Salsola arbuscula*) - seline-saxaul-boylysh (*Salsola arbuscula* - *Haloxylon persicum* - *Aristida pennata*).

Survey Results

There are species listed in the UzRDB in Kyzylkum, but during the surveys none of these species were found. The main reason for this is that the following listed Red Book species are distributed mainly in the northern part of the Kyzylkum near the Zarafshan and Uchkuduq districts, and one of the other reasons is that these Red Book-listed species are mainly visible in early spring.

Survey of OHTL section 4 recorded of *Astragalus centralis* E. Sheld., *Astragalus holargyreus* Bunge., *Astragalus adylovii* F. O. Khass., Ergashev et Kadyrov. *Onobrychis tavernierifolia* Stocks ex Boiss., *Eremosparton flaccidum* Litv., Stipa aktauensis Roshev., *Ferula kyzylkumica* Korovin., *Tulipa lehmanniana* Mercklin ex Bunge., *Calligonum zakirovii* (Khalk.) F.O. Khass., *Silene tomentella* Schischk., *Acanthophyllum cyrtostegium* Vved., *Climacoptera amblyostegia* (Botsch.) Botsch., *Climacoptera merkulowiczii* (Zakirov) Botsch., *Lagochilus vevedenskyi* Kamelin et Zuckerw., *Phlomoides transoxana* (Bunge) Salmaki., *Eremostachys eriolarynx* Pazij et Vved., *Cousinia umbilicata* Juz., *Jurinea psammophila* Iljin. and *Lappula aktaviensis* Popov et Zakirov.

The UzRDB listed species *Eremosparton flaccidum* (UzRDB 2 – Rare species) and *Tulipa lehmanniana* (UzRDB 3 – Reducing species) were present in Section 4. On the IUCN Red List *Eremosparton flaccidum* is listed as Data Deficient and *Tulipa lehmanniana* is listed as Near Threatened.

Table 112: List of Plant Species Recorded along OHTL Corridor Quadrats (2x2) During June Survey 2023

№	Species	Species presence acc. to literary sources	Author's earlier personal data	Abundance	Endemism	Conservation status	
						UzRDB	IUCN
Apiaceae							
***Ferula* L.**							
1	*Ferula foetida (Bunge) Regel*	+	+	common	UZ, KZ, TM	-	-
Asparagaceae							
Asparagus L.							

2	*Asparagus breslerianus Schult. & Schult. f.*	+	+	common		-	-
Asteraceae							
Artemisia L. *Tanacetum* L. *Takhtajaniantha*							
3	*Artemisia terrae-albae Krasch.*	+	+	common		-	-
4	*Artemisia diffusa*	+	-				
5	*Tanacetum santolina C. Winkl.*	+	-			-	-
6	*Takhtajaniantha pusilla (Pall) Nazarova.*	+	+	low		-	-
Berberidaceae							
Leontice L.							
7	*Leontice incerta Pall.*	-	+	Very low		-	-
Boraginaceae							
Lappula Moench *Heliotropium*							
8	*Lappula spinocarpos (Forssk.) Asch. ex Kuntze*	+	+	common		-	-
9	*Heliotropium argusioides Kar. & Kir.*	+	+	low		-	-
Brassicaceae							
Sisymbrium L.							
10	*Sisymbrium subspinescens Bunge*	+	+	low		-	-
Chenopodiaceae							
Anabasis (Schrenk) Benth. *Haloxylon* Bunge							
11	*Anabasis eriopoda (Schrenk) Paulsen*	+	+	common		-	-
12	*Haloxylon aphyllum (Minkw.) Iljin*	+	+	common		-	-
13	*Haloxylon persicum Bunge ex Boiss. & Buhse*	+	-			-	-
Convolvulaceae							
Cuscuta L. *Convolvulus* L.							
14	*Cuscuta epithymum (L.) L.*	+	+	low		-	-
15	*Convolvulus fruticosus Pall.*	+	+	common		-	-
16	*Convolvulus erinaceus Ledeb.*	+	-			-	-
17	*Convolvulus hamadae (Vved.) Petrov*	+	-			-	-
Cyperaceae							
Carex L.							

18	*Carex physodes M. Bieb.*	+	-			-	-
Ephedraceae							
Ephedra L.							
19	*Ephedra lomatolepis Schrenk*	+	-			-	-
Euphorbiaceae							
Euphorbia L.							
20	*Euphorbia chamaesyce L.*	+	-			-	-
Fabaceae							
Caragana Fabr. *Alhagi* Gagneb. *Ammodendron* Fisch. *Sphaerophysa* DC. *Glycyrrhiza* L.							
21	*Caragana grandiflora (M. Bieb.) DC.*	+	+	low		-	-
22	*Alhagi pseudalhagi (M. Bieb.) Desv*	+	+	common		-	-
23	*Ammodendron conollyi Bunge ex Boiss.*	+	-			-	-
24	*Sphaerophysa salsula (Pall.) DC.*	+	-			-	-
25	*Glycyrrhiza glabra L.*	+	-			-	-
26	*Eremosparton flaccidum*	+	-			2	-
Liliaceae							
Tulipa							
27	*Tulipa lehmanniana Merckl.*	+	-			3	NT
Lamiaceae							
Lagochilus Bunge ex Benth.							
28	*Lagochilus acutilobus (Ledeb.) Fisch. Fisch. & C. A. Mey.*	+	+	common		-	-
Nitrariaceae							
Peganum L.							
29	*Peganum harmala L.*	+	+	low		-	-
Poaceae							
Eremopyrum Jaub. et Spach *Poa* L. *Triticum* L.							
30	*Eremopyrum bonaepartis (Spreng.) Nevski.*	+	-			-	-
31	*Poa bulbosa L*	+	-	common		-	-
32	*Triticum durum Desf.*	+	-			-	-
Polygonaceae							
Rheum L.							

		Atraphaxis L. *Calligonum* L.					
33	*Rheum tataricum L. f.*	-	+	low		-	-
34	*Atraphaxis spinosa L.*	+	+	dominant		-	-
35	*Calligonum microcarpum*	+	-			-	-
36	*Calligonum setosum*	+	-			-	-
		Salicaceae					
		Salix L. *Populus* L.					
37	*Salix alba L.*	+	-			-	-
38	*Populus pruinosa Schrenk*	+	+	common	Uz,Kaz,Tur k	-	-
		Tamaricaceae					
		Tamarix L.					
39	*Tamarix ramosissima Ledeb.*	+	-	common		-	-
40	*Tamarix laxa Willd.*	+	+	common		-	-
		Zygophyllaceae					
		Zygophyllum L.					
41	*Zygophyllum turcomanicum Fisch. ex Bunge*	+	+			-	-
42	*Zygophyllum pinnatum Cham.*	+	+			-	-
43	*Zygophyllum oxianum Boriss.*	+	+			-	-

UzRDB 2. Rare species. Species that are not under direct threat of disappearance, but existing in such small numbers or in such area limited and specific places of habitation, that they can quickly disappear. They need careful monitoring.

UzRDB 3. Reducing species. Species, numbers and areal of which have been reducing during a certain period of time owing to natural reasons, because of the human interference or as the result of these both factors. Regular assessment of their state is needed.

23.9.4 Invertebrates

Methods

A desk-based literature review has been undertaken to identify species likely to be present, in particular identifying sensitive species (conservation concern or range restricted) that may be present.

Results

The literature review identified 106 species from 59 families that are potentially present along the OHTL route. Based on the information available none of the species likely to occur are IUCN red list species or range restricted. Two species are listed in the Uzbekistan Red Data Book as Vulnerable (*Catocala optima* - a species of moth) and Near-threatened (*Hypermnestra helios* – a species of Swallowtail butterfly).

23.9.5 Reptiles and Amphibians

Methods

A desk-based literature review was completed to identify species likely to be present along the route of the OHTL based on the habitats present and known records.

Surveys were completed in April and June 2023 where 11 survey locations were selected in representative habitats along the route of the OHTL through Sections 1 to 4. From each survey location three transects of between 1 km to 2.3 km were completed, resulting in a total of 33 transects and 39 km being completed.

Figure 155: Locations of the three most representative transects along OHTL route – Section 1

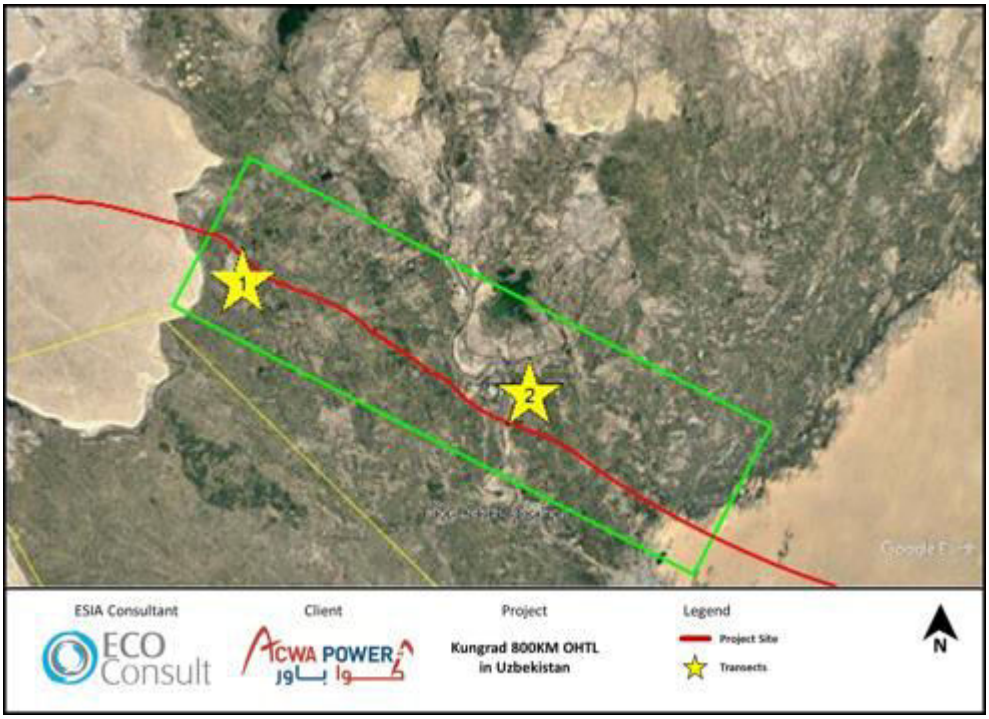


Figure 156: Locations of the transects along OHTL route – Section 2

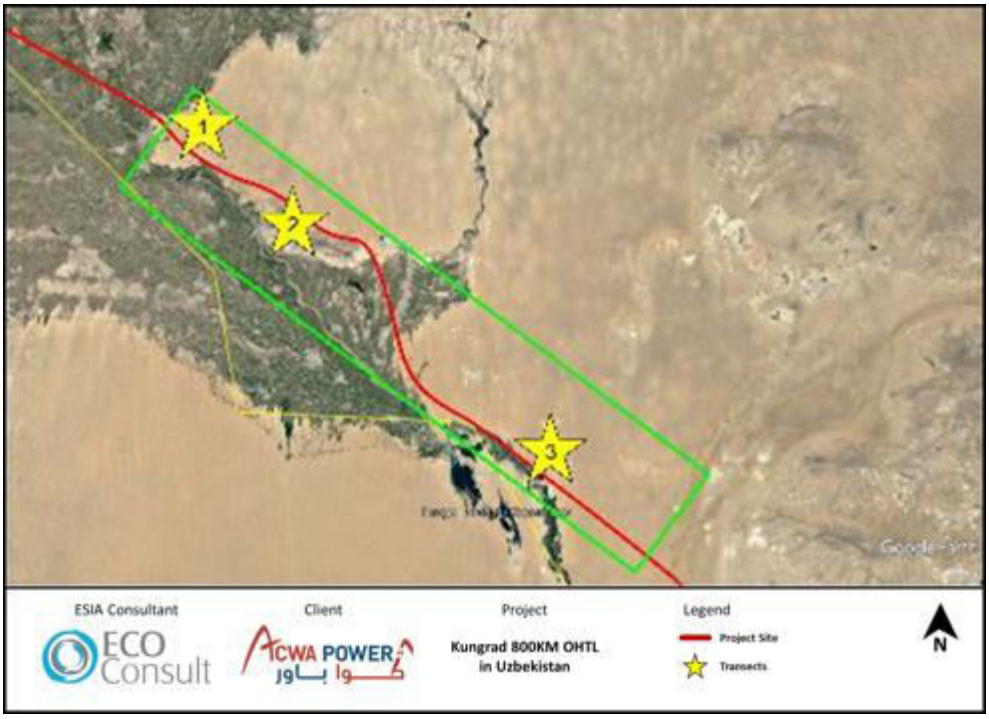


Figure 157: Locations of the transects along OHTL route – Section 3

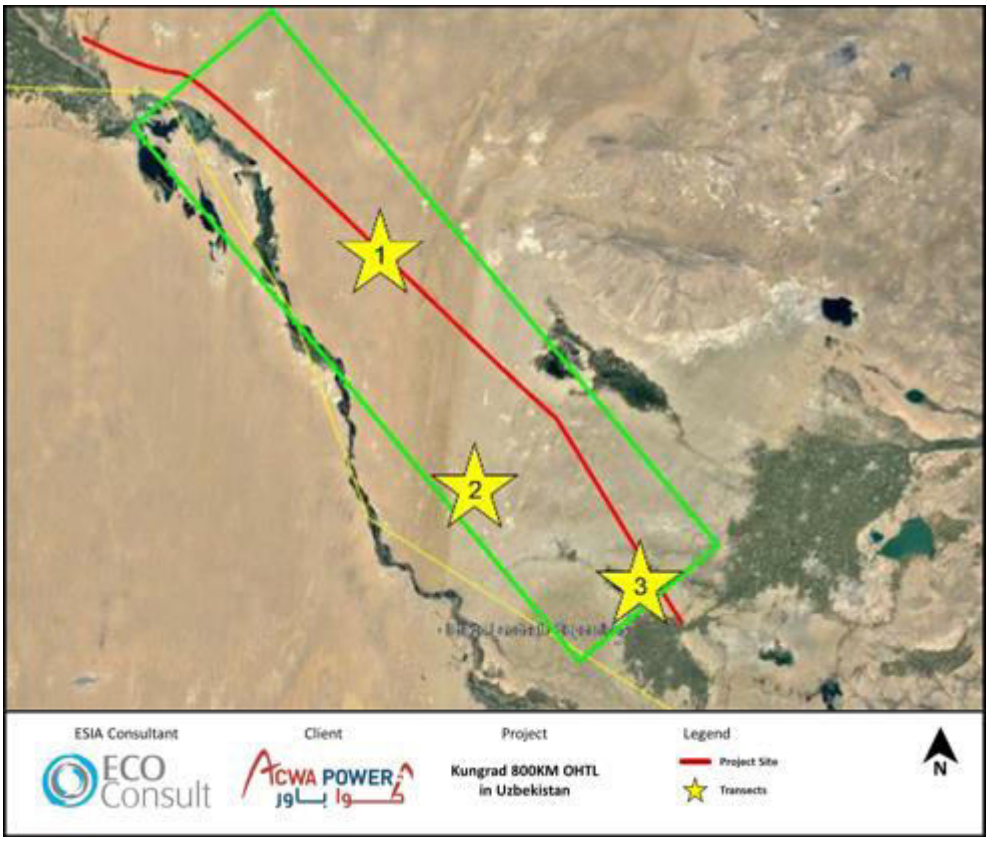


Figure 158: Locations of the transects along OHTL route – Section 4

In addition to the above, driven transects across the entire sections were undertaken as follows:

- Section 2. This area was largely excluded from detailed reptile and amphibian surveys due to it being highly modified by agriculture and anthropogenic factors
- Section 3 was subject to a driven transect across the entire length of Section 3.
- Section 4 was subject to a driven transect across the entire length of Section 4.

The switching station locations at Nukus, Sarymay and Karakul were subject to full walkovers, where access allows. All reptiles and amphibian species observed were recorded in full and an assessment of habitats made. The station at Ustyurt is within the proposed Kungrad Wind Farm site and as such will also be subject to full walkover survey (please refer to the Wind Farm Scoping Report for additional details).

The reptile's population density (D) was calculated using the following formula (Bondarenko, Chelintsev, 1996):

$$\boldsymbol{D = \frac{n}{2LB}}$$

where ***n*** – number of animal individuals recorded on the transect; ***L*** – length of the transect; ***B*** – formula to calculate an effective width of the survey strip:

$$\boldsymbol{B = W(0,79F + 0,21F^4)}$$

where ***W*** – width of the limited strip on both sides of the transect axis; ***F:***

$$F = \frac{2y}{W}$$

The recording of the distance of animals recorded and the transect excludes underestimation of the population density of the reptiles caused by a decrease in their detectability in remote parts of the survey strip, regardless of the degree of its limitation (Bondarenko and Chelintsev, 1996).

The abundance of the reptiles in habitats was estimated using the following population density scale for one/ha (Kuzyakin, 1962): 0.1 – 0.9 – rare, 1.0 – 9.9 – common, 10.0 and higher – abundant.

Results

Based on the literature and archival materials of the author, more than 20 species of reptiles can be found along the proposed OHTL route. A list of potential reptile and amphibian species that could occur is shown in the table below. The purpose of the field surveys completed was to ascertain which of these species are present in the Project area. Nineteen species were encountered and are shown in **bold**.

The most vulnerable species with the highest conservation status (VU) of IUCN is the Central Asian Tortoise (*Testudo horsfieldii*). The highest tortoise densities were found in the area opposite Sultan Uwais Range (Section 3) – 5.4 ind/ha, nevertheless, compared to the Central Kyzylkum, these are rather low densities for tortoises.

In the central part of Section 1 the OHTL runs close to the Barsa Kelmes Depression, where the biotope is quite distinctive and different from other sites. In this habitat the rare and endemic for Ustyurt subspecies of Spotted Toadhead Agama (*Phrynocephalus guttatus salsatus* Gorelov, Dunayev et Kotenko, 1995, IUCN Least Concern) can be potentially found.

None of the species of reptile recorded on the site are considered endemic or range-restricted.

No amphibians were recorded on the site but there are waterbodies suitable for these species.

Further species present or site-specific information may come from incidental sightings during the bird VP and transect surveys 2023 to 2024.

Table 113: List of Potential Reptile and Amphibian Species

Species	Species presence acc. to literary sources	Author's earlier personal data	Abundance	Conservation status		
				UzRDB	IUCN	CITES
Turan Toad *Bufotes sitibundus*	+	+	Common			
Eurasian Marsh Frog *Pelophylax ridibundus*	+	+	Numerous			
Central Asian Tortoise *Testudo horsfieldii*	**+**	**+**	**Common**	**2 (VU)**	**VU**	**II**

Species	Species presence acc. to literary sources	Author's earlier personal data	Abundance	Conservation status		
				UzRDB	IUCN	CITES
Caspian Even-fingered Gecko *Alsophylax pipiens*	+	+	Common			
Transcaspian Bent-toed Gecko *Mediodactylus russowi*	+	+	Common			
Kaspischer Even-fingered Gecko *Alsophylax pipens*						
Caspian Bent-Toed Gecko *Tenuidactylus caspius*	+	+	**Common**			
Bogdanov's Thin-toed Gecko *Tenuidactylus bogdanovi*	+	+	Common			
Comb-toed Gecko *Crossobamon eversmanni*	+		**Low numerous**			
Common Wonder Gecko *Teratoscincus scincus*	+	+	**Common**			
Steppe Agama *Trapelus sanguinolentus*	+	+	**Common**			
Sunwatcher Toad-headed Agama *Phrynocephalus helioscopus*	+	+	**Low numerous**			
Secret Toadhead Agama *Phrynocephalus mystaceus*	+	+	**Common**			
Lichtenstein's Toadhead Agama *Phrynocephalus interscapularis*	+	+	**Numerous**			
Spotted Toad –head Agama *Phrynocephalus guttatus salsatus*	+		Rare			
Steppe Racerunner *Eremias arguta arguta*	+					
Sand Racerunner *Eremias scripta*	+	+	**Common**			
Reticulate Racerunner *Eremias grammica*	+	+	**Numerous**			
Rapid Lizard *Eremias velox*	+	+	**Numerous**			
Striped Racerunner *Eremias lineolata*	+	+	**Common**			
Aralo-Caspian Racerunner *Eremias intermedia*	+	+	**Common**			
Caspian Monitor *Varanus griseus caspius*	+	+	**Rare**	**2 (VU:D)**		**I**

Species	Species presence acc. to literary sources	Author's earlier personal data	Abundance	Conservation status		
				UzRDB	IUCN	CITES
Desert Sand Boa *Eryx miliaris*	+	+	**Rare**	**3 (NT)**		**II**
Sand Racer *Psammophis lineolatus*	+	+	**Common**			
Spotted Whip Snake *Hemorrhois ravergieri*	+		Common			
Spotted Desert Racer *Platyceps karelinii*	+		**Low numerous**			
Diadem Snake *Spalerosophis diadema*	+	+	**Low numerous**			
Dice Snake *Natrix tessellata*	+	+	Common			
Blotched Rat-snake *Elaphe sauromates*	+	+	Rare	2 (VU:R)		
Karaganda Pitviper *Gloydius caraganus*	+	+	Rare			
Saw-scaled Viper *Echis carinatus*	+	+	Low numerous			

Notes: UzRDB – species/subspecies listed in the Red Data Book of Uzbekistan (2019) (2 (VU) – vulnerable; 2 (VU:D) – vulnerable, declining; 3 (NT) – near-threatened); IUCN – species included in the Red List of the International Union for Conservation of Nature (EN – endangered; 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

23.9.6 Mammals (excluding bats)

Methods

A desk-based literature review was completed to identify species likely to be present along the route of the OHTL based on the habitats present and known records.

Surveys were undertaken in June 2023 (10 days) and July 2023 (3 days) and consisted of visits where the whole OHTL route was subject to a visual survey (driven transect) during which time all mammals seen were recorded in full.

Walked transects were also completed in representative habitats along the route of the OHTL. In total 55 transects of between 1 and 2.4 km (totaling 95.5 km) were completed in Sections 1-4 of the OHTL route. Again, where encountered mammals were recorded in full in addition to which any field sign (e.g. physical remains, burrows, scats or pug marks) were also recorded.

Results

In zoogeographical terms, the study area belongs to the faunistic complex of the Iranian-Turanian community of the Palearctic province (Kostin, 1961) with a set of species typical for sandy dry deserts (Long-eared Hedgehog (*Hemiechinus auritus*), Marbled Polecat (*Vormela peregusna*), ground squirrels,

jerboas, gerbils, Red Fox (*Vulpes vulpes*), Steppe Cat (*Felis manul*), Dune Cat (*Felis margarita*) and Goitered Gazelle). The presence of surface waters, waste channels, waste lakes and lakes from self-flowing wells expands the fauna with hydrophilic species (shrew, Zaisan Mole-vole (*Ellobius tancrei*), Golden Jackal (*Canis aureus*) and Asian Badger (*Meles leucurus*)).

Based on literature review of the mammalian fauna and archival materials of the author, the total number of species likely to occur along the route of the OHTL is 43 species and is shown in the table below. The purpose of the field surveys completed was to ascertain which of these species are present in the Project area. Twenty-nine species or signs of those species were encountered and are shown in **bold**.

Further species present or site-specific information may come from incidental sightings during the bird VP and transect surveys 2023 to 2024.

None of the species recorded on the site are considered endemic or range-restricted.

Table 114: List of Potential Vertebrate Species

Scientific Name	Common Name	Abundance/ distribution	IUCN	UzRDB
Hemiechinus auritus	**Long-eared Hedgehog**	**Quite numerous, widespread**	**LC**	**-**
Hemiechinus hypomelas	**Brandt's Hedgehog**	**Few, locally distributed**	**LC**	**3 (NT)**
Suncus etruscus	Etruscan Shrew	Rare and localized	-	-
Crocidura suaveolens	Lesser White-toothed Shrew	Locally numerous, widespread	LC	-
Diplomesodon pulchellum	**Piebald Shrew**	**Rare widespread**	**-**	**-**
Tadarida teniotis	European free - tailed Bat	Rare and localized	-	2 (VU:R)
Myotis mystacinus	Whiskered Bat	-	-	-
Nyctalus lasiopterus	Giant Noctule	-	-	-
Nyctalus noctula	Noctule	-	-	-
Pipistrellus pipistrellus	Common Pipistrelle	Numerous widespread	LC	-
Pipistrellus kuhli	Kuhl's Pipistrelle	-	-	-
Eptesicus serotinus	Serotine Bat	Numerous widespread	LC	-
Vespertilio murinus	Particolored Bat	-	-	-
Lepus tolai	**Tolai Hare**	**Numerous widespread**	**LC**	**-**
Spermophilopsis leptodactylus	**Long-clawed Ground Squirrel**	**Numerous widespread**	**LC**	**-**
Spermophilus fulvus	**Yellow Ground Squirrel**	**Quite numerous, widespread**	**LC**	**-**
Allactaga major	**Great Jerboa**	**-**	**LC**	**-**
Allactaga elater	**Small Five-toed jerboa**	**Quite numerous, widespread**	**-**	**-**
Allactaga severtzovi	**Severtzov's jerboa**	**Quite numerous, widespread**	**-**	**-**
Allactaga bobrinsky	Bobrinski's jerboa	Isolated populations	-	-
Paradipus ctenodactylus	Comb-toed jerboa	-	-	-
Dipus sagitta	**Northern three-toed jerboa**	**Localised**	**-**	**-**
Jaculus turkmenicus	Turkmen jerboa	-	-	-
Cricetulus migratorius	**Gray Hamster**	**Few, widespread**	**LC**	**-**
Ellobius talpinus	**Northern Mole Vole**	**-**	**LC**	**-**
Ellobius tancrei	**Zaisan Mole Vole**	**Numerous, widespread**	**-**	**-**
Ondatra zibethica	Muskrat	-	-	-
Microtus bucharensis	**Bucharian Vole**	**Localised**	**-**	**-**
Meriones tamariscinus	**Tamarisk Gerbil**	**Localised**	**-**	**-**
Meriones libycus	**Libyan Gerbil**	**Numerous, widespread**	**-**	**-**
Meriones meridianus	**Midday Gerbil**	**Numerous, locally distributed**	**-**	**-**

Scientific Name	Common Name	Abundance/ distribution	IUCN	UzRDB
Rhombomys opimus	**Giant Day Jird**	**Numerous, widespread**	**-**	**-**
Mus musculus	**House Mouse**	**Numerous, locally distributed**	**-**	**-**
Nesokia indica	**Short-tailed Bandicoot Rat**	**Localised**	**-**	**-**
Canis aureus	**Golden or Indian Jackal**	**Localised**	**-**	**-**
Vulpes corsac	**Corsac Fox**	**-**	**LC**	**2 (VU:D)**
Vulpes vulpes	**Red Fox**	**Numerous, widespread**	**-**	**-**
Mustela nivalis	**Common Weasel**	**Quite numerous, widespread**	**-**	**-**
Mustela eversmanni	Steppe Polecat	Unknown	LC	2 (VU:D)
Vormela peregusna	**Marbled Polecat**	**Few, widespread**	**VU**	**2 (VU:D)**
Meles leucurus	Asian Badger	Localised	LC	-
Lutra lutra	Central Asian Otter	Localised	NT	EN
Felis chaus	**Jungle Cat**	**Localised**	**LC**	**-**
Felis libyca	**Steppe Cat**	**Quite numerous, locally distributed**	**-**	**-**
Felis margarita	**Sand Cat**	**Rare and localized**	**-**	**-**
Caracal caracal michaelis	Turkmenian Caracal	Few, locally distributed	LC	CR
Cervus hanglu	Tarim Red Deer	**Rare and localized**	LC	EN
Gazella subgutturosa	**Goitered Gazelle**	**Few, locally distributed**	**VU**	**2 (VU:D)**

Notes: UzRDB – species/subspecies listed in the Red Data Book of Uzbekistan (2019) (2 (VU) – vulnerable; 2 (VU:D) – vulnerable, declining; 3 (NT) – near-threatened); IUCN – species included in the Red List of the International Union for Conservation of Nature (EN – endangered; 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

Discussion of Notable Records

Brandt's Hedgehog (*Hemiechinus hypomelas*) – IUCN LC, UzRDB NT

It is a rare, mosaically common species. In the latest edition of the Red Data Book, it is not indicated for the project area, however, according to the surveyor's archival data (2021-2023), there are sightings in the Karakul oasis. Evidence of this species (skins) were found at four locations along the OHTL all in Section 4.

Corsac Fox (*Vulpes corsac*) – IUCN LC, UzRDB VU:D

A mosaically distributed subspecies. It is spread at the delta of the Amudarya River, the Kyzylkum desert, the Karshi steppe, the Sundukli sands and adyrs of the Pamir-Alay. Evidence of this species (footprints) was found at one locations along the OHTL in Section 3.

Marbled Polecat (*Vormela peregusna*) – IUCN VU, UzRDB VU:D

It sporadically inhabits sandy massifs with a high number of ground squirrels, which it actively feeds on. Evidence of this species (footprints) were found at three locations along the OHTL all in Section 4.

Goitered Gazelle (*Gazella subgutturosa*) – IUCN VU, UzRDB VU:D

Widely inhabits the desert zone of the Southern Kyzyl Kum. Encounters are quite regular, but most often on slings and droppings. Evidence of this species (footprints) were found at six locations along the OHTL all in Sections 1 and 4.

23.9.7 Bats

Methods

A search for structures/features suitable for use by roosting bats along the route of the OHTL and a 100m buffer will be undertaken in summer/autumn 2023. Direct impacts on structures/features that may be suitable for use by roosting bats are very unlikely and project design has tried to avoid any such features. However, trees (particularly near the Amu Darya River where there are riparian forests) may need to be felled to facilitate construction activities and other structures/roosts could be indirectly impacted through disturbance. Operational impacts on bats are not anticipated.

Results

The route of the OHTL largely passes through open desert or agricultural areas. There are no built (man-made) structures within 100m of the OHTL route, but there are some areas where a building or small number of buildings are within 100-300m of the route. It is certain that these structures will not be directly impacted by the project and it is very unlikely that any bat roosts (if present) would be indirectly impacted by the project.

Some natural features that have the potential to be suitable for use by roosting bats are present along the OHTL route, which includes a cliff (c.70m) at the western edge of the Nukus/agricultural area and areas with trees, e.g. around the Amu Darya. No features have been confirmed as bat roosts along the route. It is uncertain at this stage how much these features would be impacted by the project. It is unlikely the cliff will be directly impacted by the project but there may be indirect disturbance to bat roosts if they are present. Impacts on trees will depend on the exact location of the transmission towers and work areas around them, which is unknown at this stage. It is possible trees will need to be felled to facilitate ground clearance for work areas.

23.9.8 Avifauna

Methods

Vantage Point (VP) Surveys are being completed, which started in August 2023 and will end in May 2024. These will comprise of surveys split into three seasons with 12 hours of VP survey, at all VPs, in each season.

- Autumn Migration VP Surveys – August 2023 to October 2023
- Winter Bird VP Surveys – November 2023 to February 2024
- Spring Migration VP Surveys – March 2024 to May 2024
- No summer VP surveys are proposed. This is not considered a constraint as there is very unlikely to be any significant bird movement during the summer due to the general ecology of migratory birds expected in the region and because of the extreme heat and harsh conditions in Uzbekistan during

the summer. This is true of the Kungrad WF surveys which recorded very few movements of birds during the summer season, even of resident and breeding species. Although MacQueen's Bustard may be nesting in the area of the OHTL, particularly towards the southern end, breeding birds are unlikely to be very mobile during this season and there would be no significant movement from migratory populations from further north until Autumn migration starts from mid-August at the earliest.

- 19 VP locations have been selected based on likely attractants for birds as well as likely bird movement corridors based on landscape features, presence of waterbodies etc. and these locations were visited during the Turnstone Ecology site visit.
- VP locations have also been targeted to provide better coverage near to where IBAs and other features are present. VP locations, have where possible, been selected where roads intersect with the OHTL corridor. The purpose of the VP surveys is to record bird movements across the OHTL corridor as well as produce a list of species observed, the number of birds recorded and an estimate of flight heights.
- VPs surveys will last for no longer than three hours, so at least four visits of 3 hours will be completed in each season.
- There are no standard accepted guidelines for OHTL surveys, but VP viewsheds for WF are generally set at 2 km to allow all species to be observed and recorded appropriately. The VP viewsheds for the OHTL are based on viewing distance of being 2 to 5 km. This will vary through different seasons and weather conditions, but the most at-risk species (e.g. large waterbirds, large migratory raptors and bustards) are all large and easily visible species that will be able to be seen and identified over larger distances. Some birds will be missed and some gaps in the data but the methods provide a reasonable survey effort and appropriate data to be able to assess the risks of the OHTL on the most at-risk species.

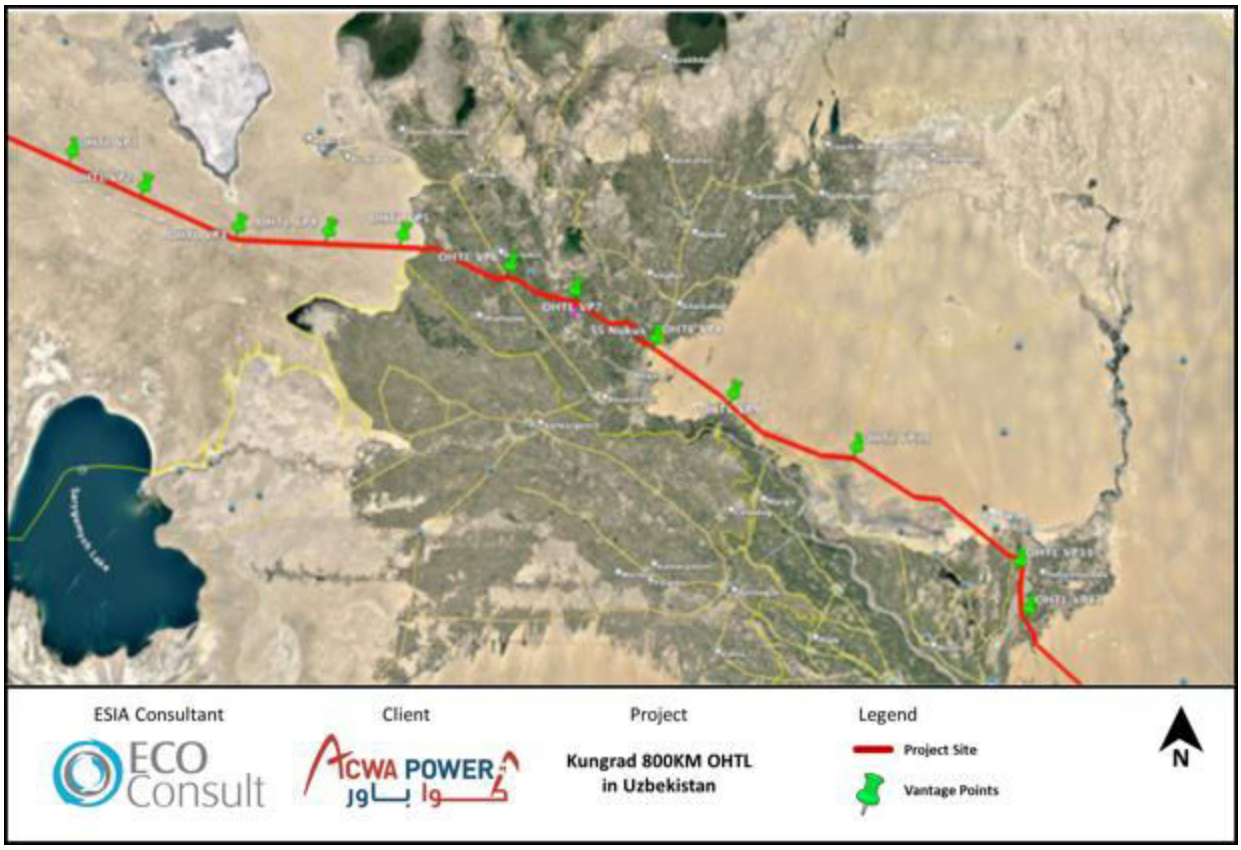


Figure 159: Location of OHTL Vantage Points (northern and central section)

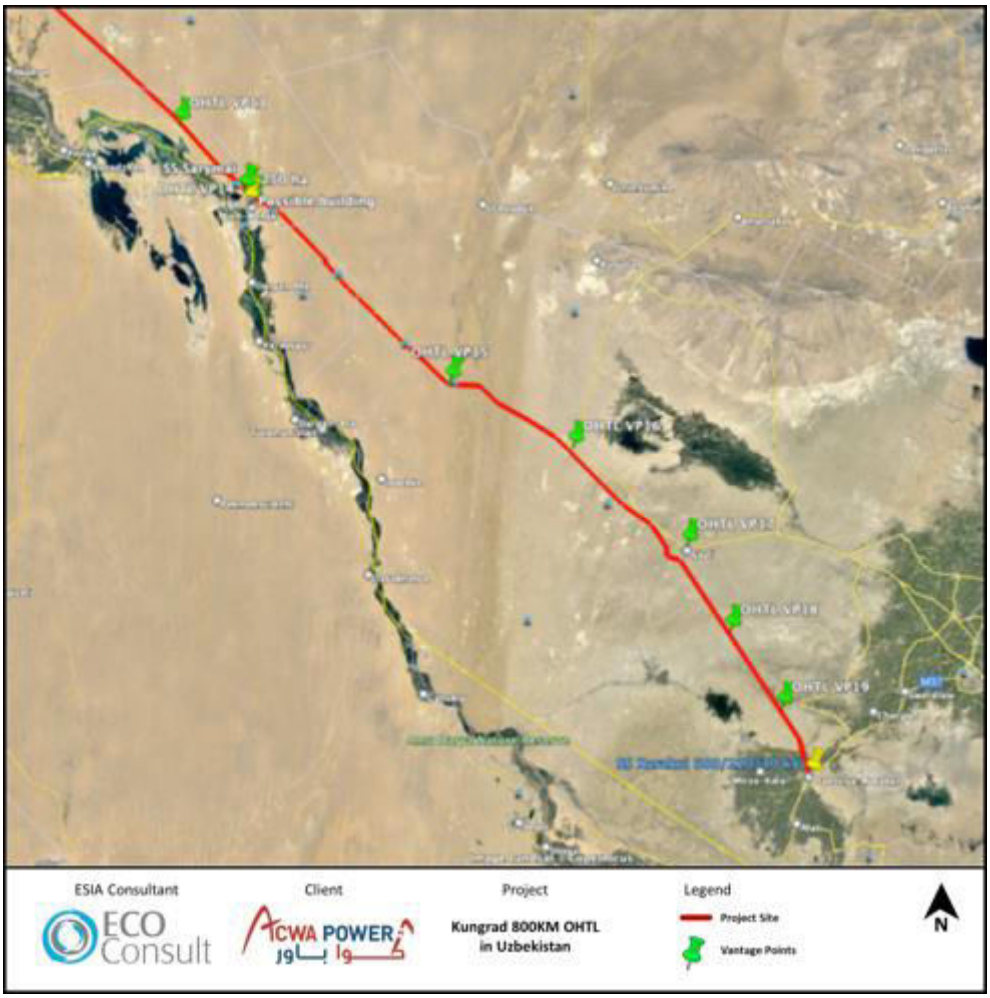


Figure 160: Location of OHTL Vantage Points (southern section)

Bird transect surveys will be undertaken along the OHTL route between the VPs, at the same time as the VP surveys. The transect surveys will also be undertaken in June and July 2024. Transects will be driven at a maximum of 50kph with stops in areas of higher bird activity or where target species are present (e.g. bustards) and counts of all birds present will be made. During the VP surveys and transects any Bustard species, Sociable Lapwing and other target species which will be recorded in full.

If MacQueen's Bustards are identified during any of the surveys in suitable breeding habitat, additional survey effort will be undertaken to identify any lekking sites/behavior and breeding activity.

Waterbird Survey

- In addition to the VP and Transect surveys, surveys of selected waterbodies will also be completed during the autumn and spring migration seasons and during the winter bird season (November 2023 to February 2024). The surveys will comprise one count in August 2023 and May 2024 and two counts per month for the rest of the Autumn, Winter and Spring seasons (September through to April). If temperatures are sufficiently cold enough that the selected freshwater and saline lagoons are frozen then surveys will not be undertaken during these periods.
- The waterbodies that have been selected for additional surveys are as follows:

- Section 1 – Sudochye Lake IBA
- Section 3 - Nukus Lakes North, Nukus Lakes South and Nukus Water Treatment Works
- Section 4 - Lake at Sarymay, Karakyr Lakes IBA and Lake NW of Karakul

Results

The route of the OHTL is considerable and spans half the width of Uzbekistan. The desktop study has identified that it runs close to several IBAs designated for migratory birds and crosses a known migratory corridor, the Amu Darya corridor as well as likely being located on the East Asia / East Africa and Central Asis / South Asia migratory flyways.

During the visit to the OHTL route and nearby IBAs and other waterbodies a lot of species of birds were recorded in these habitats that are considered to be at greater risk from the OHTLs. Notably, these were numerous waterfowl (including White-headed Duck), waders and *Ciconiiformes*, Greater Flamingo, Macqueen's Bustard, Common Crane, Great White and Dalmatian Pelicans, Osprey and Short-toed Snake Eagle.

So far there is only data available from the August and September VP and transect surveys. During the VP survey twenty-one flightlines have been recorded, mostly from between Nukus and Karakul, involving 1 Eurasian Sparrowhawk, 3 Long-legged Buzzards, 8 Marsh Harriers, 1 Hen Harrier, 1 Pallid Harrier, 3 Common Kestrel (4 birds) and 4 Black Kite (10 birds).

During the transect surveys there has been four records of MacQueen's Bustard totaling 11 birds. Two records totaling seven birds were towards the southern end nearer to Bukhara and two records totaling four birds were in the Ustyurt Plateau area near the wind farm. The latter two records involved birds that had red leg rings and are considered likely to involve birds that have been released from a captive breeding programme for hunting.

23.9.9 Sensitive Receptors

A table is provided below which details the sensitivities of the receptors recorded within the Project AoI that may be impacted by the construction and operation of the proposed wind farm and will therefore be considered within the impact assessment.

Any species recorded during surveys, but which are not listed in the sensitive receptor table are considered to be of Low/lower value.

- Impacts on Low/Lower value species are expected to be of low to moderate magnitude and are therefore not significant; and
- Mitigation for higher value receptors will also alleviate impacts on these lower value receptors.

Therefore, these Low/lower value species have not been listed out in detail and the impact assessment section will not include assessments on these receptors.

Species identified as Priority Biodiversity Features (PBFs) are also identified in the table below.

Receptor	Conservation Status		Justification	PBF (Yes or No)	Sensitivity
	IUCN	UZBDB			
Natural Habitat	-	-	Mostly Type 8 (Desert) and Sub-type 8.2 (Temperate Desert) according to IUCN Habitats Classification Scheme, with smaller areas of Type 4 (Grassland) and Sub-type 4.5 (Subtropical/tropical dry) and Type 3 (Shrubland) and Sub-type 3.5 (Subtropical/tropical dry). Not listed in Annex I or included as a Priority Habitat. No plant species present of international and no endemic or range-restricted species present. Large areas of modified (urbanised and arable land) or degraded natural habitat present across the site.	No	Low to Medium
IUCN Plants	EN	2	Calligonum matteianum and Calligonum molle (both IUCN EN, UzRDB 2 – Rare species) possibly present (but very unlikely) in Section 4.	Yes	High
UzRDB Plants	-	2 or 3	Euphorbia sclerocyathium (UzRDB 2 – Rare species) and Salsola chiwensis (UzRDB 3 – Reducing species) possibly present in Section 1. Eremosparton flaccidum (UzRDB 2 – Rare species) and Tulipa lehmanniana (UzRDB 3 – Reducing species) present in Section 4.	No	Low
Central Asian Tortoise	VU	VU	Present across the AoI in low population density. Species is IUCN and UzRDB VU	Yes	High
Caspian Monitor	-	VU	Present across the AoI in very low densities (southern end only). Species in not included on the IUCN Red List and is UzRDB VU only	No	Medium
Desert Sand Boa	-	VU	Present across the AoI in very low densities. Species in not included on the IUCN Red List and is UzRDB VU only	No	Medium
Blotched Rat-snake	-	VU	Possibly present across the AoI in very low densities. Species in not included on the IUCN Red List and is UzRDB VU only	No	Medium
Brandt's Hedgehog	LC	NT	Evidence of this species (skins) were found at four locations along the OHTL all in Section 4, indicating presence in AoI in low density. UzRDB NT species only	No	Medium
Corsac Fox	LC	VU	Evidence of this species (footprints) was found at one locations along the OHTL in Section 3, indicating presence in very low densities. UzRDB VU species only	No	Medium
Marbled Polecat	VU	VU	Evidence of this species (footprints) were found at three locations along the OHTL all in Section 4. Presence confirmed in very low density in AoI. IUCN and UzRDB VU species	Yes	High
Goitered Gazelle	VU	VU	Evidence of this species (footprints) were found at six locations along the OHTL all in Sections 1 and 4. Presence confirmed in very low density in AoI. A nationally rare species that is both IUCN and UzRDB VU	Yes	High

Receptor	Conservation Status		Justification	PBF (Yes or No)	Sensitivity
	IUCN	UZBDB			
Sociable Lapwing	CR	VU	A widespread species within Uzbekistan during spring and autumn migration periods. Migration through the AoI is likely, discussed further in the CHA document.	Yes	High
White-headed Duck	EN	EN	Breeding, passage and wintering species in Uzbekistan and known to occur in adjacent IBA and non-IBA wetlands. Migration through the AoI is likely, discussed further in the CHA document.	Yes	High
Pallas's Fish Eagle	EN	-	A rare and infrequent passage bird. Possible migration through the AoI, discussed further in the CHA document.	Yes	High
Egyptian Vulture	EN	VU	Egyptian Vulture are a widely distributed breeding species within Uzbekistan and this species will also migrate through the country. Migration through the AoI is likely, discussed further in the CHA document.	Yes	High
Saker Falcon	EN	NT	Approximately 70 breeding pairs in Uzbekistan however breeding habitat is not present within the Project AoI (e.g. cliff faces, chinks). Migration through the AoI is likely, discussed further in the CHA document.	Yes	High
Steppe Eagle	EN	VU	Breeding and migratory species through Uzbekistan. Species has previously over-wintered within the Amu Darya river corridor. Migration through the AoI is likely, discussed further in the CHA document.	Yes	High
Lesser White-fronted Goose	VU	VU	Wintering and passage species within Uzbekistan within plainland water reservoirs of the Amu Darya and Syr Darya river basins including Lake Dengizkul. Wintering is irregular and populations fluctuate between 200 and 2,000 individuals. Migration through the AoI is likely, discussed further in the CHA document.	Yes	High
Common Pochard	VU	-	Widely distributed species with large global population and known to occur in adjacent IBA and non-IBA wetlands. Migration through the AoI is likely, discussed further in the CHA document.	Yes	High
Yellow-eyed Pigeon	VU	VU	A nesting and migratory mosaically distributed species. Migration through the AoI is likely and breeding possible.	Yes	High
Greater-spotted Eagle	VU	VU	A non-breeding species and only occurs in low numbers on migration. Migration through the AoI is likely, discussed further in the CHA document.	Yes	High
Eastern Imperial Eagle	VU	VU	Breeding and migratory species within Uzbekistan. Breeding in very low density has been previously recorded within the Ustyurt Plateau and the Kyzylkum Desert. Migratory populations are also considered to be low (UzRDB). Migration through the AoI is likely, discussed further in the CHA document.	Yes	High

Receptor	Conservation Status		Justification	PBF (Yes or No)	Sensitivity
	IUCN	UZBDB			
European Turtle Dove	VU	VU	Widely distributed species with large global population. Migration through the AoI is likely and breeding possible, discussed further in the CHA document.	Yes	High
Great Bustard	EN	CR	Formerly a breeding species within Uzbekistan, however current status is as a wintering species and usually in colder winters only. Migration through the AoI is likely and wintering possible, discussed further in the CHA document.	Yes	High
MacQueen's Bustard	VU	VU	Recorded in low numbers along OHTL so far (Autumn surveys) in the Ustyurt Plateau and Kyzylkum desert areas. Likely significant migration through the Project AoI, breeding likely and wintering possible. Discussed further in the CHA document.	Yes	High

23.9.10 Assessment of Impacts

This section identifies and assesses the anticipated impacts from the Project activities on identified ecological receptors during the construction and operation phase. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

Impact assessment summary tables are relevant, however for some impacts the assessment is provided within the accompanying text and where impact significance is clear (e.g. similar impacts affecting multiple receptors), no table has been provided to avoid significant levels of repetition.

All mitigation measures contained in this section will be included in a Project specific construction Biodiversity Action Plan (BAP) which will also include details of pre-clearance, pre-construction, and during-construction monitoring. **This BAP will be provided as a standalone document.**

The BAP will be a live document however it will initially include all of the below mitigation and monitoring requirements to be undertaken during the construction and operation of the WF and OHTL. The Project Company or EPC will be required to appoint a Full Time Ecologist / Biodiversity Manager to ensure that all agreed mitigation and monitoring is fully implemented. The Project Ecologist will be supported by in-country ecologists as well as being supported by an independent International Ecological Expert (IOE) who will assist with updating the BAP and Adaptive Management Strategy, where necessary. The IOE will also be responsible for setting up and auditing the PCFM surveys, processing collected data, undertaking relevant analysis of the data (e.g. GenEst) and providing annual reports.

23.9.11 Potential Impacts during the Construction Phase

Habitat Loss, Fragmentation and Degradation

Site clearance and subsequent construction activities will result in the direct loss of areas of natural habitats (in some places degraded) and modified habitat over the full construction footprint of the Project. This will be limited to the relatively small areas of the transmission tower bases and associated clearance around them and the four switching stations (one of which is within the wind farm footprint and two of which already exist but may need to be upgraded). There is also likely to be temporary habitat loss and degradation of habitats as a result of temporary access roads and work areas, temporary lay-down areas and other possible temporary facilities (e.g. batching plants, worker accommodation). The final design of the OHTL will be completed by the EPC Contractor and therefore the full details of required habitat loss is not currently known. However, it is anticipated based on current design that:

- A total of 4,632 transmission towers and 221 angle towers will be required. This would require the total footprint for all towers to be 1.475 km^2.
- Each substation will have a footprint of around 0.3km^2.
- Any required access roads to the transmission tower locations, construction areas and laydown areas, etc. It is anticipated that this would require a total footprint of around 31.66 km^2.
- Any site facilities including laydown areas, batching plant and site worker accommodation.

Where possible any temporary work areas (access roads etc.) will be limited to where habitat is already modified or degraded. Actual loss of natural habitat will therefore be very minor.

Rare Flora

Plant species that are listed on the IUCN Red List, in the UzRDB or that are range restricted that are either confirmed as present within the AoI or are within known or possible range and possibly present within the AoI. This includes the following:

- Eremosparton flaccidum (UzRDB 2 – Rare species) present in Section 4 under Figure 143
- Tulipa lehmanniana (UzRDB 3 – Reducing species) present in Section 4 under Figure 143;
- Euphorbia sclerocyathium (UzRDB 2 – Rare species) possibly present in Section 1 under Figure 143;
- Salsola chiwensis (UzRDB 3 – Reducing species) possibly in Section 1 under Figure 143;
- Calligonum matteianum (IUCN EN, UzRDB 2 – Rare species) possibly in Section 4 under Figure 143 (but very unlikely); and
- Calligonum molle (IUCN EN, UzRDB 2 – Rare species) possibly in Section 4 under Figure 143 (but very unlikely).

Construction Phase – Habitats and Flora		
Type	Negative	N/A
Duration	Short-term	Limited to construction
Magnitude	Low	Minimal loss of habitat
Reversibility	Irreversible	Permanent habitat loss is irreversible
Sensitivity	Medium	Undesignated site supporting natural (and degraded natural and modified) habitat with some High Sensitivity Ecological Receptors
Likelihood	High	Habitat loss both permanent and temporary are certain to occur
Significance	**Minor**	

Mitigation Measures

The following mitigation measures will be employed to reduce the significance of habitat loss, fragmentation, and degradation during the construction period. Mitigation measures are largely based on avoidance of impact through selection of the working areas to favor areas of degraded natural habitat or those areas where habitats have been modified. Where impacts cannot be avoided the following will be completed

- All site workers will undertake a Project induction before working on site. The induction will include a comprehensive biodiversity element where the baseline ecological value and sensitivity of the site will be discussed.
- Prior to construction works, working areas will be clearly demarked so that site workers fully understand the working area. Encroachment into areas outside of agreed working areas will be prohibited and working areas will be subject to regular check by the EPC Contractor and the Project Ecologist (or representative) to check enforcement of working areas.
- Prior to clearance of vegetation, pre-clearance surveys will be undertaken by a suitably qualified ecologist. Particular attention required to identify IUCN species listed in the UzRDB and non-

native/invasive species. This will be undertaken by a botanical expert and at the appropriate time of year.

- On completion of construction works the EPC Contractor will be responsible for habitat rehabilitation works in all areas that have been subject to temporary disturbance. Habitat rehabilitation works will also be completed in areas adjacent to the substations and other temporary work areas where required. All habitat areas, including those subject to rehabilitation, will be subject to Condition Score Assessments to calculate loss / gains of habitats across the Project AoI. The Project needs to demonstrate that there has been a no net loss in natural habitat and additional habitat rehabilitation will need to be completed if habitat areas do not recover to a high enough condition. It is worth noting that due to the fragility of the soil in some areas (e.g. the Ustyurt Plateau), habitats are likely to recover slowly, and additional monitoring and rehabilitation works may be required after Year 5. It is also possible that habitat recovery is not successful and off-site compensation / off-setting may be required as previously discussed the "Section 11.4" .
- Longer-term post-construction monitoring will be required annually in the first five years post construction and then in Years 10, 15, and 20. Post-construction surveys will be fully detailed in the Project BAP.

Rare Flora

Areas where the rare plants are identified will be avoided if possible. If this is not possible mitigation must be in place to minimize loss of the habitat/species, translocate if required and manage/restore areas to support the species away from habitat that is lost.

Translocation would only involve moving plants from the areas of tower bases and immediate working areas up to 500m from the work area, within suitable substrate and growing conditions to prevent the immediate loss of plants within the footprint.

The rate of vegetation establishment will be monitored in the first few years post-construction and additional seeding and habitat rehabilitation will be completed, if necessary.

Direct Impacts on Sensitive Receptors (Habitats and Flora) – Non-native Species and Introduced Flora

It is possible that non-native or introduced flora could be imported in to the AoI on vehicles or within any imported material. The impacts of non-native and introduced flora could potentially be significant in absence of any mitigation as these species could become established and out-compete native flora.

Three species listed on the national quarantine list were identified during the botanical assessment of the wind farm area and these are *Cuscuta campestris* (non-native), *Cuscuta epithymum* (probably native) and *Rhaponticum repens* (native). Construction works could improve conditions for these species and it is possible earth moving could increase the distribution and spread them along the route of the OHTL.

Impacts associated with non-native, invasive or introduced flora could result in long-term negative impacts, irreversible (if allowed to become established) and potentially significant.

Mitigation Measures

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

- Construction vehicles will be clean prior to being taken to site and once on-site they will be left in-situ for the duration of the construction period. Cars and other worker transportation vehicles will be driven along proper roads to the site so the risk of being contaminated with mud etc. is considered very low
- Adequate wheel-washing facilities to be constructed at more fixed work locations (e.g. substations, laydown areas, batching plants) and any wastewater will be disposed of correctly to prevent spread of undesirable species.
- Regular site walkover surveys throughout the construction period and post construction monitoring by a suitably qualified botanist to check for the presence and abundance of non-native or invasive species. In case such areas are identified, areas of non-native or invasive species will be mapped and a program of mechanical control will be completed in order to remove these species from the AoI. Chemical control will be avoided however, if necessary, will be used but in accordance with national and international guidelines as well as proper risk assessment and will only be used with prior approval of the Lenders.

Direct Impacts on Sensitive Receptors (Vertebrates) - Site Clearance and Earthworks

As well as impacts to habitats it is near-certain that site preparation works and construction activities will negative impact sensitive ecological receptors (e.g. reptiles, mammals, breeding birds) as a result of direct mortality.

Central Asian Tortoise (PBF, IUCN and UzRDB VU) are likely to be particularly exposed to impacts during construction as they are cryptic and slow-moving. In addition, their life cycle means that they will be particularly exposed to construction related mortality. Central Asian Tortoise are only typically active for 8 – 12 weeks per year, in the early Spring, after which they enter a period of summer aestivation followed, in most years, by winter hibernation. In some years, with warm autumn temperatures, there may be a second period of activity but this is sometime very short-lived and very hard to predict. Unmitigated impacts on Central Asian Tortoise could potentially be medium-term and irreversible (e.g. loss of a generation of breeding animals or a period of lower recruitment due to loss of eggs).

Construction Phase – Direct Mortality Central Asian Tortoise		
Type	Negative	N/A
Duration	Short-term	Limited to construction
Magnitude	Medium	Habitat loss limited and as such direct impacts are very limited in their extent
Reversibility	Irreversible	Permanent mortality
Sensitivity	High	IUCN Vulnerable species are of high sensitivity
Likelihood	High	Unmitigated mortality and injury is certain
Significance	**Moderate**	

Three other species of reptile; Desert Monitor, Desert Sand Boa and Blotched Rat-snake (all UzRDB VU) are receptors of moderate sensitivity and are also exposed to similar impacts during construction. These species are more active during the year and the magnitude of likely impacts are slightly less than for Central Asian Tortoise.

Construction Phase – Direct Mortality other Reptiles		
Type	Negative	N/A
Duration	Short-term	Limited to construction
Magnitude	Medium	Habitat loss limited and as such direct impacts are very limited in their extent
Reversibility	Irreversible	Permanent mortality
Sensitivity	Medium	UzRDB Vulnerable are receptors of medium sensitivity
Likelihood	High	Unmitigated mortality and injury is certain
Significance	**Moderate**	

Terrestrial mammals could also be impacted as a result of habitat clearance works resulting in direct mortality of small mammals (e.g. rodents, ground-squirrel), as well Marbled Polecat (IUCN VU) which is a high sensitivity receptor and Corsac Fox (UzRDB VU) and Brandt's Hedgehog (UzRDB NT) which are both moderate sensitivity species. Impacts to high sensitivity receptors shown in the table below and significance of receptors of lower sensitivity will be lower.

Direct mortality of Goitered Gazelle is considered to be highly unlikely.

Construction Phase – Direct Mortality Mammals (Marbled Polecat)		
Type	Negative	N/A
Duration	Short-term	Limited to construction
Magnitude	Medium	Habitat loss limited and as such direct impacts are very limited in their extent
Reversibility	Irreversible	Permanent mortality
Sensitivity	High	IUCN Vulnerable species are of high sensitivity (or lower)
Likelihood	High	Unmitigated mortality and injury is certain
Significance	**Moderate**	

There is a possibility of the construction work causing disturbance to lekking sites or damage and disturbance to nesting sites of MacQueen's Bustard (IUCN VU). Bustards naturally avoid areas of disturbance and as most of the route is within areas of modified habitat or close to main roads and urbanised areas, the areas where bustards could be lekking or nesting is limited. More open areas where MacQueen's Bustard may be lekking or nesting is limited to Section 4 of the OHTL route and areas away from existing disturbance only exist in some parts of the route, specifically between Taza-Kel'teminar and the A380 and between Gazli and Karakul (both approximately 60 km). As such lekking and nesting is possible, but it is not anticipated that there will be a significant number of nesting attempts within the OHTL AoI.

Ground nesting raptors, such as Steppe Eagle (IUCN EN), are not expected to occur as nest sites would have been identified already within nesting range (Ustyurt Plateau) or the AoI is outside of the known nesting range. Other species such as Eastern Imperial Eagle (IUCN VU) are not expected to nest as there is no suitable nesting habitat (forest/large trees).

Construction Phase – Disturbance / Direct Mortality, Loss of Nesting Sites and Reduction in Habitat Quality – MacQueen's Bustard		
Type	Negative	N/A
Duration	Short-term	Limited to construction
Magnitude	High	Habitat loss limited and as such direct impacts are very limited in their extent. Suitable lekking and nesting areas are limited with the AoI so loss of nesting sites is very unlikely, although if lost magnitude would be high.

Reversibility	Reversible	Direct mortality of adults very unlikely, disturbance to lekking/nesting or loss of nests, eggs and chicks possible
Sensitivity	High	IUCN Vulnerable are receptors of high sensitivity given that it is a CH qualifying species
Likelihood	Medium	Unmitigated disturbance, loss of nests and chicks is possible
Significance	**Major**	

Vegetation and ground clearance are also very likely to negatively impact other nesting birds (passerines etc.), and possibly species such as European Turtle Dove and Yellow-eyed Pigeon (both IUCN VU) which are high sensitivity receptors, through direct mortality of adult birds as well as loss of nests, eggs and chicks. The nesting bird assemblage is of moderate conservation importance and impacts are likely to be short-term (1 year) and reversible (generally higher fecundity species).

Construction Phase – Direct Mortality Ground and Tree Nesting Birds (passerines etc.)		
Type	Negative	N/A
Duration	Short-term	Limited to construction
Magnitude	Medium	Habitat loss limited and as such direct impacts are very limited in their extent
Reversibility	Reversible	Direct mortality of adults very unlikely but loss of nests, eggs and chicks near-certain but high fecundity species
Sensitivity	High	IUCN Vulnerable species are of high sensitivity (or lower)
Likelihood	Medium	Unmitigated loss of nests and chicks is certain
Significance	**Moderate**	

Mitigation Measures

A summary of mitigation measures to avoid and mitigate for direct impacts on sensitive vertebrate receptors is included below. Mitigation measures are largely based on avoidance of impact through selection of the working areas to favor areas of modified habitat or area of degraded natural habitat. These measures will be included (and expanded upon) in a Construction Biodiversity Management Plan.

- All site workers will undertake a Project induction before working on site. The induction will include a comprehensive biodiversity element where the baseline ecological value and sensitivity of the receptors within the AoI will be discussed.
- Prior to construction works, working areas will be clearly demarked so that site workers fully understand the working area. Encroachment into areas outside of agreed working areas will be prohibited and working areas will be subject to regular check by the EPC Contractor to check enforcement of working areas.
- Working areas should avoid trees / shrubs as these are likely, due to their sporadic distribution across the AoI to be of importance to breeding birds.
- Construction of the OHTL is expected to commence in June 2024 so pre-clearance works will include the following:
    - Pre-clearance mammal surveys will be undertaken in spring / summer 2024 to identify and map any Marbled Polecat and Corsac Fox burrows and if identified within or adjacent to working areas they will be recorded and mapped in detail. Camera traps will be used to identify if the burrows are in active use or not.

- If burrows are not in active use they will be checked by an ecologist and carefully destroyed (excavated) with supervision.
- If burrows are found to be in active use further avoidance and mitigation is required. Where land acquisition limits allow (i.e. work can be moved within a larger plot of land where work is agreed) exclusion zones will be set up so that work can continue but avoid the burrow. If this is not possible the work in these areas will be delayed to the extent possible to avoid the most sensitive times for specifies identified (e.g. when they have young or overwinter). Once these periods are over the burrow will be monitored and destroyed as above.
- It is likely that any work in the area around a burrow will result in the animals evacuating and re-locating to another nearby burrow away from disturbance. Whilst Marbled Polecat are a high sensitivity receptor they are considered to occur at very low densities and disturbance impacts are therefore likely to be negligible, minor at worst and therefore not significant. They will have large territories with several burrows which can be utilized in areas away from the immediate work areas. The loss of any burrows in the work areas, considered to be of very low likelihood, will not have a significant impact on these species.

- Pre-clearance surveys and translocation will be completed for Central Asian Tortoise, Desert Monitor, Desert Sand Boa and Blotched Rat-snake prior to commencement of construction activities (i.e. April-May 2024) in any permanent or temporary works area with a tentative suggested approach below.
  - Any animals found during the spring active season of 2024 (April-May) will be captured, tortoises will be marked on the carapace as being 2024 animals and moved approximately 2 km from the work area. Animals will be moved to areas of suitable habitat and will be distributed evenly. Detailed records will be kept of all animals moved.
  - Each work area will be thoroughly searched by appropriately qualified ecologists and any burrows that could potentially support tortoises (they have a characteristic shape) will be fully investigated using an endoscope. Should tortoises be found they will carefully be dug out (by hand) and translocated. Where burrows are shown to be empty, they will be destroyed. Only burrows in the working area are to be destroyed. If other receptors (lower sensitivity reptiles and mammals) are found in the burrows they will be dug out and removed away from construction zone. Detailed records will be kept of all animals moved, number of burrows checked and number of burrows destroyed.
  - Translocation efforts will ONLY take place during the tortoise active season and will cease as soon as aestivating behavior is recorded. Only active animals will be translocated.
  - Marking of captured animals will ONLY include a mark / notch on the scute. No paints or other obvious marking will be applied to captured tortoises that could make them potentially more vulnerable to predation.
  - If occupied burrows are found after the active season, then the burrows will be clearly marked (using colored flags) and the working areas adjusted to avoid direct impacts on aestivating / hibernating tortoise.
  - In the unlikely event that a tortoise is dug up or disturbed during works in periods of inactivity (i.e. aestivation / hibernation) then they will be carefully transported to a temporary holding facility that will be set up by the project. Transportation to a suitable

holding facility will be undertaken by a suitably trained ecologist / species specialist. The holding facility will be operational for accidental findings of tortoises during construction.

- This exercise will be completed throughout the spring active season for any work areas required in 2024 so that the population is significantly reduced, thus reducing the likelihood of animals aestivating and hibernating in work areas. The process will be repeated as required if work extends into the active season of 2025.

- If animals are kept in a holding facility, after the winter hibernation period they will be released into areas of suitable habitat adjacent (within 2km) to the site they were found. If construction activities have finished in the areas from which they were taken they will be released into that area. Any animals caught and taken to holding facilities will be marked in such a way as their capture location will be known. Marking could include PIT tagging or painting with an identification number. Any paint or obvious marks on the carapace should be fully removed prior to release. Records will be thorough to ensure all animals kept in a holding facility can be easily identified as individuals, where they were moved from and where they need to be released again.

- If the surveys in spring 2024 identify areas used by lekking or nesting MacQueen's Bustard they will be recorded and mapped in detail. An exclusion zone of 1 km from any areas where lekking MacQueen's Bustards have been identified and an exclusion of 500m from any MacQueen's Bustard nest sites will be applied. Where land acquisition limits allow (i.e. work can be moved within a larger plot of land where work is agreed) work can continue outside of the exclusion zone but disturbance to the birds will be monitored and work will cease if there is a negative impact. If this is not possible the work in these areas will be delayed to the extent possible until the end of the lekking or nesting period (i.e. August/September) or until the lekking activity or nesting attempt ceases naturally.

- Limit the requirement to work in areas of natural habitat and areas that require vegetation clearance to avoid impacts on other nesting birds. Prior to clearance of vegetation, pre-clearance surveys will be undertaken by a suitably qualified ecologist for nesting birds, in particular to identify nesting sites of higher sensitivity and conservation status (e.g. European Turtle Dove and Yellow-eyed Pigeon). Should these species be identified as nesting within or very near to work areas, where land acquisition limits allow (i.e. work can be moved within a larger plot of land where work is agreed) exclusion zones of 50m minimum will be set up so that work can continue but avoid the nest. If this is not possible the work in these areas will be delayed until the end of the nesting period (i.e. August/September) or until the nesting attempt ceases naturally.

Direct Impacts on Sensitive Receptors (Vertebrates) – Vehicle Collisions

Vehicle related collision are possible for all vertebrate species present within the Project's AoI and this will result in direct mortality on receptors of low to high sensitivity. Any such impact would be negative, long-term and irreversible and would be of medium to high magnitude and therefore of minor to major significance (depending on the receptor killed).

Larger mammals including Goitered Gazelle are more likely to disperse away from construction areas due to their sensitivity to disturbance and thus the risk of collision with vehicles will be small. Marbled Polecat are mostly nocturnal and as such the likelihood of collision is significantly reduced. Small mammals and

slower moving species such as Central Asian Tortoise, Desert Monitor, Desert Sand Boa and Blotched Rat-snake are at higher risk of collision with vehicles and machinery.

It is possible that carcasses on the road could attract scavenging animals, including birds of prey which in turn would increase their risk of collision with vehicles and machinery.

Mitigation Measures

- Appropriate speed limits will be enforced on access roads and working areas.
- Regular signage will be installed along the site access roads informing all drivers of the speed limit.
- A ban of driving at night will be enforced and if absolutely necessary the speed limit will be reduced to acceptable limits (e.g. 15 kmph).
- Ban against off-road (outside of designated access routes) driving at all times of the day.
- Regular checks of access roads for carcasses and if found these will be moved to at least 50m from the road to reduce the likelihood of hitting scavengers, including birds of prey.
- An incidental / chance find procedure will be included in the BMP so that all workers report any road collisions so that any such incident can be investigated in full.

Direct Impacts on Sensitive Receptors (Habitats, Vertebrates) – Poaching, Collection etc.

It is possible that site workers may poach or take plants and animals from the site, either for firewood, as food (e.g. hares, eggs), as a trophy (e.g. Goitered Gazelle) to sell (e.g. Central Asian Tortoise, other reptiles or small mammals) or persecution (e.g. snakes). However, on other projects implemented by the Developer in Uzbekistan there have not been issues with hunting and poaching and therefore this impact is considered unlikely

Any of the identified receptor are potentially at risk from this long-term, irreversible negative impact. The likelihood of this occurring is possible and the magnitude of this impact ranges from Low to High depending on the receptor affected.

Mitigation Measures

- The Project will enforce strict controls on hunting, gathering, poaching and otherwise disturbing flora and fauna within the Project AoI. Any breaches of this ban will be strictly enforced, and any workers found in breach of this control measure will be subject to disciplinary procedures. This will entail instant dismissal where species of international conservation concern (IUNC CR/EN/VU) or high in-country conservation concern (UzRDB CR/EN) are affected. For more common species a formal warning will be issued, followed by dismissal if the offence is repeated.
- The ban on hunting etc. will be included in the site induction along with discussions about the sanctions for breaches of this control measure.
- A chance find procedure will be implemented should any site worker find a wild animal, especially one that has become a nuisance (e.g. scavenger in the works camp, presence of small mammals in worker accommodation, presence of snake or scorpion on the works site) and the EPC Contractor will arrange for an appropriately qualified person to capture and relocate. Where scavengers have been identified within the works site additional housekeeping measures may be required.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Disturbance

The presence of site workers and machinery can result in disturbance related impacts to all terrestrial ecological receptors present within the AoI. These impacts are not certain, and the magnitude of such impacts will vary depending on the sensitivity of each receptor to disturbance. For example, disturbance distances for large and more secretive or nocturnal species such as Goitered Gazelle are likely to be significantly greater than for smaller mammals, Central Asian Tortoise, and other species of reptiles. The significance of any such disturbance impacts is likely to range from Low to Moderate / Major, depending on the sensitivity of the affected receptor. The duration of impact will also likely vary from very short-term (e.g. running away from a vehicle using an access road) to short to medium term in areas adjacent to construction areas or worker accommodation. It is likely that any disturbance impacts, irrespective of duration will be reversible once the disturbance event has passed.

Mitigation Measures

- Site wide induction to include information regarding disturbance of ecological receptors.
- Chance find procedure to report sightings of potentially sensitive receptor (e.g. Goitered Gazelle, MacQueen's Bustard) and investigation of any such sightings by the EPC Contractor in order that additional buffer areas can be agreed, where necessary (see above).

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Reduced Air Quality / Dust

The soil across the AoI is very fragile and the AoI is very dusty. It is likely that constructed related disturbance to upper soil layers will likely increase the amount of dust in the air which in turn could result in negative impacts on plants and vertebrate receptors. In addition, air pollution from site vehicles from the concreate batching plant could also result in negative impacts on valued receptors. These impacts are possible, short-term and reversible and are considered to be of minor to moderate significance.

Mitigation Measures

- Where necessary tracks and working areas will be damped down to reduce the risk of dust. Damping down will also include areas of soil / bare earth adjacent to roads. These measures will be implemented where necessary.
- Vehicles will be properly maintained to reduce emissions.
- Emissions from the batching plant will be monitored in line with control plans to minimize air pollution.

Direct Impacts on Sensitive Receptors (Vertebrates) – Noise

Noise as a result of construction can result in direct impacts on valued ecological receptors (vertebrates) due to acoustic masking, disturbance and displacement thereby reducing survivorship and reproductive success.

Any impacts are likely to be short- to medium term (for the duration of construction) and reversible. The magnitude of impact ranges from low to medium and is likely to be of low to moderate significance.

Mitigation Measures

- Vehicles will be properly maintained to noise emissions.
- Timing of works to avoid sensitive periods of the year and maintain buffer zones around MacQueen's Bustard lekking sites and nests and known burrows of Marbled Polecat and Corsac Fox (see above).
- Use of available technology and management practices with construction methodologies to reduce noise.
- Regular monitoring of noise levels within works compounds and works areas as far as possible and apply corrective measures as necessary.

Direct Impacts on Sensitive Receptors (Vertebrates) – Lighting

Lighting could potentially result in negative impacts of a range of ecological receptors including those of high sensitivity such as Marbled Polecat and Goitered Gazelle. In addition, lighting could impact foraging and commuting routes for bats.

Any impacts are likely to be short to medium term (for the duration of construction) and reversible. The magnitude of impact ranges from low to medium and is likely to be of low to moderate significance.

Mitigation Measures

- Limit the amount of lighting, especially within the wider AoI (e.g. at transmission tower sites and working areas). This will be achieved by ensuring that night-time working is limited and is only completed when strictly necessary.
- Where lighting is required within lay-down areas and worker compounds etc. ensure that any lighting is shielded and protected to reduce light-spill and glare. Low UV intensity lighting should also be used, where possible, to further reduce light spill.
- For external security lights PIR trigger units should be used and these should be timed to automatically switch off after five minutes.
- No lighting will be installed along the access road roads.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Littering, Waste Management

Unmitigated it is possible that poor waste management could result in the proliferation of litter across the Project AoI including plastic containers, plastic bags and glass. This waste could result is negative impacts to sensitive receptors through ingestion or entanglement. Any such impact could be long-term and irreversible, and the significance of this impact would be low to high depending on the receptor effected.

In addition, poor management of other solid wastes, including food waste could result in the presence of pest species such as rats and mice, which could outcompete wild rodents, and feral cats and dogs which could increase the risk of predation of wild rodents and other prey species (e.g. Tolai Hare, ground-squirrel, reptiles. ground nesting birds).

Mitigation Measures

- Waste Management will be included in the Site Induction so that all site workers understand their responsibilities to maintaining a clean and tidy site. Where possible all materials than can be recycled will be.
- Zero tolerance to littering in work areas. This zero-tolerance approach should also be applied to smoking and workers must use appropriate smoking areas (supplied with 'butt bins') at all times, even when on construction sites. Litter must not be thrown out of vehicle windows when driving to and from or around the site.
- Daily inspections of working areas should be completed and corrective actions applied, where necessary.
- Additional mitigation measures for pest species, including feral cats and dogs are included below.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Pest Species

As discussed above it is possible that pest species become established within the working areas as a result of increased littering or poor waste management as well as the propensity of certain species (e.g. rats, cats and dogs) to associate with human habitation.

An increase in pest species could result in long-term negative impacts on wild animals through direct and indirect competition for food resources, direct mortality through predation, and direct impacts as result of disturbance impacts. Such impacts could be reversible or irreversible, will be between low to high magnitude and as such significance will vary from minor to major depending on the receptor being affected.

Mitigation Measures

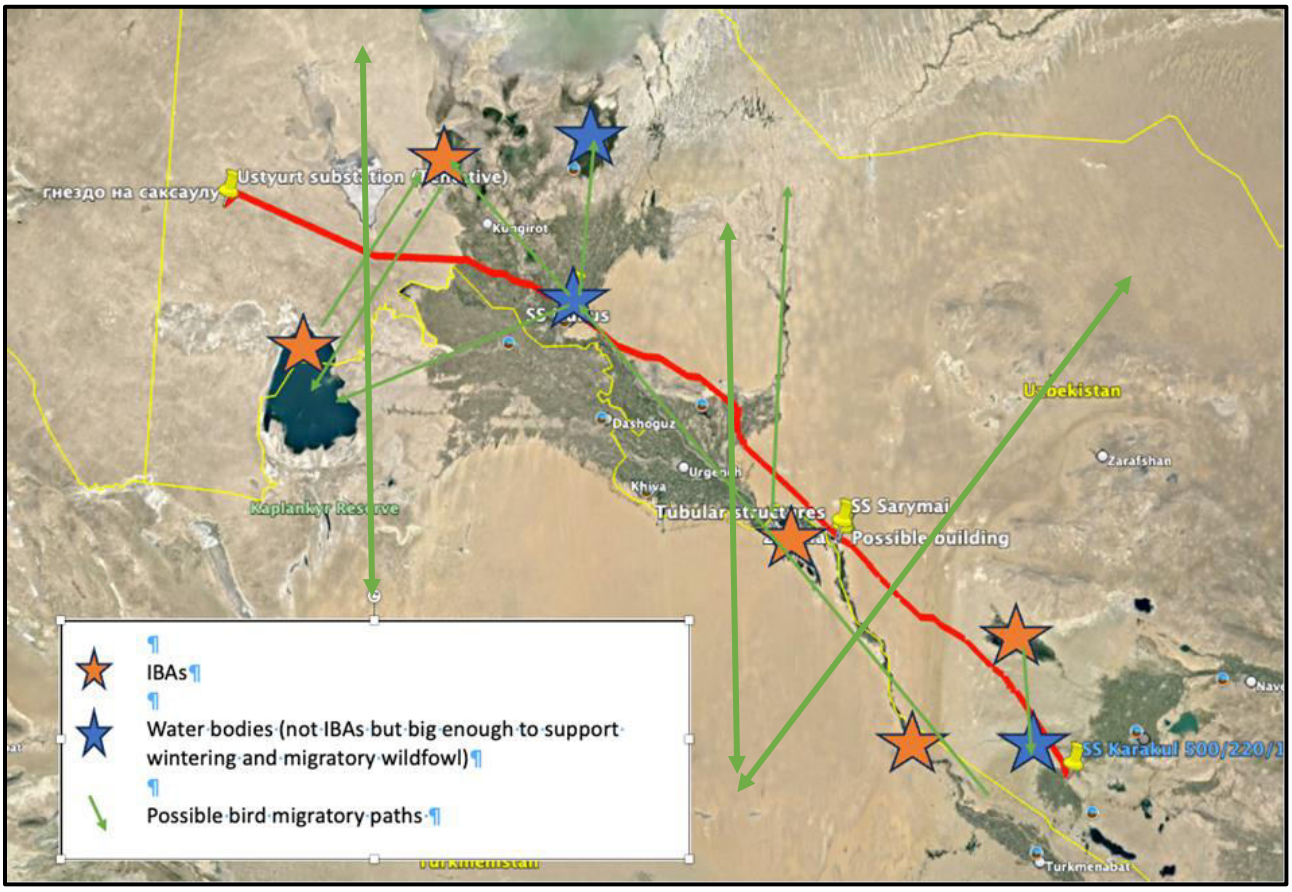
- Where pest species are identified the EPC Contractor / Ecologist will be notified and an appropriate course of action taken. For small mammal pest's live traps will be used, in order to reduce the risk of by-catch. Poison baits should be avoided, unless it can be certain that non-target species will be affected, and any such use should be in accordance with national and international best practice. If poison baits are to be used it must be certain that any poisoned animal cannot move out on to the wider AoI to reduce the risk of natural predators eating poisoned animals.
- Where feral cats and dogs are identified the EPC Contractor / Ecologist must be notified and efforts made to catch these animals and transport them to appropriate animal shelters away from the site. Guard dogs for the works site (e.g. security for site offices, workers accommodation) must not be used.

23.9.12 Potential Impacts during the Operation Phase

Direct and Indirect Impacts on Sensitive Receptors (Birds) – Collision with OHTL

The route of the OHTL is considerable and spans half the width of Uzbekistan, notably crossing the broad migration routes of the Central Asia to East Africa and Central Asia to South Asia flyways. There is no refined migration corridor or 'bottleneck' along any part of the route, so birds moving through will be on

a very broad front generally moving north or south along the flyway. Although, it has been identified that the route runs close to several IBAs designated for migratory birds and crosses a known migratory corridor, the Amu Darya corridor. These areas are likely to have a higher volume of migratory birds and will potentially have a higher risk of impacts but also due to the scale of the project it is inevitably going to cause impacts to birds that are likely to be a significant impact cumulatively along the whole OHTL route.



The operation of OHTLs is likely to have an impact on birds as they are proven mortality factor for migratory and soaring birds. In most cases, impacts from over-head powerlines lead to severe injuries or immediate death. In case of collision accidents, birds crash at high flight speed into cables or wires. The resulting injuries vary widely and are comparable to traumata caused by collisions with cars. Electrocution harms mostly birds sitting on the live components or having ground contact, but this is less of an issue with high power OHTL such as the one proposed here.

Due to the requirements and length of the OHTL, routing options will not avoid the risk of collision impacts. For a large proportion of the route (Ustyurt substation to Sarymay substation) it is proposed to have two OHTL running in parallel and for the remainder (Sarymay to Karakul) a single OHTL. Whilst there is a possibility of multiple lines together increasing the collision risk, it does also increase the visibility of the lines and could aid in reduction of collisions. Additionally, in some areas there are exiting OHTL or other urbanised areas that will increase the avoidance of the proposed OHTL.

The proposed design of the towers and lines are possibly the least impactful possible as the towers are free standing with no support wires, the conductor wires are all on the same level and there is only one shield wire above. It is usually the thinner, and less visible, shield wire/s that are the highest risk of casing collisions, so only having a single wire is positive.

The following table shows the species of conservation concern considered to be of higher risk of impact from collision with the OHTL. These species are also discussed further in the CHA document.

Table 115: Species of conservation concern considered to be of higher risk

Common Name	Conservation Status		Notes
	IUCN	UZBDB	
Sociable Lapwing	CR	VU	A widespread species within Uzbekistan during spring and autumn migration periods. Migration through the AoI is likely
White-headed Duck	EN	EN	Breeding, passage and wintering species in Uzbekistan and known to occur in adjacent IBA and non-IBA wetlands. Migration through the AoI is likely
Pallas's Fish Eagle	EN	-	A rare and infrequent passage bird. Possible migration through the AoI
Egyptian Vulture	EN	VU	Egyptian Vulture are a widely distributed breeding species within Uzbekistan and this species will also migrate through the country. Migration through the AoI is likely
Saker Falcon	EN	NT	Approximately 70 breeding pairs in Uzbekistan however breeding habitat is not present within the Project AoI (e.g. cliff faces, chinks). Migration through the AoI is likely
Steppe Eagle	EN	VU	Breeding and migratory species through Uzbekistan. Species has previously over-wintered within the Amu Darya river corridor. Migration through the AoI is likely
Lesser White-fronted Goose	VU	VU	Wintering and passage species within Uzbekistan within plainland water reservoirs of the Amu Darya and Syr Darya river basins including Lake Dengizkul. Wintering is irregular and populations fluctuate between 200 and 2,000 individuals. Migration through the AoI is likely
Common Pochard	VU	-	Widely distributed species with large global population and known to occur in adjacent IBA and non-IBA wetlands. Migration through the AoI is likely
Greater-spotted Eagle	VU	VU	A non-breeding species and only occurs in low numbers on migration. Migration through the AoI is likely
Eastern Imperial Eagle	VU	VU	Breeding and migratory species within Uzbekistan. Breeding in very low density has been previously recorded within the Ustyurt Plateau and the Kyzylkum Desert. Migratory populations are also considered to be low (UzRDB). Migration through the AoI is likely
Great Bustard	VU	CR	Formerly a breeding species within Uzbekistan, however current status is as a wintering species and usually in colder winters only. Migration through the AoI is likely and wintering possible
MacQueen's Bustard	VU	VU	Recorded in low numbers along OHTL so far (Autumn surveys). Likely significant migration through the Project AoI, breeding likely and wintering possible

Sociable Lapwing

Whilst the impact of collision with OHTLs is not as well published for wading birds as it is for other species, there is still a risk. It is likely that due to their flight behavior and higher maneuverability wading birds are more likely to avoid collision with OHTL than other more at-risk species. However, considering the conservation status of Sociable Lapwing and impacts could be significant.

It is a widespread species within Uzbekistan during spring and autumn migration periods where it is known from the Central Kyzylkum, the Aydarkul Lake and the Tudakul and the Talimarzhan water reservoirs. It can be found on the banks of reservoirs and marshes in the plainland wetlands and dry steppe areas, fallow land and harvested fields during migration periods. This species does not breed in Uzbekistan. In 1970–80s, flocks of 10–20 individuals were recorded however in recent years concentrations of birds have been found during the autumn migration in the Talimarzhan Reservoir (2000+ birds in 2012 and 4000+ birds in 2015).

There are no known stop-over sites present within the AoI and the AoI does not support suitable staging habitats. The AoI is outside of areas where this species is known to congregation large numbers in Uzbekistan (e.g. Talimarzhan Reservoir approx. 200km SE of AoI).

MacQueen's Bustard

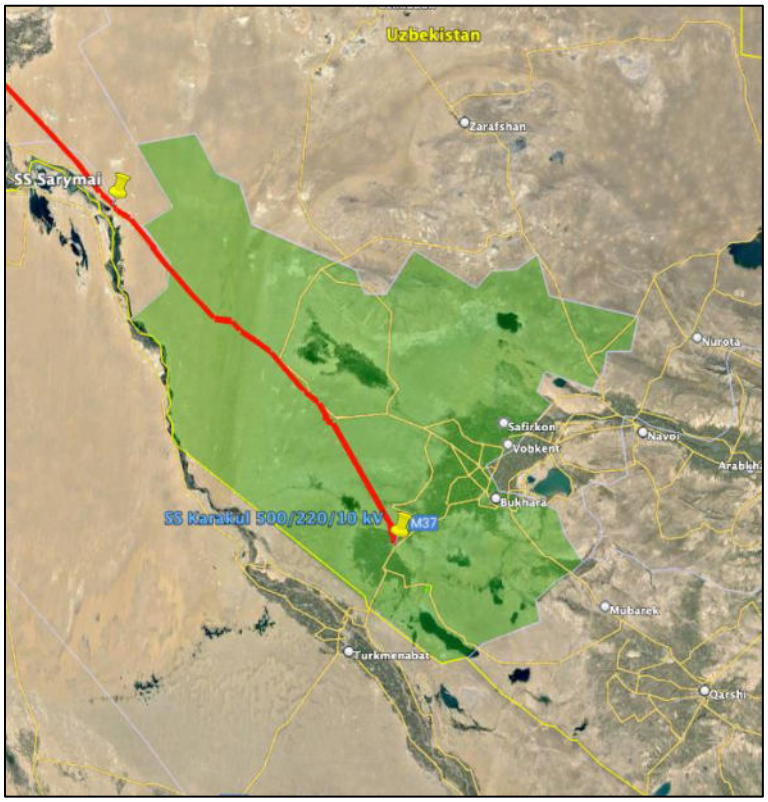
It is well documented that bustard species are heavily impacted by collisions with OHTLs. The size, flight behavior and other biological characteristics of bustards results in a low level of detection and being able to avoid collision with such structures such as OHTL and fencelines.

Previous nesting population in Uzbekistan between 1960–80-s estimated between 1,500 to 3,000 individuals; however, during migration up to 20,000 individuals were recorded. According to the UzRDB in-country populations and breeding range has decreased during the last decades (sic 1990's to 2010's). Recent (2016) estimates of the breeding population within the south-eastern area of the Kyzylkum Desert (Bukhara Region) were approximately 2,000 breeding pairs and this was updated in 2021 to approximately 2,350 breeding females . It is also considered that approximately 10% of the total Uzbekistan breeding population over-winters in the southern part of the Kyzylkum Desert (Bukhara Region) . Many of the papers reviewed to inform the CHA indicate a likely 9.4% annual decline in MacQueen's Bustard across its range, mainly due to unsustainable wintering mortality from hunting.

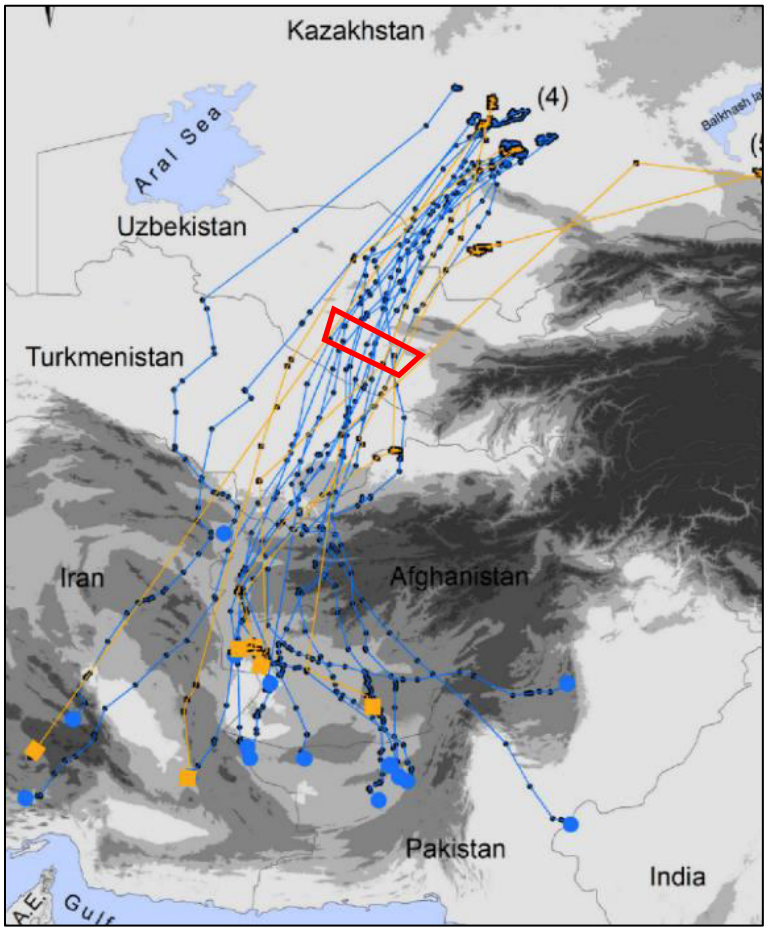
In addition to unsustainable winter hunting MacQueen's Bustard, mortality at OHTLs has been recorded across its range including within Uzbekistan (Bukhara Region, 2010).

Satellite tracking data from three distinct populations of birds breeding outside of Uzbekistan; Central Kazakhstan and in the Xinjiang and Gansu areas of China / Mongolia shows that those populations regularly migrate through central Uzbekistan. It is also assumed that birds breeding in Central Uzbekistan (across the Kyzylkum Desert and Bukhara Regions) will also migrate along this route to similar wintering sites.

Low numbers recorded in the WF during surveys however no evidence of breeding noted. Low numbers also recorded on the OHTL surveys including color-ringed birds which are assumed to be from captive breeding and release programmes.



Breeding MacQueen's Bustard area - Bukhara Region of the Kyzylkum Desert



Major migration route for MacQueen's Bustard through Central Uzbekistan (overlap between migratory paths and OHTL in shown in red)

Other species – large migratory soaring birds and waterbirds

Generally, any large soaring or fast flying species is at risk of collision with OHTLs. The size and flight behavior (and sometimes other biological characteristics) of these species results in a low level of detection and being able to avoid collision with such structures.

Steppe Eagles are known to move through Uzbekistan in significant numbers during migration, more so than the other migratory soaring birds of higher conservation concern. These species move through Uzbekistan on a broad migration front and would not be behaving or moving in any particular way in relation to any physical features in the landscape. There may be more movement along the Amu Darya corridor, for example, but there is unlikely to be a significant concentration of any species.

It is anticipated that most migratory soaring birds will be at insignificant risk to collisions due to their flight behavior, i.e. smaller and more maneuverable birds (such as falcons and harriers) will actively avoid the OHTL and most large soaring raptors (like eagles and vultures) will be moving at a much greater height than the OHTL and avoid it. Factors such as unsuitable weather for migration and the need to rest or roost is likely to bring them into greater risk of collision.

Data from the from the Kungrad wind farm VP surveys (from winter, spring and summer) undertaken in 2023 were analyzed (as the OHTL VP data is not yet available to use). Any birds recorded flying at 15m to 30m were considered to be at risk of collision with the OHTL, based on towers being approximately 30m in height and the lines between the towers being slightly lower. The data for all species recorded that are considered to be at greater risk (small passerines were excluded) are included in the table below. This shows that for most species they were not recorded at the height of the OHTL or only a small proportion were recorded at the height of the OHTL, e.g. only 8 Steppe Eagles were recorded flying at 15 to 30m which is 2% of the Steppe Eagle recorded. Three MacQueen's Bustards were recorded flying at 15 to 30m, which is 20% of the birds recorded.

Common Name	**Number of birds recorded at 15m to 30m flight height**	**Total number of birds recorded**	**Percentage of birds recorded at 15m to 30m flight height**
Black Kite	0	13	0%
Black-bellied Sandgrouse	10	20	50%
Black-winged Pratincole	8	20	40%
Buzzard	0	1	0%
Common Kestrel	8	33	24%
Eastern Imperial Eagle	**0**	**11**	**0%**
Egyptian Vulture	**0**	**1**	**0%**
Eurasian Hobby	0	1	0%
Golden Eagle	**1**	**27**	**4%**
Greater Sand Plover	7	13	54%
Greater Spotted Eagle	**0**	**3**	**0%**
Hen Harrier	0	12	0%
Lesser Kestrel	1	2	50%
Long-legged Buzzard	20	62	32%
MacQueen's Bustard	**3**	**14**	**21%**
Marsh Harrier	0	2	0%

Montagu's Harrier	0	1	0%
Pallas's Fish Eagle	**0**	**1**	**0%**
Pallid Harrier	0	14	0%
Short-toed Eagle	0	1	0%
Steppe Eagle	**8**	**442**	**2%**
White-tailed Lapwing	2	5	40%
White-tailed Sea-eagle	0	3	0%

Large accumulations of waterbirds are known to use waterbodies in the wider area of the project AoI during all seasons of the year, but particularly during migration and winter. Some species are known to winter in the area in globally significant numbers, such as White-headed Duck and Common Pochard.

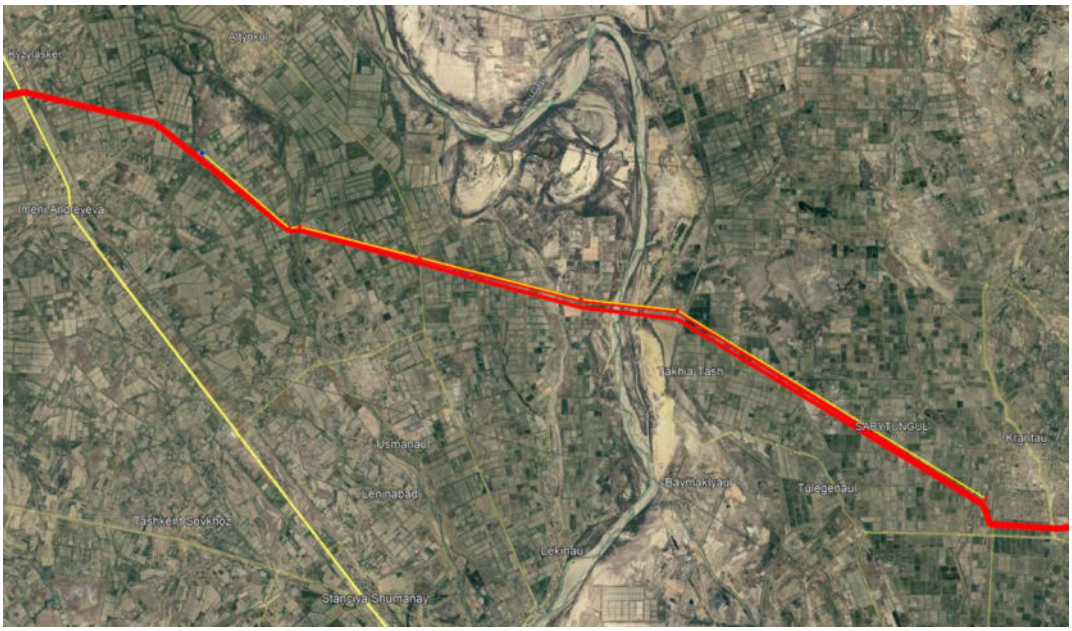
There are no known stop-over sites present within the AoI and the AoI does not support suitable staging habitats. It is very likely that wintering and migrating populations will cross the project AoI when moving between waterbodies as well as on migration. However, it is considered very unlikely that the project will result in significant impacts to these species due to natural avoidance behavior of water birds as well as their likely flight heights being much higher than the OHTL when undertaking movements between waterbodies or on longer migration flights. The closest waterbody to the OHTL which is known to support significant populations of White-headed duck for example, Karakyr Lake, is approximately 9 km north of the OHTL and other lakes are further away. It is therefore likely that any birds moving between lakes during passage and winter periods will be flying at altitudes significantly higher than the OHTL and as such the risk of collision is minimal. Any birds undertaking longer migration flights to more southerly wintering grounds or northerly breeding areas are again likely to be flying at altitudes higher than the proposed OHTL and the risk of collision is minimal.

Operation Phase – Direct and Indirect Impacts on Sensitive Receptors (Birds) – Collision with OHTL		
Type	Negative	N/A
Duration	Long-term	Impacts will be occurring throughout the entire operation phase
Magnitude	High	High level of collision risk for some sensitive species
Reversibility	Irreversible	Fatalities of birds are considered irreversible impacts
Sensitivity	High	IUCN Critically Endangered species are of high sensitivity (or lower)
Likelihood	High	Unmitigated collision is certain
Significance	**Major**	

Mitigation Measures

- Bird Flight Deflectors (BFDs) are proposed to be installed along the OHTL in areas that are likely to have a greater risk of having bird collisions. Currently the main risk area is the southern end of the route within the Kyzylkum Desert where MacQueen's Bustard migrate through in significant numbers, but could also be nesting or wintering. It is proposed BFDs are installed between Taza-Kel'teminar and the Karakal substation (c. 340km – partially 2 OHTLs) and where there may be higher bird flight activity along the Amu Darya corridor (30km of 2 OHTL). The BFDs installed will need to be ones that glow or light up at night to increase visibility for nocturnal migrants (e.g. FireFly diverters). Following further bird survey work following surveys other areas shown to be higher risk might be proposed.

Proposed 30 km over Amu Darya Corridor (2x OHTL)



Proposed c.340 km between Taza-Kel'teminar and the Karakal substation (partly 2 x OHTL)

- Operational monitoring will be completed for at least the first three years of operation to monitor actual levels of mortality. Post construction fatality monitoring will be completed along the whole OHTL and the program of post construction monitoring will include carcass searching, searcher efficiency trials and carcass persistence trials. Additionally, Bird Strike Indicators (BSIs) will be used to detect bird strikes with the OHTL. The results of the post-construction fatality monitoring will be used to inform a GenEst Analysis. Post-construction monitoring will follow the latest international best practice including the recently published PCFM Handbook (EBRD, IFC, KFW 2023). Full details of the PCFM Protocol will be included in an Operational Biodiversity Action Plan (BAP) document. PCFM survey areas will also include OHTLs that are adjacent to the Project AoI, especially in areas that may be subject to greater movement of high-risk species (e.g. MacQueen's Bustard).
- An adaptive management strategy will be developed (in line with the PCFM Handbook), and additional mitigation will be undertaken if the results of the post-construction fatality monitoring indicate higher than predicted mortality, especially in relation to species of elevated conservation concern. Adaptive management could include retrofitting of BFDs on unmarked lines (including adjacent OHTL) where PCFM surveys indicate areas of elevated mortality or provision of additional BFDs on marked lines if the installed BFDs are not preventing (or reducing) mortality.
- On completion of the three-year post-construction fatality monitoring a decision will be taken to continue or cease this survey effort or reduce it to specific times of the year. If monitoring is ceased site workers will continue to record any carcasses they find and this information will be passed on to the Project team.
- A chance find procedure will be implemented and any carcasses seen by site workers will be reported to the Project Ecologist so that they can investigate.
- It is likely that even with installed BFDs, mortality of MacQueen's Bustard will result in a net loss of this species and off-setting will be required. An off-set plan, which could include contribution to captive

breeding and release programmes, wider installation of BFDs and removal of LV and MV OHTLs, insulating live parts of LV and MV OHTLs will be detailed in the Biodiversity Action Plan.

Indirect Impacts on Sensitive Receptors (terrestrial mammals and breeding / resident birds) – Disturbance

During the operation of the OHTL disturbance impacts are likely to be very minor as the site will not be subject to regular activity other than occasional vehicle movements and maintenance operations around the site. Certain species including Goitered Gazelle and MacQueen's Bustard are likely to be more susceptible to such impacts as a result of their natural behaviors. It is possible other receptors including breeding passerines and other mammals may experience disturbance impacts during the operation of the OHTL. Any such impact will have to be very short-term (for the duration of the disturbance impact) and reversible and is likely to only result in impacts of minor magnitude. The significance of operational disturbance is therefore considered to be minor, at worst.

Mitigation Measures

- Ban on off-road driving, especially during sensitive periods of the year (e.g. breeding bird season) and if off-road driving is required a check of the working area should be completed by the Project's Ecologist.
- Speed limits to be enforced.
- Sensitive species are to be included in the site induction for all operational staff where additional control measures will be discussed including allowing animals to move around the site, not chasing after them in vehicles or approaching them on foot and what to do if they observe breeding birds within their works areas.

In addition, if any significant maintenance work is required (e.g. replacement of any transmission towers or wires etc.) all impacts related to construction will be relevant and all mitigation outlined in previous sections will be followed.

23.9.13 Monitoring

Long term monitoring of the Project AoI will be completed as set out above and will include:

- Habitat and Flora monitoring within the AoI to measure the success of habitat rehabilitation work to reasonably demonstrate a net gain in Natural Habitat as well as to record the presence of invasive / non-native flora.
- Post-construction fatality monitoring to be completed in the first three years of operation to record the actual impact of collisions with the OHTL. Additional surveys and or mitigation measures to be implemented as part of an Adaptive Management Strategy.
- All of the above monitoring requirements will be included within Construction and Operational Biodiversity Action Plans which will include KPIs and a BEMP against which the results of the monitoring will be assessed.

23.9.14 Potential Wider Conservation Benefits of the Project (compensation / off-setting)

It is considered possible that even with mitigation and habitat rehabilitation the Project will result in a minor residual negative impact on natural habitat (net gain not achieved) as well as other possible residual negative impacts on MacQueen's Bustard (net loss due to mortality). Residual impacts on other receptors of conservation concern are likely to be neutral.

A cooperation agreement will be made between ACWA Power and the Emirates Bird Breeding Centre for Conservation (EBBCC). This will involve monitoring the impacts on MacQueen's Bustards and working together to offset negative impacts from the development of the OHTL and other related projects by release of captive bred birds.

In addition to the above, additional offsets that the Developer has committed to have been identified (in addition to the above action) as well as potential wider conservation benefits in relation to the Project, both of which will also be assessed as previously discussed under "Section 11.4" and "Section 11.411.5". Such offsets and benefits will be assessed in details as part of the BAP that will be prepared.

23.10 Other Issues

Discussed below are other E&S issues that are applicable for the OHTL development but which in general are considered minor in nature or are considered not applicable at a site-specific level.

A. Air Quality and Noise during Construction

Key risk and impacts are related to the construction phase only and include the following:

- Construction activities will likely result in an increased level of dust, particulate matter and pollutant emissions which in turn will directly impact ambient air quality
- Possible noise emissions to the environment from the construction activities which will likely include the use of machinery and equipment such as generators, hammers and compressors and other activities.

"Section 13" identifies key mitigation and monitoring measures related to dust, emission and noise control. Those should be considered within an Air Quality and Noise Management Plan as required within "Section 22.2". Such measures and plan should be implemented by the EPC Contractor for the Wind farm component as well as the OHTL component.

B. Noise during Operation

According to the "IFC EHS Guidelines for Electric Power Transmission and Distribution" (IFC, 2007) noise in the form of buzzing or humming can be often heard around high voltage power lines producing corona – however noise produced by power lines does not carry any known health risks. In addition, such noise quickly dissipates with distance and is easily drowned out by typical background noises and beyond the 30m security and sanitary protection zone this is expected to be negligible. **Therefore, this impact will be scoped out.**

C. Electric and Magnetic Fields (EMF) during Operation

Electric and magnetic fields (EMF) are radiation associated with the use of electric power such as household wiring, electric appliances and also from OHTL. Electric fields are produced from the voltage in the transmission line while magnetic fields are produced from the electric current. While electric fields can be shielded by objects (such as buildings or trees), magnetic field pass through most objects. Such fields are strongest at the source and decrease significantly with increasing distance from the source.

Electric fields (ELF) are produced by voltage and increase strength as the voltage increases. Electric field strength is measured in volts per meter (V/m). Magnetic fields are produced by the current, which measures the flow of electricity, which increases in strength as the current increases. Electromagnetic fields are measured in units of tesla (T). Most electric power operates at 50 or 60 cycles per second or hertz (Hz), termed 'extremely low frequency (ELF).[117]

Extensive scientific research and studies have been undertaken to address potential human health impacts from long term exposure to EMF from transmission lines. The consensus is that the overall scientific evidence for human health risk from EMF exposure is weak however EMF exposure could not yet be recognized as entirely safe.

Similarly, the "EHS Guidelines for Electric Power Transmission and Distribution" issued by the IFC also states that although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern.

The IFC EHS Guideline also requires that exposure level limits to the public should remain below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) limits provided in the table below.

Table 116: ICNIRP Exposure Limits for General Public Exposure to Electric and Magnetic Fields

Frequency	Electric Field (V/m)	Magnetic Field (µT)
50 Hz	5000	100
60 Hz	4150	83

A study undertaken by Western Area Power Administration (responsible for electric power functions in Central and Western States of the USA), known as the "Electric and Magnetic Field Facts"[118] included measuring fields for 321 power lines for 1990 annual mean loads. The table below presents the outcomes of the study including typical values for electric and magnetic fields for a 500kV OHTL at various distances – with values of 1000 V/m and 1.26µT respectively. As noted, within the 30 m (the sanitary protection zone required by "Sanitary Norms No. 0236-07: Sanitary Standards and Regulations to Ensure Safety for Populations Living near High Voltage Power Lines" as discussed previously ,the values are significantly lower than the ICNIRP limits referenced above.

Table 117:Typical 60 Hz electric and magnetic field levels from overhead power lines

500 kV OHTL	Centerline	100 feet (30.5 m)	200 feet (60.96 m)	300 feet (91.44 m)
Electric field V/m	7000	1000	3000	1000

[117] Radiation: Electromagnetic fields (who.int)
[118] EMF book for pdf.idd (wapa.gov)

Magnetic field µT	8.67	1.26	0.32	0.14

In addition to the above, a study conducted by the National Institute of Environmental Health Sciences[119] further reinforces the findings mentioned above. The figure below presents the typical EMF levels for 500kV power transmission lines based on the study. As noted, the measured fields at a distance of 30m from the OHTL line are significantly lower than the ICNIRP guidelines as well.

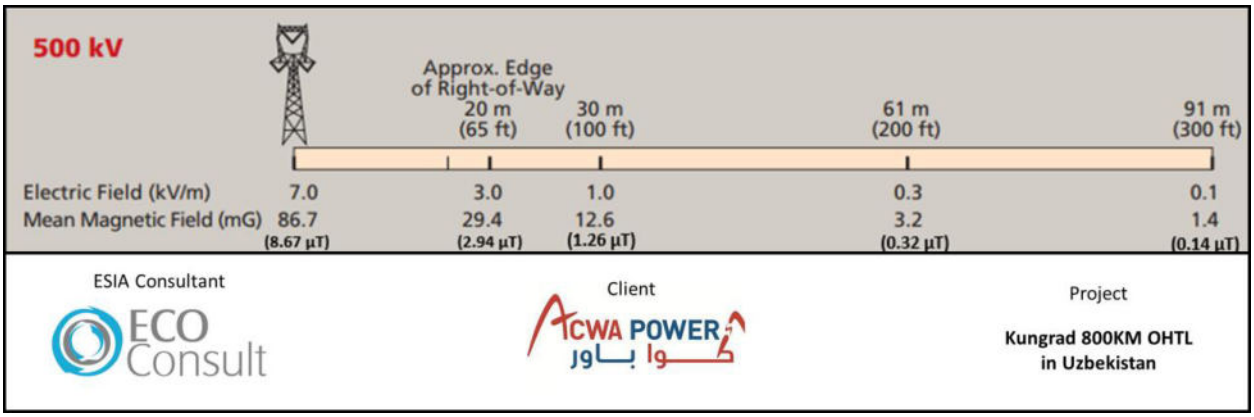


Figure 161: Typical EMF Levels for Power Transmission Lines

Finally, a study undertaken by ICNIRP[120] specifically for magnetic fields with one year's recorded load data with averages for a representative sample of 43 different lines further supports the findings earlier. This study enhances the credibility of the conclusion that the 30-meter buffer zone is adequate in ensuring public safety and well-being. As noted below, at 30m the magnetic fields are significantly lower than the limits required.

Table 118: Magnetic Field values for different OHTLs

Typical Magnetic Field (µT) values for OHTL					
Type of line	**Usage**	**Distance from line**			
		15m	**30m**	**61m**	**91m**
115kV	Average	0.7	0.2	0.04	0.02
	Peak	1.4	0.4	0.09	0.04
230kV	Average	2.0	0.7	0.18	0.08
	Peak	4.0	1.5	0.36	0.16
500kV	Average	2.9	1.3	0.32	0.14
	Peak	6.2	2.7	0.67	0.30

Finally, as indicated earlier, based on consultations with the Republican Sanitary Epidemiological Service, it was indicated that a 30m buffer zone from the OHTL is sufficient to ensure local limits for EMF are met (which is also applicable for ICNIRP limits).

As discussed previously , the LRP will take into account all physical (i.e. houses in particular) and economic structures within the ROW which includes the 30m.

[119] EMF Electric and Magnetic Fields Associated with the Use of Electric Power (nih.gov)
[120] EHC 238 Front pages final.fm (icnirp.org)

Any physical structures (e.g. houses) within the 30m sanitary zone will be included within the Livelihood Restoration Plan (LRP). Refer to "Section 23.5" for additional details. **Therefore, this impact will be scoped out.**

D. Labor and Working Conditions during Construction

Key risk and impacts are related to the construction phase only and include the following:

- Inappropriate management of the workforce could entail several human right risks and violations. This could include child labor, forced labor, confiscation of passports of foreign workers, unacceptable working conditions and terms of employment, harassment, etc.
- Should a worker camp be constructed there could be risks related to inappropriate accommodation facilities which could entail risks for workers such as overcrowding, suffocation, spread of contagious disease, and other.
- Influx of Project workers into local communities could result in certain community health, safety and security impacts such as risk diseases, inappropriate Code of Conduct, increase in social vices, etc. (should workers be accommodated within neatest community settlements across the OHTL route).

As identified within "Section 22.2" earlier, a Labor and Working Conditions Management Plan should be developed. The Plan should cover both the wind farm component as well as the OHTL component.

During the operational phase, O&M activities are expected to be undertaken by the internal team of technicians and engineers from the electricity company . Therefore, there no relevant impacts during the operational phase.

E. Occupational Health and Safety

There will be generic risks to workers health and safety from working on construction and operation sites, as it increases the risk of injury or death due to accidents. This could include but not limited to fall from heights, electrocution, strike by rotating objects, trips and falls, etc. There are other site-specific risks which include: (i) risk related to remoteness of the site (e.g. in case of medical emergency); (ii) risk from sand and salt storms; (iii) risks from extreme hot and cold weather.

However, the following is noted:

- As required "Section 22.2" the EPC Contractor is required to prepare and submit an Occupational Health and Safety Plan (OHPS) and Emergency Preparedness and response Plan (EPRP). The Plan should cover both the wind farm component as well as the OHTL component.
- It is expected that the electricity company have an OHSP and EPRP for the O&M activities undertaken for high voltage OHTLs within Uzbekistan.

F. Community Health and Safety

Key impacts and risks are related to trespassing of unauthorized personnel into the Project site could result in potential risk from several hazards such as unauthorized climbing of the transmission tower, which could result in safety hazards (electric shock, thermal burn hazards and other).

However, it is recommended that post informative signs on the transmission towers about public safety hazards and emergency contact information in both Russian, English, Uzbek and Karakalpak language. Signs, especially warnings need to be pictorial as well as written to ensure they are understood by those unable to read.

G. Traffic and Transport during Construction

Key impacts and risks are related to the construction phase and include inappropriate management of traffic and transportation activities which could entail public health and safety risks from accidents and similar activities. The following key transportation requirements are anticipated:

- Transportation of towers and conductors to site-specific areas
- Transportation of workers to/from accommodation areas to working areas
- Transportation construction related materials such as concrete
- Other

As identified within "Section 22.2" earlier, a Traffic and Transport Management Plan should be developed. The plan should cover both the wind farm component as well as the OHTL component.

During the operational phase, O&M activities are expected to be undertaken by the internal team of technicians and engineers from the electricity company which could involve travel to site-specific areas. However, this is not expected to include any key traffic and transport activities and therefore impacts during the operational phase are considered negligible.

H. Waste Management during Construction

Such impacts are related to improper waste (to include solid waste, wastewater and hazardous waste) management practices (e.g. improper storage onsite, improper final disposal, etc.) as well as improper storge of hazardous material.

Such practices during construction could contaminate and pollute soil which in turn could pollute groundwater resources. This could also directly or indirectly affect flora/fauna and the general health and safety of workers (from being exposed to such waste streams). Generally, such impacts can be adequately controlled through the implementation of general best practice housekeeping measures and which are expected to be implemented by the EPC Contractor throughout construction phase.

Those have been identified earlier. In addition, those should be considered within the Waste Management Plan as required within "Section 22.2". Such measures and plan should be implemented by the EPC Contractor for the Wind farm component as well as the OHTL component.

24. ANNEXES

24.1 Annex 1 – Detailed Regulatory Review