



# **Jambyl 1 GW Onshore Wind Power Project (WPP)**

## **Environmental & Social Impact Assessment (ESIA):**

### **Volume I – Non-Technical Summary**

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## 1. Introduction

### 1.1. Purpose of the NTS

This document is the Non-Technical Summary (NTS) of the Environmental and Social Impact Assessment (ESIA) prepared for the Jambyl 1 GW Onshore Wind Power Project (the Project).

The purpose of this NTS is to provide a clear and accessible summary of the Project, the ESIA process, and the key environmental and social issues identified, together with the main measures proposed to avoid, reduce or manage potential impacts.

The NTS is intended for a non-technical audience, including local communities, stakeholders, government authorities and other interested parties. It does not replace the full ESIA report but summarises its main findings in a concise and understandable format.

### 1.2. Overview of the Project

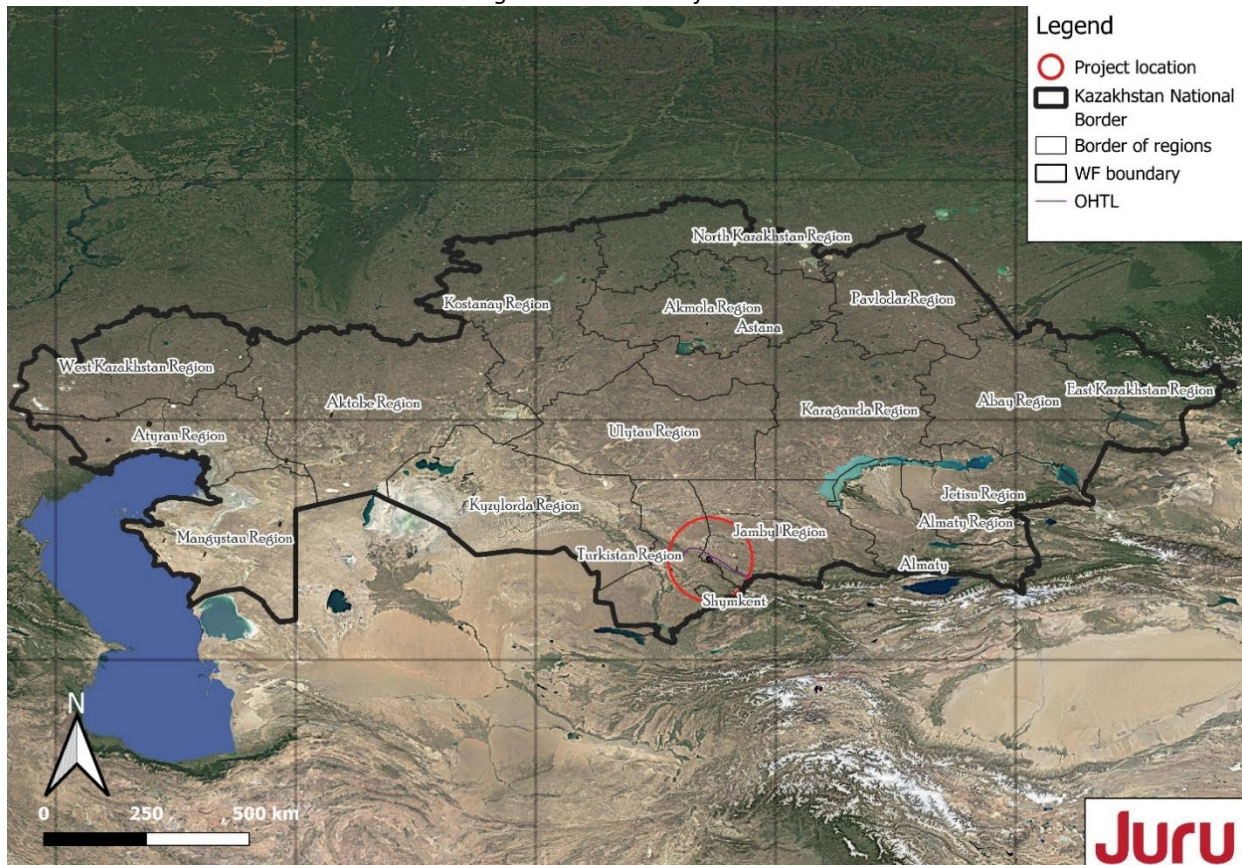
The Project involves the development of a 1 gigawatt (GW) onshore wind power project (WPP), together with a battery energy storage system (BESS), in the Sarysu and Talas districts of the Jambyl Region, in southern Kazakhstan (see *Figure 1*).

The Project is being developed by Masdar, Abu Dhabi Future Energy Company PJSC, through the project company Qazaq Wind Power LLP. The electricity generated by the Project will be supplied to the national electricity grid, supporting Kazakhstan's transition towards increased use of renewable energy sources.

The Project comprises of:

- wind turbine generators installed across a site area of 14,000 Ha,
- associated substations and electrical infrastructure,
- a battery energy storage system to support grid stability,
- and two overhead transmission lines (OHTLs) connecting the Project to existing substations.

Figure 1: Overall Project Location



### 1.3. Overview of the ESIA process

An Environmental and Social Impact Assessment (ESIA) has been undertaken to identify, assess and manage the potential environmental and social effects associated with the construction and operation of the Project. The ESIA has been prepared in accordance with:

- National environmental legislation and permitting requirements of the Republic of Kazakhstan; and
- relevant international good practice and lender standards, including, but not limited to, the Asian Infrastructure Investment Bank (AIIB) Environmental and Social Framework (AIIB ESF, 2024) and International Finance Corporation (IFC) Environmental and Social policies and Performance Standards.

The ESIA process included:

- baseline environmental and social studies,
- assessment of potential impacts,
- identification of mitigation and management measures,
- and stakeholder engagement activities.

The findings of the ESIA inform the Project’s environmental and social management and monitoring approach, which is summarised later in this NTS.

## 2. Project Overview

### 2.1. Location and setting

The Jambyl 1 GW Onshore Wind Power Project (WPP) is located in the Jambyl Region of southern Kazakhstan, within the Sarysu and Talas districts. The Project area occupies an elevated open steppe plateau, which is physically and visually separated from surrounding lower-lying areas and characterised by wide open plains and gentle relief. Land within and around the Project area is used mainly for livestock grazing, with some agricultural cultivation and limited industrial activity in the wider area. The elevated and open nature of the plateau means the area is naturally exposed to consistent winds, which is why it has been identified as a suitable location for generating electricity from wind energy.

As well as its good wind resource, the site was selected as it lies in a remote rural area, with no large towns or cities in close proximity. The nearest main town is Zhanatas, located approximately 13.5 km to the north of the WPP site area, while smaller settlements such as Ushbas and Aktogay are located several kilometres from the nearest proposed wind turbine generators. There are no permanent residential settlements within the WPP area. As shown in *Figure 2*, all towns and villages are located outside the WPP area, with residential receptors separated from the turbines by open grazing land. Overall, residential receptors are located at considerable distances from the proposed wind turbine generators, reflecting the elevated and isolated setting of the WPP area.

In addition to the wind farm area, the Project includes two overhead transmission lines (OHTLs) that connect the WPP to existing substations within the regional electricity network. One OHTL connects the Project to the Jambyl Substation, while the second connects the WPP to the Opornaya Substation and onward to the Kentau Substation. These transmission lines are aligned with and run close to existing OHTLs, and their routes extend across several districts and pass through predominantly rural landscapes, including grazing land and areas with existing linear infrastructure. The relationship between the OHTL routes and nearby towns and villages is illustrated in *Figure 3* and *Figure 4*.

The surrounding environment reflects typical conditions of southern Kazakhstan, with a continental climate and pronounced seasonal variation. While surface water features are limited in extent, seasonal watercourses, small drainage lines and local water points play a role in supporting grazing activities and local land use. The wider area supports natural steppe habitats and associated wildlife, all of which have been carefully considered during site selection, Project layout design and the ESIA process.

Figures included in this NTS show the location of the WPP and OHTL routes in relation to nearby towns, villages and infrastructure, to help understand the Project's setting within the wider region.

Figure 2: WPP Area and Surrounding Towns & Villages

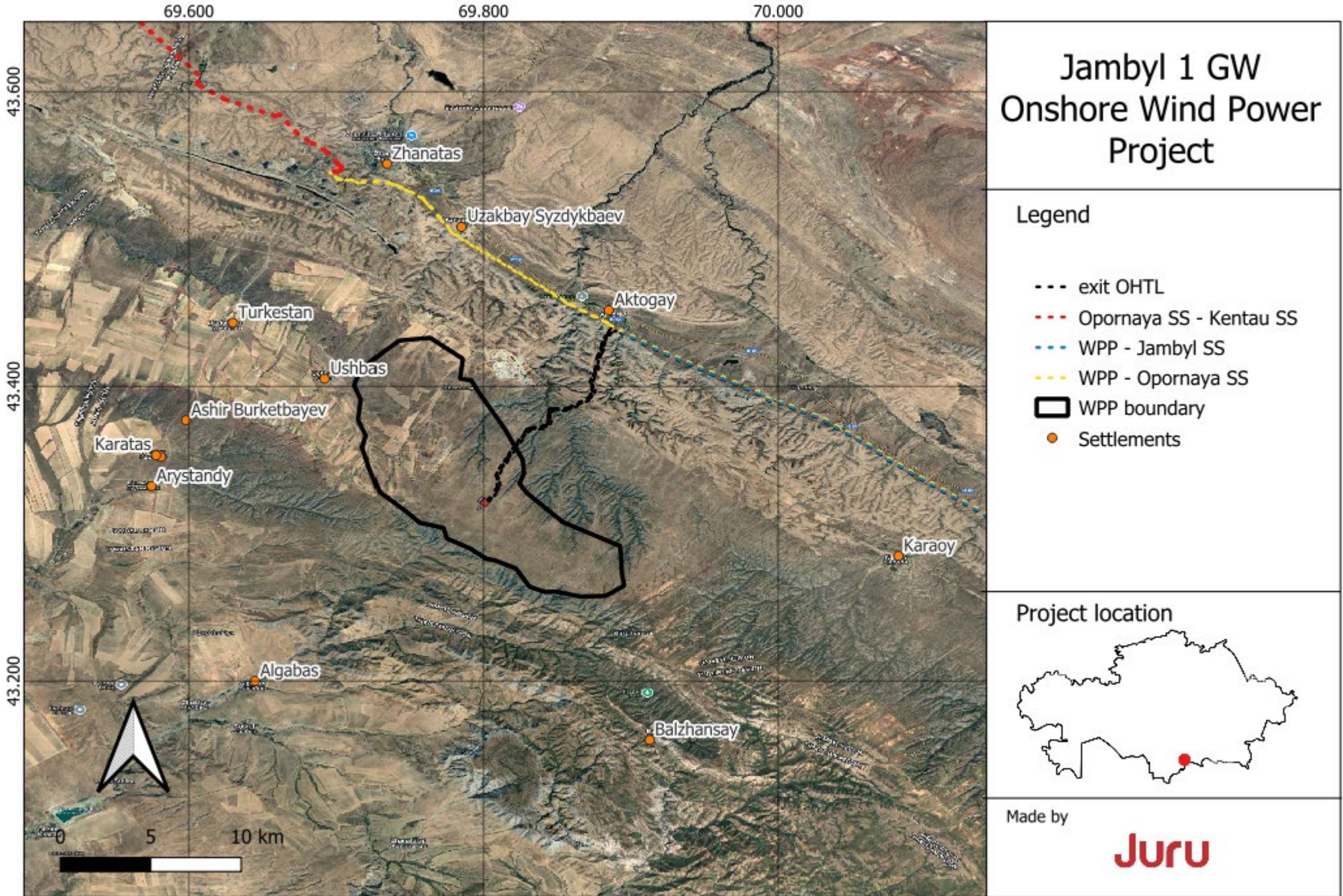


Figure 3: WPP- Jambyl SS OHTL Route and Nearby Towns & Villages

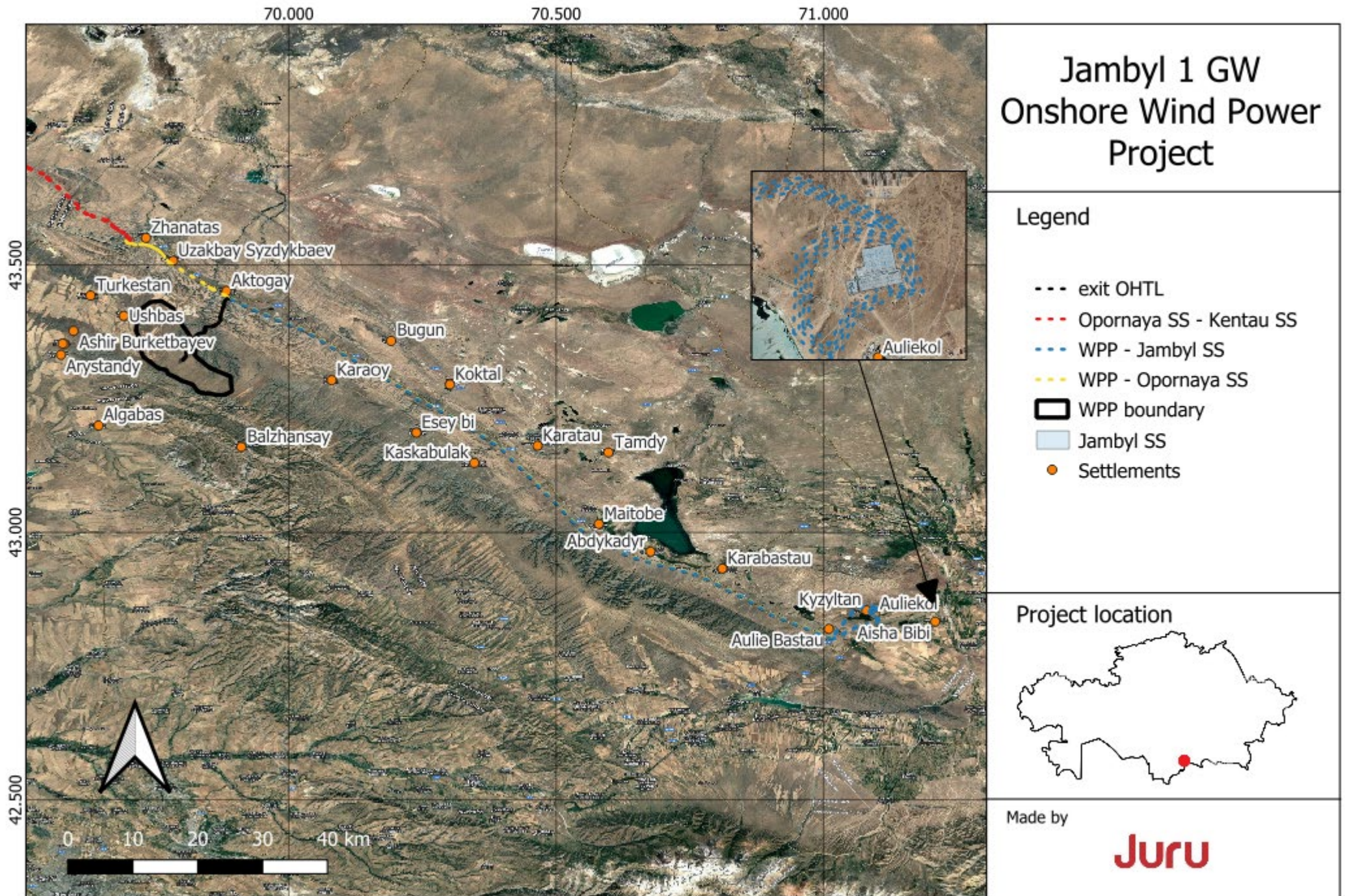
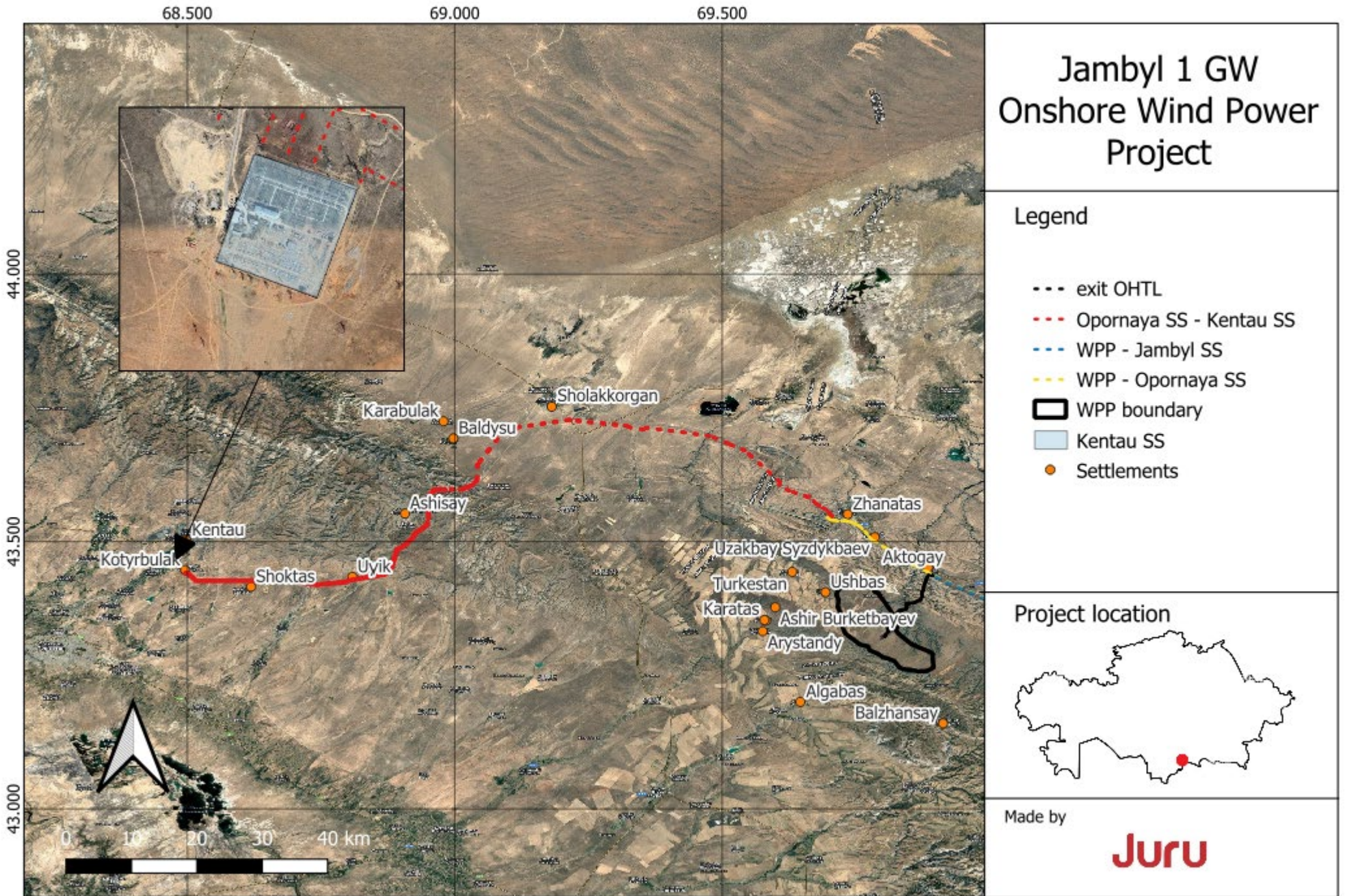


Figure 4: WPP- Kentau SS OHTL Route and Nearby Towns & Villages



## **2.2. Key project components**

The Project comprises a number of components that together generate electricity from wind and deliver it to the national power grid.

The main component of the Project is the wind power plant, which consists of up to 140 wind turbine installed across the WPP area. This represents a worst-case layout, and the final number of turbines may be lower following further design refinement. The turbines are distributed across the elevated plateau to make use of the natural wind conditions while maintaining separation distances from settlements, infrastructure and environmental features.

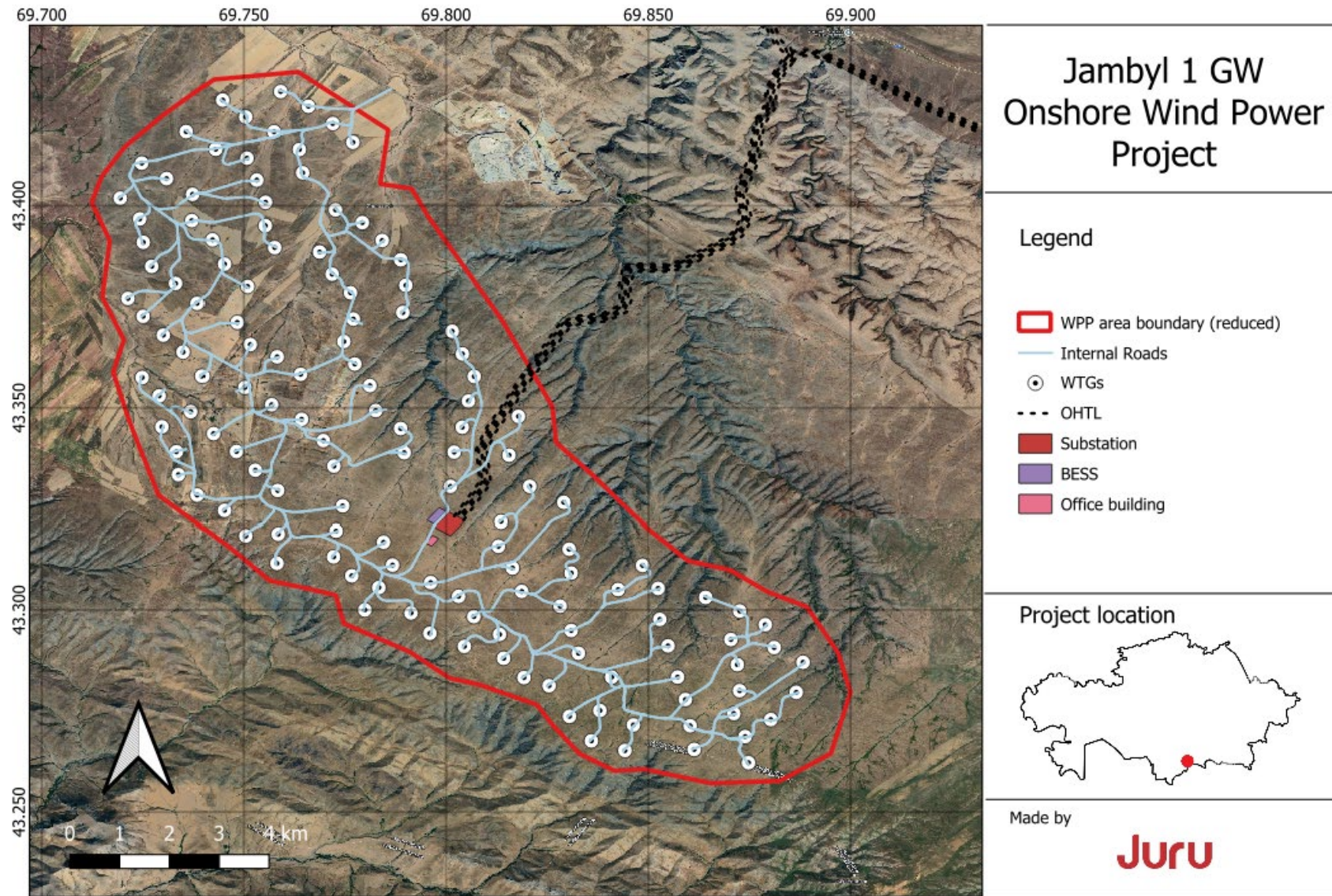
A plan showing the indicative layout of the wind turbines, together with the location of the battery energy storage system, associated buildings, and Internal access roads within the WPP area, which are used during construction and operation to reach turbine locations, are shown in Figure 5.

Electricity generated by the turbines is collected through an internal electrical network, which will be buried, and transferred to on-site substations, where the voltage is adjusted to allow efficient transmission to the national electricity network. A battery energy storage system will be installed to support grid stability by storing electricity when generation is high and releasing it when demand is higher.

Electricity is exported from the WPP via two overhead transmission lines (OHTLs), which connect the Project substations to existing substations within the regional electricity network. One OHTL connects the WPP to the Jambyl Substation and is approximately 90 km in length, while the second OHTL connects the WPP to the Kentau Substation and is approximately 140 km in length. These transmission lines follow defined corridors across predominantly rural land.

Electricity generated by the WPP is exported via two overhead transmission lines (OHTLs), which connect the Project substations to existing substations within the regional electricity network. One OHTL, approximately 130 km in length, connects the WPP site to the existing Jambyl Substation, located near the city of Taraz. The second OHTL, approximately 160 km in length, connects the WPP site to the existing substation near Kentau. Where possible, the OHTLs have been routed alongside or close to existing OHTLs and roads, in order to minimise additional land take and environmental disturbance. The transmission lines generally follow existing OHTL routes and do not require the creation of new transmission corridors, crossing predominantly rural land.

Figure 5: Internal roads inside Project WPP area



## **2.3. Project phases**

The Project will be developed in 2 phases, covering construction and operation.

### **Construction Phase**

During the construction phase, activities will include preparation of the site, construction of access tracks, installation of wind turbine foundations, delivery and erection of wind turbine components, construction of substations and other supporting facilities, and installation of the OHTLs. Construction activities will be temporary and will move progressively across the Project area rather than taking place everywhere at the same time.

Construction will require a temporary workforce and the use of construction equipment and vehicles. Measures to manage potential environmental and social effects during construction are identified in the ESIA and will be implemented through the Project's environmental and social management and monitoring arrangements.

The construction phase represents the period during which the majority of potential environmental and social impacts may arise; however, these impacts are temporary in nature and are managed through the measures identified in the ESIA.

### **Operation Phase**

Once construction is complete, the Project will enter the operational phase. During this phase, the wind turbines will generate electricity from the natural wind resource and export this electricity to the national grid via the transmission lines. Operational activities will be relatively low-intensity and will mainly involve routine inspection, maintenance and monitoring of the wind turbines, substations and electrical infrastructure.

A smaller permanent workforce will be required during operation compared to construction, and vehicle movements will be limited mainly to maintenance and monitoring activities.

## **3. Need for the Project and Alternatives**

### **3.1. Energy context**

Kazakhstan has set national objectives to diversify its energy supply and increase the proportion of electricity generated from renewable energy sources, in order to support long-term energy security and economic development. Wind power is an established and proven form of renewable energy in Kazakhstan, particularly in areas with suitable natural wind conditions.

The Jambyl 1 GW Onshore Wind Power Project has been developed to make use of the natural wind resource present in the elevated steppe areas of the Jambyl Region and to contribute electricity to the national grid without the need to burn fuel. By generating electricity from wind, the Project supports national energy policy objectives and helps reduce reliance on conventional power generation sources.

The Project will provide electricity to the national grid, contributing to the reliability and stability of electricity supply and supporting regional and national development priorities.

### **3.2. Project objectives**

The main objectives of the Project are to:

- generate electricity from a renewable wind resource using modern onshore wind technology;
- supply electricity to the national grid to support energy security and reliability;
- contribute to Kazakhstan's renewable energy and energy diversification objectives; and

- develop the Project in a manner that avoids or minimises potential environmental and social impacts, in accordance with national requirements and international good practice.

### **3.3. Alternatives considered**

As part of the ESIA process, a range of alternatives were considered to identify a Project design that avoids or minimises environmental and social impacts where practicable. These alternatives included:

- alternative Project locations and site layouts;
- alternative wind turbine arrangements within the WPP area;
- alternative routing options for the OHTLs; and
- the “no Project” alternative, under which the wind power project would not be developed.

The assessment of alternatives took into account environmental, social, technical and economic considerations. The selected Project layout and transmission routes were identified as providing a suitable balance between efficient electricity generation and the avoidance or reduction of potential environmental and social impacts.

## **4. Assessment Approach**

### **4.1. Legal and policy framework**

The Project is subject to the environmental legislation and permitting requirements of the Republic of Kazakhstan, which establish the national framework for environmental protection, environmental impact assessment, public consultation and information disclosure. In line with these requirements, a separate Environmental Impact Assessment (EIA) has been prepared and submitted to the relevant national authorities to support the statutory permitting process for the Project.

In parallel with the national EIA process, the Environmental and Social Impact Assessment (ESIA) has been prepared to address the requirements of international lenders and to reflect international environmental and social standards and good international industry practice, which are commonly applied to large infrastructure and energy projects financed by development banks and commercial lenders. The ESIA provides a comprehensive assessment of environmental and social risks and impacts and sets out measures for their management, monitoring and ongoing engagement, promoting a consistent, transparent and internationally recognised approach to Project development.

Together, the application of national legislation and international standards ensures that potential environmental and social impacts are identified at an early stage and that appropriate measures are put in place to avoid or minimise impacts where practicable, and to manage residual impacts effectively. This combined approach also supports meaningful stakeholder engagement and ongoing environmental and social management throughout the development of the Project.

### **4.2. ESIA methodology**

The ESIA was carried out using a systematic and structured approach to identify and assess the potential environmental and social effects associated with the Project during construction and operation. The assessment process included:

- collection and review of existing information;
- field surveys and baseline studies to understand current environmental and social conditions;
- identification of potential environmental and social risks and impacts;
- evaluation of the significance of potential impacts, taking into account the sensitivity of receptors and the nature of Project activities; and

- identification of measures to avoid, minimise or manage potential impacts.

The ESIA also considered cumulative impacts, where Project activities may interact with other existing or planned developments in the wider area, and assessed potential impacts under both normal and reasonably foreseeable conditions.

The findings of the ESIA informed the Project design, including the siting of infrastructure and routing of transmission lines, and form the basis for the environmental and social management and monitoring measures identified in the ESIA.

### **4.3. Stakeholder engagement**

Stakeholder engagement has been an integral part of the ESIA process and has been undertaken to ensure that stakeholders are informed about the Project, understand its potential environmental and social impacts, and have opportunities to provide feedback.

Engagement activities were carried out with a range of stakeholders, including local communities and residents, land users, local authorities and other interested parties within the wind project area and along the overhead transmission line routes. Engagement included the disclosure of Project information and meetings with stakeholders to explain the Project and the ESIA process in a non-technical manner.

Stakeholder engagement for the Project is guided by a Stakeholder Engagement Plan (SEP). The SEP sets out how information is shared, how engagement activities are undertaken, and how stakeholder feedback is recorded and considered throughout Project development.

Engagement will continue as the Project progresses through construction and operation, with further opportunities provided for stakeholders to receive information and raise questions or concerns.

### **4.4. Grievance mechanism**

A grievance mechanism has been established for the Project to allow stakeholders to raise questions, concerns or complaints related to Project activities. A separate worker grievance mechanism will also be put in place for workers to raise grievances, which will be managed by the EPC Contractor and reported to the Project Company.

The grievance mechanism is intended to be accessible, transparent and free of charge, and can be used by individuals or communities who consider themselves affected by the Project. Grievances can be submitted through a range of channels, and all grievances will be recorded and reviewed in a timely manner.

The grievance mechanism provides a structured process for acknowledging, assessing and responding to concerns, and aims to resolve issues in a fair and appropriate manner. Information on how to access the grievance mechanism and submit a grievance is made available to stakeholders as part of Project information disclosure and engagement activities.

The grievance mechanism has been and will continue to be disclosed during all public consultations and targeted stakeholder engagement activities and grievance contact details are included on all documents, brochures and leaflets for disclosure to stakeholders.

Grievances can be raised to the Project during meetings, site visits, via voicemail or phone calls, or in written form. The contact details for raising / submitting grievances are presented in the table below, covering the methods available to contact the Grievance Manager using: phone calls, voice or text messages, email, voice or text WhatsApp messages, or written letters.

Juru has developed a grievance form that can be used by stakeholders to record any grievance they wish to raise. Alternatively, Juru staff will be able to complete the form on behalf of a complainant (e.g. if complainants raise grievances by phone or if a complainant wishes to receive support to capture the issues they wish to raise).

Your data will remain confidential. If you wish, you can raise a grievance anonymously, but if you do so, it will not be possible to receive a response from the Project about actions taken to respond to your grievance.

The contact points for raising a grievance during this ESIA preparation and Project pre-construction phase are included here:

Company	Contact Details
<p><b>Juru Ltd.</b> Zukhra Sultanova – Senior Social Consultant</p>	<p>Email: z.sultanova@juru.org Telephone/WhatsApp: +7 778 817 63 64 Postal address: Nurly Tau Business Center, Office 4, Block 3B, 19 Al Farabi Ave., Almaty, Kazakhstan, 050010</p>
<p><b>Juru Ltd.</b> Dinara Beisekova–Social Consultant</p>	<p>Email: o.khegay@juru.org Telephone / WhatsApp: +7 777 407 74 77 Postal address: Nurly Tau Business Center, Office 4, Block 3B, 19 Al Farabi Ave., Almaty, Kazakhstan, 050010</p>
<p><b>Project Company</b> Nauryzbek Zhumagazin – Masdar Community Liaison Officer</p>	<p>Email: nk.zhumagazin@gmail.com Telephone/WhatsApp: +7 747 271 14 69</p>

## 5. Summary of Environmental Impacts and Mitigation

### 5.1. Biodiversity and Ecology

The ESIA assessed the potential effects of the Project on biodiversity and ecology during both construction and operation, covering the wind power plant (WPP) area and the overhead transmission line (OHTL) routes. The assessment was informed by extensive baseline surveys undertaken over multiple seasons between 2024 and 2025, focusing on habitats, plants, birds, bats and terrestrial fauna.

The Project area is dominated by open steppe, grazing land and agricultural fields that are typical of southern Kazakhstan and are widespread across the region. No legally protected areas or internationally designated Key Biodiversity Areas are located within the Project footprint. The nearest Important Bird Area, designated for wintering Great Bustards, is located approximately 14 km from the WPP area.

While the Project does not overlap any protected sites, the wider region supports a variety of wildlife, including migratory birds and bats, reflecting Kazakhstan’s position along major regional migration routes.

Baseline studies identified that a range of bird species use the wider area during migration, including large soaring birds such as eagles, vultures and cranes, as well as bustards that are known to be sensitive to collision with overhead powerlines. Surveys also recorded bat activity across the WPP area, with higher levels of activity

during late summer and early autumn, when some bat species fly at heights that overlap with wind turbine blades.

Terrestrial mammals recorded within the wider area are typical of steppe environments, with the Karatau subspecies of Argali sheep identified as the most sensitive non-flying species in the region.

During construction, potential impacts on biodiversity may arise from temporary land disturbance, vegetation clearance, increased vehicle movements and the presence of construction personnel. These effects could lead to short-term disturbance or displacement of wildlife if not properly managed. During operation, the main potential biodiversity risks relate to the collision of birds and bats with wind turbines, collision of birds with overhead transmission lines, and longer-term disturbance or displacement of sensitive species in the vicinity of Project infrastructure.

The Project design has incorporated measures to avoid and reduce biodiversity impacts. The WPP layout and OHTL routes were selected to avoid protected areas, Key Biodiversity Areas and major wetlands, and to follow existing infrastructure corridors where possible, thereby reducing habitat fragmentation. The transmission lines will incorporate bird-friendly design measures to improve visibility and reduce collision risk. Wind turbine placement has been informed by detailed survey data and collision risk modelling, allowing higher-risk areas to be avoided where feasible.

Baseline surveys and collision risk modelling identified that large soaring bird species, including eagle and vulture species, occur regularly within the wider Project area during migration and seasonal movements. For some of these species, a moderate residual collision risk remains during the operational phase of the wind farm, which is characteristic of large onshore wind power projects. In response to this residual risk, a Shutdown-on-Demand (SoD) strategy will be implemented as an operational mitigation measure. Shutdown-on-Demand will involve the temporary shutdown of selected turbines during periods of elevated collision risk, informed by defined trigger conditions.

The ESIA also identified bats as an important consideration during the operational phase. Surveys confirmed regular bat activity across the WPP area, with higher activity recorded during late summer and early autumn. As a result, bat collision risk is managed through a combination of turbine design, operational monitoring and adaptive management measures.

Construction activities will be managed through good practice measures, including defined working areas, control of vehicle speeds, workforce awareness training, and procedures to prevent harm to wildlife. A dedicated Biodiversity Management Plan will be implemented during construction and operation, setting out measures for biodiversity protection, monitoring requirements and actions to be taken if unexpected impacts are identified. The Biodiversity Management Plan will include provisions for operational monitoring of birds and bats, implementation of Shutdown-on-Demand measures, and an adaptive management framework under which mitigation measures will be reviewed and refined based on monitoring results and operational experience.

With the implementation of these mitigation and management measures, the ESIA concluded that most biodiversity impacts associated with the Project will be localised, limited and manageable. Some residual risk of bird and bat collisions remains, which is typical for large onshore wind projects; however, this risk has been reduced as far as practicable through Project design and ongoing management. Overall, the Project is not expected to result in significant population-level impacts on habitats or species of conservation importance and is considered consistent with national requirements and international good practice.

## 5.2. Noise and Vibration

The ESIA assessed potential noise and vibration impacts associated with the construction and operation of the Project.

During construction, noise will be generated by activities such as earthworks, vehicle movements, foundation construction, installation of infrastructure and movement of construction equipment. These activities will be temporary and localised, moving progressively across the Project area rather than occurring at all locations at the same time.

At some turbine locations, controlled blasting may be required during foundation excavation where bedrock is present. Blasting will be infrequent, short in duration and carried out during daytime hours only by licensed contractors. Blast-induced ground vibration attenuates rapidly and, based on experience from similar wind farm projects, perceptible vibration generally does not extend beyond 200 m, while vibration levels associated with cosmetic building damage rarely occur beyond 50–100 m. These ranges align with the Project's minimum exclusion radii of 200–300 m, within which no personnel or livestock are permitted during blasting. Airblast noise from blasting is a short-duration airborne noise pulse, typically lasting a fraction of a second, which decays rapidly with distance and, in open steppe conditions, becomes faint and often indistinguishable from normal background noise at distances of around 1 km. All permanent settlements and dispersed dwellings are several kilometres from all WTG foundation sites, meaning that all residential receptors lie well outside the range at which blast-induced noise or vibration could be perceptible.

Overall, construction-related noise and vibration impacts are expected to be temporary and localised. These impacts will be managed through the application of good construction practice, including appropriate scheduling of works, use of well-maintained equipment, implementation of safety and exclusion zones during blasting, and communication with local land users where activities may cause temporary disturbance.

During operation, noise will be generated primarily by the wind turbine generators as they rotate in the wind. The ESIA concluded that, with the proposed turbine layout and separation distances, operational noise levels are expected to comply with applicable standards at all nearby residential receptors.

In addition to permanent residential receptors, the assessment also considered seasonal and overnight land users, including livestock herders who may use movable grazing shelters or wagons within the WPP area. These shelters are temporary, repositioned as grazing patterns change, and although not classified as permanent residential dwellings, are used overnight during the grazing season. The ESIA identified that, under conservative worst-case conditions, wind turbine noise may be perceptible audible at such locations and could represent a noticeable change from existing quiet conditions, with the potential for some sleep disturbance during periods of use. However, actual exposure is expected to be intermittent and limited, as shelters are moved frequently, herders do not remain at fixed locations, and turbine sound is only generated during windy conditions and so often reduced by wind masking, and dependent on wind direction. Taking these factors into account, the ESIA concluded that noise impacts for movable grazing shelters are moderate, and that targeted consultation with affected herders will be undertaken to ensure they are informed and to discuss appropriate measures, such as acoustic insulation, where required.

The ESIA noise assessment was based on conservative, worst-case assumptions, including turbine operating conditions and layout scenarios designed to ensure that potential impacts were not underestimated. This included modelling the maximum anticipated number of wind turbines and assuming use of the noisiest turbine model. In practice, actual noise experienced on the ground is therefore expected to be lower than those predicted, due to factors such as turbine operation varying with wind conditions, wind masking effects, and the fact that not all turbines contribute to noise at a given location at the same time. As a result, the likelihood of sustained exposure to the modelled worst-case noise levels is considered to be low.

To ensure that noise impacts are appropriately managed, the Project will implement monitoring and management measures during operation. These will include responding to any noise-related concerns raised by local land users through the Project's grievance mechanism, investigating complaints where they arise, and implementing additional mitigation measures, if required. This approach will allow potential noise issues to be identified, assessed and addressed in consultation with affected stakeholders, including herders using temporary grazing shelters.

### **5.3. Visual and shadow flicker**

The ESIA assessed potential landscape, visual and shadow flicker impacts associated with the construction and operation of the Project, taking into account the characteristics of the surrounding landscape, the location of nearby settlements and the proposed wind turbine layout.

During construction, temporary visual effects will be associated with construction activities, equipment, crane operations and vehicle movements within the WPP area. These effects will be short-term and localised, reducing once construction is completed and temporary areas are reinstated.

During operation, wind turbine generators will introduce new vertical elements into an open steppe landscape characterised by wide plains and gentle relief. Within and close to the WPP area, turbines will be clearly visible, particularly from elevated ground and locations with open views. In the near-range, views from Ushbas and Turkestanskiy villages are expected to be partial and locally screened, with turbines visible mainly from certain directions and not dominating views from within the settlements. The Kamar-Aulie area, including the shrine and cemetery, will have views of the wind farm and is one of the locations from which the turbines will be most clearly visible. However, these views are influenced by local topography and distance, and the turbines will be seen as part of the wider surrounding landscape rather than as a continuous foreground feature.

At mid-range distances, villages such as Akhtogay, Karaoy, Zhanaaryk and Algabas are screened by local topography, and the ESIA concluded that the wind turbines are not expected to be visible from within the main settlement areas. As a result, visual effects at these locations are expected to be negligible to low. At long-range distances, including from Zhanatas, which is located more than 10 km from the WPP area, the wind turbines may be theoretically visible from some elevated locations; however, due to the distance involved, they would appear very small, be difficult to distinguish from the horizon, and would not be visually prominent. Visibility at this distance is strongly influenced by weather conditions and viewing direction, and visual effects at Zhanatas are expected to be insignificant.

The ESIA concluded that landscape and visual effects will be most noticeable within the WPP area and its immediate surroundings, reducing progressively with distance. For receptors already influenced by the presence of the existing wind farm, the Jambyl Project is not expected to result in a substantial change to the overall visual character, and additional visual effects are expected to be moderate to low at nearby villages.

Shadow flicker occurs when rotating turbine blades pass between the sun and a receptor under specific conditions. The ESIA assessed the potential for shadow flicker effects at nearby settlements and concluded that no exceedances of applicable shadow flicker standards are predicted at permanent residential receptors, including at the nearest village of Ushbas. As a result, shadow flicker impacts at residential properties are not expected to be significant.

Within the WPP area shadow flicker may be experienced occasionally by temporary land users, such as herders during grazing activities, depending on location of shelters, time of year and daily movement patterns. These effects are expected to be intermittent and limited in duration. During operation, the Project will continue to engage with potentially affected parties, including users of grazing land, to identify any concerns related to

shadow flicker. Where required, monitoring and appropriate management measures will be implemented to ensure that any effects are identified and addressed in a timely and proportionate manner.

Overall, through careful siting of turbines, routing of access tracks, and reinstatement of temporary construction areas, landscape, visual and shadow flicker impacts associated with the Project are expected to be manageable and not significant.

#### **5.4. Water resources**

The ESIA assessed potential impacts on surface water and groundwater resources associated with the construction and operation of the Project, with a particular focus on construction activities, when interaction with water features is most likely to occur.

During construction, potential impacts on water resources may arise from earthworks, foundation construction, installation of access tracks, and works associated with the overhead transmission lines. These activities could temporarily affect natural drainage patterns, increase sediment runoff during rainfall events, or create a risk of accidental spills of fuels or oils if not properly managed.

The ESIA concluded that these potential impacts will be localised and temporary, as construction activities will move progressively across the Project area and permanent infrastructure has been designed to avoid watercourses, springs and natural drainage features where possible. Where access tracks cross drainage lines, appropriate drainage structures will be installed to maintain natural water flows.

To avoid pressure on local water resources, construction water will be supplied by licensed tanker delivery, and no abstraction from local rivers, springs, ponds or shallow groundwater is planned. Measures such as erosion and sediment control, spill prevention, and proper management of fuels and chemicals will be implemented as part of good construction practice.

During operation, the Project will have a limited interaction with water resources. Wind turbines and associated infrastructure do not require ongoing water abstraction, and no routine discharges to surface water or groundwater are expected. Vehicle movements and maintenance activities during operation will be infrequent and confined to existing access routes.

With the identified mitigation and management measures in place, impacts on water resources associated with the Project are expected to be manageable and not significant, and the Project is not expected to adversely affect water availability or use by local communities and herders.

#### **5.5. Land and soils**

The ESIA assessed potential impacts on land and soils associated with the construction and operation of the Project, with a particular focus on construction activities, when ground disturbance is greatest.

During construction, impacts on land and soils may arise from earthworks for wind turbine and OHTL foundations, construction of access tracks, installation of electrical infrastructure, and movement of construction vehicles and equipment. These activities will result in temporary land take, disturbance and compaction of soils, and an increased risk of soil erosion where vegetation cover is removed.

The ESIA concluded that these impacts will be localised and largely temporary, as construction activities will move progressively across the WPP area and along the OHTL routes rather than taking place everywhere at the same time. Land disturbance will be limited to the areas required for construction, and no areas of unstable ground or geotechnical constraints that would prevent Project development were identified.

Impacts on land and soils will be managed through the application of good construction practice, including minimising the construction footprint, stripping and storing topsoil where practicable, implementing erosion control measures on exposed ground, managing excavated materials appropriately, and reinstating temporarily disturbed areas following construction.

During operation, land take will be limited to the permanent footprint of wind turbines and OHTL towers, access tracks and associated infrastructure. Ongoing disturbance to soils will be minimal and largely confined to routine maintenance activities along existing access routes.

Overall impacts on land and soils associated with the Project are expected to be manageable and not significant.

## **5.6. Waste and Wastewater**

The ESIA assessed the generation and management of waste and wastewater associated with the Project, with a focus on construction activities, when waste generation is highest.

During construction, waste will include excavated materials from foundation works, construction materials and packaging, general domestic waste from the workforce, and small quantities of hazardous waste such as waste oils, lubricants and chemical containers. Wastewater will generally be limited to that generated from construction camps and welfare facilities.

If not properly managed, waste and wastewater could result in localised soil or water contamination or nuisance effects. However, the ESIA concluded that these risks can be effectively managed through the implementation of appropriate waste and wastewater management measures.

All waste will be segregated, stored safely, and removed by licensed contractors for reuse, recycling or disposal at authorised facilities. Hazardous waste will be stored in designated areas and handled in accordance with applicable regulations. Construction wastewater will be managed using sealed systems such as septic tanks, with regular removal by licensed operators. Uncontrolled disposal, burning or burial of waste within the Project area will not be permitted.

During operation, waste and wastewater generation will be limited, consisting mainly of small quantities of maintenance waste and wastewater from staff facilities at the operation and maintenance base. These wastes will be managed using the same principles and controls applied during construction.

Overall, with the implementation of standard good waste management practices, waste and wastewater associated with the Project will not result in significant adverse environmental or social impacts.

## **5.7. Air Quality**

The ESIA assessed potential air quality impacts associated with the Project, with a focus on construction activities, when emissions to air are most likely to occur.

During construction, temporary impacts on air quality may arise from activities such as earthworks, vehicle movements on unpaved tracks, material handling, and the operation of construction equipment and machinery. These activities may generate dust and exhaust emissions, which could be noticeable in the immediate vicinity of construction works.

The ESIA concluded that, due to the remote location of the WPP area, the absence of permanent residential settlements within the Project site, and the separation distances to nearby villages, construction-related air quality impacts are expected to be localised and temporary. Dust levels reduce rapidly with distance from active works, and no significant impacts at residential receptors are anticipated.

Air quality impacts during construction will be managed through the application of good construction practices, including dust suppression measures where required, control of vehicle speeds on unpaved roads, appropriate maintenance of construction equipment, and minimisation of unnecessary vehicle movements. These measures will be implemented as part of the Project's environmental management arrangements.

During operation, air quality impacts will be insignificant, as wind turbine generators do not produce any air emissions. Vehicle movements during operation will be limited and infrequent, and no significant effects on air quality are expected.

Overall with the implementation of the proposed management measures, the ESIA concluded that air quality impacts associated with the Project are not expected to result in significant adverse effects.

## **5.8. Traffic and transport**

The ESIA assessed potential traffic and transport impacts associated with the Project, with particular attention to the construction phase, when traffic movements will be greatest.

During construction, additional traffic will be generated by the movement of construction workers, delivery of materials and equipment, and the transport of major wind turbine components, including oversized and abnormal loads such as turbine blades and towers. Construction traffic will use a combination of existing public roads and designated access routes, together with internal Project access tracks within the WPP area.

The ESIA recognised that abnormal load deliveries require careful planning and coordination due to their size and routing requirements. These movements will be planned in advance, follow approved transport routes, and be managed through appropriate traffic control measures to ensure road safety and minimise disruption to other road users. Deliveries will be scheduled to avoid unnecessary congestion and sensitive periods where practicable.

Overall, construction traffic will result in a temporary increase in vehicle movements, particularly during peak delivery periods. However, given the rural nature of the surrounding road network, low existing traffic volumes, and the absence of large settlements along most access routes, the ESIA concluded that significant traffic-related impacts are not expected. Potential risks such as road wear, traffic safety concerns, and temporary disturbance to local land users and herders will be managed through the implementation of a Traffic Management Plan, including clear communication with local communities and appropriate road maintenance and reinstatement where required.

During operation, traffic volumes will be low, limited mainly to routine maintenance and monitoring visits to the wind turbines, substations and associated infrastructure. A positive residual impact of the Project is the retention of the permanent access roads and internal track network, which will improve connectivity and mobility for local land users within the WPP area, including during winter months when access has historically been limited. These improved routes will provide more reliable and safer access across the site for grazing activities and land management.

Overall with the implementation of the proposed management measures, the ESIA concluded that traffic and transport impacts associated with the Project are expected to be temporary during construction, limited during operation, and manageable, with no significant long-term effects on the local road network.

## **5.9. Climate change**

The ESIA considered the relationship between the Project and climate change, including how changing climate conditions may affect the Project and how the Project contributes to efforts to address climate change.

Climate change refers to long-term changes in weather patterns, including temperature, rainfall and wind conditions, as well as the frequency of extreme weather events. In Kazakhstan, these changes are already being observed and include hotter summers, more variable winters, changes in rainfall patterns, and an increased frequency of droughts and extreme weather events. Such changes can affect water availability, grazing conditions and livelihoods that depend on natural resources.

The ESIA concluded that the Project itself is not expected to be significantly affected by climate change. Wind power projects are designed to operate under a wide range of weather conditions, and the Project's location and design are considered suitable for anticipated future climate conditions in the region.

At the same time, the Project contributes to addressing climate change by generating electricity from a renewable wind resource, without burning fossil fuels or producing greenhouse gas emissions during operation. By supplying renewable electricity to the national grid, the Project helps reduce reliance on conventional power generation and supports Kazakhstan's transition towards a more diverse and resilient energy system.

Although climate change is a global issue, actions taken at the national and project level contribute to reducing its long-term effects. The ESIA concluded that the Project will make a positive contribution to climate change mitigation and is consistent with Kazakhstan's national policies and international efforts to respond to changing climate conditions.

## **6. Summary of Social Impacts and Mitigation**

### **6.1. Labour and working conditions**

The ESIA assessed labour and working conditions associated with the construction and operation of the Project in accordance with national legislation and international standards. The assessment considered employment practices, working hours, occupational health and safety, worker accommodation, freedom of association, and risks related to child or forced labour. Both direct Project workers and contractor and subcontractor workers were included in the assessment.

During construction, the Project will require a large temporary workforce. All workers will be employed under written contracts that define terms and conditions of employment in line with Kazakhstan's Labour Code. The Project will apply non-discrimination and equal opportunity principles, and employment decisions will be based on skills and experience. Child labour and forced labour will not be permitted.

Occupational health and safety risks are inherent in construction activities, including working at height, use of heavy machinery, and electrical works. These risks will be managed through a comprehensive health and safety management system, including risk assessments, training, provision of personal protective equipment, and emergency preparedness. Workers will be informed of their rights and responsibilities and will be able to raise safety concerns without fear of retaliation.

Where worker accommodation is required, facilities will be designed and managed in line with international guidance to ensure safe, hygienic and dignified living conditions. This includes adequate space, water supply, sanitation, waste management, medical support, and recreational facilities. Accommodation will be located and managed to minimise impacts on nearby communities.

A worker grievance mechanism will be in place to allow workers to raise concerns related to working conditions, treatment, or safety. Grievances will be addressed in a timely and confidential manner. With these measures in place, the ESIA concluded that labour and working condition impacts are expected to be manageable and of minor residual significance during both construction and operations phases.

## 6.2. Community health and safety

The ESIA assessed how construction and operation activities may affect the health, safety, and security of nearby communities. The assessment considered potential risks associated with construction traffic, interaction between community members and construction areas, noise and dust generation, labour influx, communicable diseases, and the presence of security personnel. These issues were assessed in the context of existing community conditions, including access to healthcare, infrastructure, and public services in settlements across the Project Area of Influence.

During construction, temporary impacts on community health and safety may arise from increased traffic along local and regional roads, movement of heavy vehicles, and construction activities near settlements and farms. These impacts could include increased risk of road accidents, short-term increases in dust and noise levels, and restricted access to land or services. To address these risks, the Project will implement traffic management measures, including designated transport routes, speed limits, driver training, vehicle maintenance requirements, and coordination with local authorities.

The assessment also considered risks related to labour influx, including pressure on local services, potential transmission of communicable diseases, and changes to community dynamics. The Project will apply measures to manage workforce behaviour and interactions with communities, including codes of conduct, induction training, and awareness-raising on respectful behaviour. Health screening, access to medical services, and hygiene standards will be applied within worker accommodation and construction sites to reduce public health risks including pressure on local services.

Gender-based violence and harassment (GBVH) was identified as a contextual risk in Kazakhstan, particularly in rural areas with limited access to support services. Projects have the potential to increase GBVH risks, so preventive measures will be implemented in line with international good practice. These include mandatory training for workers, clear reporting and response procedures, referral pathways to local support services, and a zero-tolerance approach to harassment, exploitation, or abuse.

Security arrangements for the Project will be designed to protect assets and personnel while respecting the rights, dignity, and safety of local communities. Any security personnel engaged will be trained in proportional use of force, community interaction, and applicable national laws and international standards. The Project will ensure that grievance mechanisms are accessible to community members to raise concerns related to safety, security, or misconduct. With these measures in place, residual impacts on community health and safety are expected to be manageable and of insignificant to minor residual significance at both construction and operational phases of the Project.

## 6.3. Land and livelihoods

The ESIA assessed the potential impacts to landowners and land users and their livelihoods as a result of land acquisition and temporary land use required by the Project construction and operations.

The majority of the land in Jambyl region is owned by the Government of Kazakhstan, and all of the land required for the Project will be returned to the Government Reserve Lands as a result of the land acquisition process. This land will then be rented to the Project Developer, for the purpose of constructing the Project.

The Project will not lease the entire area of Project impact, it will only lease the land that is specifically required for the Project. In other words, it will lease land for the:

- Footprints of the wind turbine generators (WTGs);
- Footprints of the OHTL towers;
- Crane hardstands and laydown areas;

- Internal roads;
- Battery Energy Storage System (BESS);
- Project substation; and
- Operations buildings.

Once construction is complete, land users will be able to use their remaining land between and around Project infrastructure, to continue growing fodder crops and grazing animals.

Servitude rights will be gained for the land that is within the right of way of the OHTLs, through negotiation with the landowners. The land between the two transmission lines for the Jambyl OHTL will also be included in the servitude calculations. Land users will be able to continue to use the land. There will only be restrictions in the erecting of structures, and growing trees that may impact the OHTL. Note, that no trees have been identified in the OHTL right of way.

There may also be some temporary acquisition required during construction for laydown areas, worker accommodation and temporary access roads. The exact location and size of temporary land acquisition has not yet been identified and will be updated in later versions of the LRP. To date no physical displacement impacts (relocation of people from their primary houses) have been identified for any of the Project infrastructure.

There is a prescribed process to complete land acquisition under Kazakh national law. This process will be followed in parallel and in coordination with the land acquisition under international requirements. In order to meet both national and international requirements for mitigation and management of impacts related to land acquisition, the Project has prepared two Livelihood Restoration Plans (LRPs) for the Project (one for the WPP, and one for the Jambyl OHTL section). A third LRP will be prepared for the Kentau OHTL, which will follow the format and entitlements of the Jambyl OHTL LRP.

Overall, with the implementation of the proposed mitigation and monitoring measures included in the LRPs, residual land acquisition impacts are assessed as minor or insignificant, and no significant adverse effects are expected during the operational phase of the Project.

#### **6.4. Cultural heritage**

The ESIA assessed potential impacts of the Project on cultural heritage, including archaeological sites, burial mounds, sacred places, and intangible cultural heritage. The assessment was based on desk studies, review of national heritage registers, field surveys conducted by licensed specialists, and consultations with local communities and authorities.

Archaeological surveys identified a number of burial mounds and burial sites within the wider study area, primarily dating to the Early Iron Age. The Project has applied the mitigation hierarchy, with avoidance as the primary measure for protecting cultural heritage. Buffer zones have been established around all identified sites in accordance with national legislation, and construction activities will be restricted within these zones to avoid impacts on known heritage features. As a result, no direct impacts on known cultural heritage sites are expected during construction or operation.

Despite extensive surveys, there remains a possibility that previously unknown tangible heritage resources could be discovered during construction. To address this risk, a chance-find procedure will be implemented. This procedure requires that work is stopped immediately if potential cultural heritage is encountered, and that relevant authorities are notified so appropriate actions can be taken.

The ESIA also considered intangible cultural heritage, including sacred sites valued by local communities. Engagement with communities will continue throughout the Project to ensure that any concerns related to cultural or spiritual values are identified and addressed. With the implementation of these measures, the ESIA

concluded that the Project is not expected to result in significant impacts on cultural heritage, and residual impacts are assessed as insignificant or minor during construction and into the operations phase.

## 7. Environmental and Social Management and Monitoring

The environmental and social risks and impacts identified in the ESIA will be managed throughout construction and operation through the development and implementation of a project specific Environmental and Social Management System (ESMS), that will ensure that the mitigation and management measures identified in the ESIA are effectively implemented.

The Project ESMS will be aligned with Masdar's corporate Health, Safety, Social and Environmental Management System (HSSE MS). Masdar's HSSE MS is based on the company's extensive experience in the development, construction and operation of renewable energy projects worldwide and provides a structured approach to managing environmental and social performance in line with national requirements and international lender standards.

During construction, the EPC contractor will be required to implement the construction phase ESMS through a series of site-specific management plans and procedures. These will cover key topics and issues identified in the ESIA, including noise and vibration, traffic management, waste and wastewater, protection of water resources, land use, biodiversity, and community health and safety. Environmental and social performance will be monitored through regular inspections, reporting and oversight by the Project company.

Impacts related to land access, land use and livelihoods will be managed in accordance with a Livelihood Restoration Plan (LRP), which will be developed to provide affected land users and households with support maintain or restore their livelihoods where Project-related impacts occur.

During operation, environmental and social management will continue to be applied through Masdar's HSSE MS and the Project's operational management arrangements. Monitoring will focus on key issues relevant to the operational phase, such as noise, shadow flicker, land use interactions and ongoing engagement with local land users, including herders.

Potential impacts and risks to biodiversity will be managed through the development and implementation of a dedicated Biodiversity Management Plan (BMP). The BMP will set out measures to avoid, minimise and manage impacts on habitats and species, together with monitoring requirements and corrective actions where required.

The Project will apply an adaptive management approach, whereby monitoring results, operational experience and feedback from stakeholders are used to review performance and, where necessary, adjust management measures to address unforeseen issues or changing conditions.

Stakeholder engagement and the grievance mechanism will form an integral part of the ESMS. Local communities and land users will be able to raise concerns or complaints related to Project activities, which will be recorded, investigated and addressed in a timely and transparent manner. Information from grievances will also be used to inform monitoring activities and continuous improvement of Project management.

Overall, this approach ensures that environmental and social risks associated with the Project are systematically managed, monitored and addressed throughout construction and operation, in accordance with Masdar's HSSE MS, national requirements and international good practice.

## 8. Conclusions

The ESIA assessed the potential environmental and social risks and impacts associated with the Project during both the construction and operational phases, covering the wind power plant, battery energy storage system, overhead transmission lines, access roads and associated infrastructure. The assessment was undertaken in accordance with national requirements and international lender standards.

The ESIA concluded that the Project will give rise to a range of environmental and social impacts during both phases. Construction-related impacts are generally more intensive but temporary, reflecting the scale and geographical extent of construction activities, while operational impacts are typically more limited in extent but longer term, and are characteristic of large-scale onshore wind energy developments. With the implementation of the mitigation and management measures defined in the ESIA, the majority of impacts are assessed as temporary, localised and reversible.

During construction, potential impacts include land disturbance, traffic movements, noise and vibration, dust generation, waste management and interactions with local land users, including herders. These impacts are expected to be limited to the construction period and will be managed through the Project's construction Environmental and Social Management System and associated management plans.

During operation, residual impacts may include the presence of wind turbines in the landscape, noise, shadow flicker, and ongoing interactions with land users within the WPP area. These impacts have been assessed in the ESIA and have been avoided or minimised where practicable through Project design, including turbine layout optimisation and routing of overhead transmission lines. Ongoing monitoring and adaptive management measures will be applied during operation to ensure that these impacts remain within acceptable levels.

The ESIA also assessed impacts related to land acquisition, land access and livelihoods, particularly in relation to livestock grazing activities within the WPP area. The Project does not require permanent physical resettlement, and land acquisition has been minimised through Project design. Where land is temporarily or permanently affected, impacts are primarily related to restricted access to grazing areas and changes to land use patterns. These impacts will be managed through the implementation of a Livelihood Restoration Plan, which sets out measures to support affected land users in maintaining or restoring their livelihoods. With these measures in place, residual impacts on land use and livelihoods are assessed as acceptable and manageable.

The ESIA identified that the main residual social impact relates to night-time noise exposure at a small number of non-residential receptors, including seasonal or temporary overnight accommodation used by livestock grazers. While wind turbine noise may be audible under certain conditions and could lead to some sleep disturbance, these effects are expected to be intermittent, and appropriate mitigation and management measures will be implemented. Overall, residual social impacts are assessed as acceptable and manageable, subject to effective implementation of the agreed measures and continued engagement with affected land users.

Potential impacts on biodiversity have been addressed through early Project design and avoidance measures and will be managed through the implementation of a Biodiversity Management Plan. Taking these measures into account, residual biodiversity impacts are considered acceptable and consistent with national requirements and international lender standards.

In addition to residual impacts, the Project will deliver positive residual effects, including the generation of renewable electricity, contribution to national and global efforts to address climate change, improved access and connectivity within the Project area, and local employment and economic opportunities during construction and operation.

Overall, the ESIA concluded that, following the implementation of the proposed mitigation and management measures, no residual impacts of Major significance are predicted. Residual environmental and social impacts

are assessed as minor to moderate and are considered acceptable and manageable within the framework of the Project's environmental and social management systems. The Project is therefore considered to be environmentally and socially acceptable, subject to effective implementation of the commitments set out in the ESIA.